# INNOVATION AND THE PRESERVATION OF SOCIOEMOTIONAL WEALTH: CORPORATE ENTREPRENEURSHIP IN FAMILY CONTROLLED HIGH TECHNOLOGY FIRMS

**Luis R. Gomez-Mejia**
Texas A&M University
Mays Business School
College Station, TX
lgomez-mejia@mays.tamu.edu

**Marianna Makri**
University of Miami
School of Business Administration
Coral Gables, FL
mmakri@miami.edu

**Robert E. Hoskisson**
Rice University
Jones Graduate School of Business
Houston, TX
robert.hoskisson@rice.edu

**David G. Sirmon**
Texas A&M University
Mays Business School
College Station, TX
dsirmon@mays.tamu.edu

**Joanna Tochman Campbell**
Texas A&M University
Mays Business School
College Station, TX
jcampbell@mays.tamu.edu

6/9/2010

**INNOVATION AND THE PRESERVATION OF SOCIOEMOTIONAL WEALTH: CORPORATE ENTREPRENEURSHIP IN FAMILY CONTROLLED HIGH TECHNOLOGY FIRMS**


**ABSTRACT**

Using the behavioral agency model we hypothesize that in high technology industries family controlled firms tend to invest less in R & D and engage in lower technological diversification than non-family controlled firms even though doing so increases business risk in this industry. Families adopt these seemingly irrational policies in order to preserve their socioemotional wealth. Furthermore, we argue that the depressing effect of family control on R & D investment is greatest when the CEO is a family member and when institutional ownership is weak, conditions that give the family greater discretion to pursue its socioemotional wealth preservation strategy. Lastly we hypothesize that the family becomes more willing to invest in R & D when firm performance declines as this might result in the dual loss of socioemotional wealth and financial welfare. Overall, we find strong support for these hypotheses.

Innovation is “the fundamental impulse that sets and keeps the capitalist engine in motion” (Schumpeter, 1934: 82–83). More pointedly, Balachandra and Friar (1997) argue that the introduction of new product, services, and methods are the lifeblood of most organizations, while Franko concluded that firm R&D investment “emerges as a principal, perhaps *the* principal, means of gaining market share in a global competition” (1989: 470). In fact, the value of innovation for improving firms’ survival and future performance has been widely recognized and extensively reported in the literatures across domains, including economics (e.g., Cohen & Levinthal, 1989; Berstein, 1989; Dahlander & Gann, 2010), sociology (e.g., Bradach & Eccles, 1989; DiMaggio & Powell, 1983, Gabbay & Zuckerman, 1998), and management (e.g., Brown & Eisenhardt, 1995; Li et al., 2008; Wallin & Von Krough, 2010). Moreover, within the management field this research effort is being conducted across major sub-domains including strategic management (e.g., Hoskisson & Hitt, 1988; Hoskisson, Hitt, Johnson & Grossman, 2002; Baum, Calabrese & Silverman, 2000), organization theory (e.g., Cyert & March, 1963; Day, 1994; Burns & Stalker, 1994), organizational behavior (e.g., Lee, Florida & Gates, 2010; Owen-Smith & Powell, 2004; Eisenberger, Pierce & Cameron, 1999), human resource management (e.g., Galbraith & Merrill, 1991; Saura Diaz & Gomez-Mejia, 1997; Trembley & Chenevert, 2008), and entrepreneurship (e.g., Dushnitsky & Lenox, 2005; Majundar, 2000; Rothwell, 1991), among others.

Besides the notion that continuous innovation is salutary for competitive advantage at the organizational and even national level (Brown & Eisenhardt, 1995; Franko, 1989; Johnston, Hascic & Popp, 2010), two other threads are common in this literature. The first suggests that innovation is risky because it involves trial and error efforts under conditions of high causal ambiguity (e.g., Nohria & Gulati, 1996). The second thread, which is particularly evident when issues related to corporate governance are addressed (e.g., Hill & Snell, 1988; Dougherty & Hardy, 1996; Hoskisson et al., 2002; Zahra, 1996), suggests that the owners and managers of public firms' view innovation differently. Managers are more conservative than owners in their risk preferences and since managers' (i.e., agents) employment and compensation is tied to the focal firm (e.g., Hill & Snell, 1988), they enjoy less discretion than owners (e.g., Finkelstein, Hambrick & Cannella, 2009), and managers tend to be evaluated upon short term results while the benefits of innovation efforts may take a long time to materialize (e.g., Caranikas-Walker, Goel, Gomez-Mejia, Cardy & Grabke-Rundell, 2008). Hence, there is a conflict between the desires of managers and owners (i.e. principals) in terms of investments in innovation. Owners would desire managers to take greater risks by investing more in innovation efforts, whereas managers prefer to avoid the risk that such investments convey (Hill & Snell, 1988).

In high technology industries these ideas take on added urgency for two related reasons. First, as noted by Ahuja, Lampert and Tandon (2008: 58): "Developing a competitive advantage through product and process innovation is essential for the success of technology-based growth companies… Investments in R&D can create barriers for established firms via patents, or alternatively can allow new firms to overcome existing entry barriers with innovative new technologies. The technological capabilities created by R&D are among the best sources of competitive advantage and a driving force behind growth." Second, while innovation for managers is a riskier endeavor in the high technology industry (due to greater complexity, higher uncertainty and rapid technological change; Balkin & Gomez-Mejia, 1987), for owners in this type of industry the risk of investing in innovation is lower than the risk associated with not investing in innovation (Palmer & Wiseman, 1999; Sundaram, John, & John, 1996). Therefore, principals of high technology firms should be motivated to insist that their firms invest in innovation, offering managers with enough inducement to mitigate their conservative attitudes (Balkin, Markman & Gomez-Mejia, 2000; Trembley & Chenevert, 2008).

There is some evidence, however, to suggest that the purported innovation-friendliness of high technology owners may not always hold true, that is, even if the "right" decision is to invest more heavily in innovation, not all owners may be as enthusiastic to support this strategy. For instance, Hoskisson et al. (2002) report that some investors have a shorter time horizon than others and, hence, owners' desires to engage in innovation depend on their objectives. In other words, varied groups of owners, especially among publicly-traded firms, may posses conflicting objectives, where some may see less value than others in pursuing an aggressive innovation program, even in a high-technology context. This raises the question of what happens to a firm's innovation efforts when its owners respond differently to market and institutional pressures to pursue innovation.  What then makes some high technology firms comply with the wishes of some owners with respect to innovation? Are there differences in influence and idiosyncratic utilities among owners that make the high technology firm more or less responsive to market forces that favor innovation? Do some owners resist these pressures by pursuing a personal agenda guided by non-economic rationality? Does the high technology firm's emphasis on innovation depend on who has a controlling interest and the motives of the dominant owners?

We address these related questions in the context of high technology, family controlled firms. While high technology firms should find it advantageous to engage in innovation in order to survive and prosper, we propose that these firms will vary in their innovative efforts based on their ownership profile and how much the dominant party values innovation or is driven by some other utilities that counterbalance the economic rationale for investment in innovation.

We argue that family ownership plays an important role in determining a high-technology firm's innovation strategy and that family influence varies depending on other salient factors, such as how the firm is performing, the concentration of other types of owners, and how the top management team is structured. Overall, we expect that when family principals are in a dominant ownership position the firm is less likely to pursue an active innovation strategy even when the context (such as high technology) favors such a strategy from an economic perspective. The reason families resist the economic incentive for high R&D investment is that such a strategy may jeopardize the family's socioemotional wealth or SEW. SEW refers to the utility a family receives from ongoing firm ownership and control. Specifically, Gomez-Mejia and colleagues state that SEW captures the "affective endowment" of family owners, including the family's desire to exercise authority, enjoyment of family influence, maintenance of clan membership within the firm, the appointment of trusted family members to important posts, retention of a strong family identity, the continuation of family dynasty and such (see Gomez-Mejia, Takacs Haynes, Nunez-Nickel, Jacobson & Morgano-Fuentes, 2007; Gomez-Mejia, Makri & Larraza-Kintana,2010; Berrone, Cruz, Gomez-Mejia & Larraza-Kintana, 2010). In their recent review of the family business literature, Berrone et al. (2010: 88) conclude that "the simplifying assumption that socioemotional concerns are important to family owners is well supported in numerous empirical studies which use a variety of methodologies, samples and timeframes."

Because family owners tend to place great value on SEW, independent from additional financial gains, we contend that they feel greater vulnerability than other shareholders to the potential loss of SEW that might result from aggressive investments in R&D As such, family owners are more willing to face the consequences of constrained innovation efforts in order to better preserve family SEW. Hence, when families are in control of the high technology firm, particularly if the CEO is a family member, R&D investments would be lower in spite of the potential economic downside of this strategic choice. However, we also argue that family owners do not want the firm to fail thereby fully jeopardizing SEW and the family´s welfare. Thus, family owners are willing to increase innovation investments when firm performance is poor and/or when other influential shareholders value such investments. Empirical results provide strong support for our expectations.

The present study makes several important contributions to the literature. First, we show that corporate control conditions can reinforce either organizational resistance or desire to pursue an aggressive innovation strategy, depending on the self-interest of the dominant principal. This can occur even in situations (such as high technology industries) where there is broad consensus among scholars that innovation efforts are very positive and are even required to remain competitive (Sundaram et al., 1996). As such, we make a contribution to agency theory by expanding the growing literature examining the heterogeneity of ownership and how different interests influence corporate strategy decisions, sometimes in the pursuit of non-economic utilities. In this regard, we advance the behavioral agency perspective (Wiseman & Gomez-Mejia, 1998) to show that problem framing may vary by type of principal and that how issues are subjectively framed by key principals will affect strategic choices. Specifically, in our case we argue that when faced with a context that implies losses in socioemotional wealth family owners in a controlling position are willing to make strategic choices that are suboptimal and risky using strict economic calculus if these seemingly irrational choices help preserve the family´s socioemotional endowment. This behavioral agency logic helps explain why family controlled high technology firms would pursue a low R&D intensity and low technological diversification strategy despite the financial hazards of such choice and the fact that the family has most of its patrimony tied to one firm (which should make it more averse to financial losses). Second, we apply the convergent insights of the innovation, corporate governance and family business literatures to better understand the set of complex factors that underlie how firms make innovation-related decisions even when "the right choice" (for instance, greater R&D investments in high technology industries) is scarcely debatable from a competitive advantage perspective. Third, we examine the conditions under which family owners may be willing to trade off diminished SEW for innovation investments, namely when faced with performance hazard that threatens firm survival and/or when the family is challenged by non-family principals who value innovation investments (that is, when the family does not enjoy unconstrained discretion to preserve SEW). Fourth, we examine the impact of family ownership on innovation not only in terms of input (R&D investments) but also diversification of R&D outcomes or the extent to which firms expand their technological reach in multiple directions (i.e., patent diversification into a broad set of technology classes).

Lastly, the context (high technology), explanatory variable (family ownership) and dependent variable (innovation) in this study are important for their own sake. The so called "knowledge-intensive industry" is of great interest as an engine for economic growth in the U.S. and abroad. Family organizations around the world account for approximately 65% to 90% of all business establishments (Arregle et al., 2007) and families often exercise an important role in high technology firms. Finally, a better understanding of the drivers of technological innovation from a governance perspective is important since empirical literature on the subject remains scarce (Ahuja et al., 2008).

## THEORETICAL FRAMEWORK

The traditional agency perspective, with its roots in economic theory and finance, suggests that family owners in the high technology sector would tend to actively support innovation. This is because the family normally has most of its wealth tied to one particular firm and, as noted earlier, lower innovation poses greater risk in this sector where product life cycles are sometimes measured in months. Hence, in this particular context, greater levels of R&D investment provide the conservative family owners the least risk. However, as argued below, the behavioral agency model (BAM) leads to the opposite prediction.

To the extent that SEW preservation is a key objective of family owners (Gomez-Mejia et al., 2007; Berrone et al.,2010; Cruz et al.,2010; Gomez-Mejia et al.,2010) and that strong innovative initiatives jeopardize that SEW, the behavioral agency model (BAM) developed by Wiseman and Gomez-Mejia (1998) would suggest that the preservation of SEW drives the family-controlled high technology firm to choose less rather than more innovation (even though this choice is economically risky). According to BAM, which integrates elements of prospect theory, behavioral theory of the firm and agency, risky actions (such as limiting innovation efforts in an industry that competes through innovation) would ensue as problems are framed negatively when comparing anticipated outcomes from available options. BAM predicts that decision makers are willing to make risky decisions when the situation is framed in negative terms. The mechanism explaining this is "loss aversion", which concerns the avoidance of loss even if this means accepting higher risk. Hence, "loss aversion explains a preference for riskier actions to avoid an anticipated loss altogether…risk preferences of loss averse decision makers will vary with the framing of problems in order to prevent losses to accumulated endowment" (Wiseman & Gomez-Mejia, 1998 :135). From BAM's perspective, risk is perceptual depending on how the problem is framed. An individual who perceives a subjective threat to his or her endowment (what is considered important for personal welfare that is already accrued and can be counted on) is more willing to undertake risky actions to preserve that endowment.

Gomez-Mejia et al. (2007) hypothesized that for family firms the most important reference point when framing major decision choices is the loss of SEW, which they define as the stock of affect-related value a family derives from its controlling position in a particular firm. This socioemotional endowment includes as noted earlier, the unrestricted exercise of personal authority vested in family members, identification of owners with the firm that carries their name, utility of placing close relatives and friends in key positions, being part of a tight social group or clan, and so forth (e.g., Kepner, 1983; Schulze et al., 2001, 2003; Zahra, 2001, 2003; Zahra, Gomez-Mejia, Cruz & De Castro, in press; Littunen, 2002).

In a set of empirical papers, Gomez-Mejia and colleagues (Gomez-Mejia et al., 2007; Gomez-Mejia et al., 2010; Cruz et al., 2010; Berrone et al., 2010), argue that family owners are likely to frame relinquishing SEW as a deep personal loss. That is, "… preserving the family's SEW, which is inextricably tied to the organization, represents a key goal in and of itself. In turn, achieving this goal requires continued family control of the firm. Hence, independent of financial considerations, family owned firms are more likely to perpetuate owners' direct control over the firm's affairs" (Gomez-Mejia et al, 2007: 110). Thus, according to this logic, family owners are more inclined to accept greater probabilities of financial losses (for instance, losing potential market share by not pursuing an aggressive innovation strategy) if assuming this risk diminishes the possibilities of SEW losses.

**Family Ownership and R&D Investments**

In most of the technology and innovation literature (please see review by Ahuja et al., 2008) as well as in the corporate governance literature (see, for instance, the research of

Hoskisson and colleagues, 1988, 1990, 1991, 2002; Makri, Lane & Gomez-Mejia, 2006) R&D investments are seen as critical aspects of most innovation efforts. As these investments increase, innovation activities and outcomes resulting from these activities should increase accordingly. As noted by Ahuja et al. (2008), the size of the R&D budget adjusted for firm size (what is generally known as R&D intensity) reflects the actual inputs of the innovation task. In their words, "unless R&D is subject to strongly diminishing returns within a broad range of values, the effect of R&D should be unambiguously positive on innovation output." (Ahuja et al., 2008: 13). While R&D investments should increase the high technology firm's competitive advantage and thus reduce its risk bearing (because the firm competes through innovation often in market segments with short product life cycles), when families are in a dominant position they are more likely to use their influence to restrict R&D investments. They will do so because as R&D investments increase, the family principal may be threatened by the loss of SEW. In fact, prior research shows that family firms are more responsive to threats, in terms of changing their strategies, than non-family firms (Gomez-Mejia et al., 2010: Sirmon, Arregle, Hitt & Webb, 2008). There are at least four reasons as to why R&D investments threaten the family owner's SEW endowment.

First, as R&D investments increase the family is forced to incorporate expertise from outside the family circle as most R&D effort is highly specialized and complex. That is, expansion of R&D investments is likely to pose a hazard to SEW because it entails an increased need for managerial talent and expertise that may not be available within the family group or trusted colleagues that are close to the family group. As the firm increases its investments in R&D, the family may have little choice but to hire cognizant executives (such as a Chief Technology Officer) and technical personnel who are capable of handling this growth and subsequently give up some authority over important projects and key decisions; this in turn may undermine the control, clan and identification aspects of SEW (Cruz et al.,2010). Recruitment of outsiders who are experts in specialized knowledge areas beyond the comprehension of family owners may also increase information asymmetries and goal conflict between new hires and entrenched family members, further eroding family SEW (Galve Gorriz & Salas Fumas, 2002). The family may be reticent to depend on outsider's perspectives and opinions in their decision making because it would imply loss of control (Kepner, 1983; Jones, Makri & Gomez-Mejia, 2008). Psychiatrist Kets-De-Vries (1993) held in-depth interviews with family owners of more than 300 firms and found that delegating responsibility to outsiders tends to be discouraged. Similar arguments can be found in Kepner (1983), Gersick, Davis, Hampton & Landsberg (1997), Schulze et al. (2003), Gomez-Mejia et al. (2007), and Jones et al., (2008), among others. In short, the decision to aggressively expand R&D is likely to uncover existing deficiencies in human capital, thus requiring greater use of outsiders. But this is a constraint that family owners would rather avoid even though most high technology firms with strong family presence may have already delegated substantial responsibility to non-family specialists.

Second, R&D investments usually require a willingness to experiment as well as the introduction of new routines and modus operandi that move the firm away from its "true and tried" methods of operation (Eisenmann, 2002). A high technology firm controlled by families is more likely to stay closer to the "core" because it is a choice that provokes less anxiety and one that given prior success (particularly if family founders are still active) feels more comfortable to the dominant coalition. The fact that the family in most cases had a strong hand in building that core (unlike the typical agent who manages what was already there) should increase commitment to it, diminishing the need for greater R&D investments (what some scholars refer to as the pursuit of a “harvesting strategy”). This is probably reinforced by psychological and social biases in cognitions (Hambrick & Mason, 1984). Decision maker’s mental biases, maps, and filters in favor of a “true and tried” approach become even more relevant when investment outcomes are uncertain (Hambrick, Cho & Chen, 1996). The most studied demographic traits influencing strategic choices as a function of these mental biases, maps and filters include age, past background of managers, and tenure (Hambrick et al., 1996, Wu, Levitas, & Priem, 2005; Bantel & Jackson, 1989) but it seems reasonable that family membership is an enduring, intrinsic and inalienable personal characteristic that should play a profound role in this process. Furthermore, the top management team of family firms tends to be less diverse because of the family’s desire for control (Cruz et al.,2010) and lack of diversity engenders a dominant logic that is more resistant to trial and error (Bantel & Jackson, 1989), the oil that fuels R&D and exploring different arenas of technological competence.

Third, because family firms tend to diversify less (Anderson & Reeb, 2003b), partly because of a fear of loss of control (Gomez-Mejia et al.,2010; Palmer, Jennings, & Zhou, 1993), this presents an additional obstacle to R&D expansion. As first argued by Nelson (1959), firms with a broader product line tend to benefit more from R&D expansion. This happens because it is difficult to predict how knowledge accumulated in one area may be used in another area. The popular press is full of anecdotal evidence of how a particular line of research led to applications that were completely different from the original intent (for instance, Botox which is now widely used in lieu of plastic surgery had its origin in research to combat botulism in canned food; Viagra was found to be effective for treatment of erectile dysfunction even though it was discovered by testing blood pressure medications). That is, the benefits of research investments are likely to be greater when R&D efforts can yield knowledge that may be applied to multiple domains. A broad technology base, particularly under related diversification, should facilitate cross-pollination of ideas across domains. Furthermore, knowledge transfer across domains and creative applications of research findings from one product line to another are made easier by porous organizational boundaries because of shared organizational codes, internal networks and frequent communication exchanges. By having a more static and narrower scope (see Gomez-Mejia et al., in press; Jones et al, 2008) the family controlled high technology firm is less likely to have a mind set of exploration into diverse terrains, mitigating the desire to further expand its R&D investments.

Fourth, high technology firms usually finance R&D expansion by securing external investments, either in the form of debt or by ceding ownership to parties outside the firm (such as venture capitalists or institutional investors) in exchange for much needed funding. This resource dependence translates into a loss of family control and hence SEW. Debt financing or the issuing of new stock means that non-family outsiders can more closely monitor how the firm is managed, how R&D funds are allocated, and the general strategic direction of the firm, thus undermining the family's capacity to exercise unconstrained authority, influence and power. As noted by Mishra and McConaughy (1999), "the aversion to debt may have the side effect of reducing the growth rates of family firms", and in high technology this probably takes the form of giving up R&D investments which the family firm may not be able to sustain through internal financing.

To summarize our discussion so far, greater R&D investment in high technology firms may reduce firm risk (because these firms compete through innovation) yet family owners would prefer to incur the risk of constraining R&D given that the alternative (increased R&D investments) may result in the loss of SEW. That is, from a behavioral agency perspective the latter choice is framed negatively by the family because potential SEW losses rather than economic considerations become a critical reference point. If the family is not the sole owner of the firm (as in publicly traded firms) it bears only a fraction of the risk associated with a low R&D investment strategy yet enjoys a disproportionate share of the non-economic utilities associated with this choice (that is, the preservation of family SEW). This leads to our first hypothesis:

> *Hypothesis 1: Family controlled high technology firms invest less in R&D than their non-family controlled counterparts***.**

**Family Ownership and Technological Diversification**

Hypothesis 1 treats R&D investments as an input measure of innovation. Patents have also been used extensively as an indicator of innovation on the output side (e.g., Ahuja et al., 2008; Makri et al., 2006; Makri, Hitt & Lane, 2010; Balkin et al., 2000). Technological diversification refers to the extent to which a firm draws from many different areas of technological knowledge. Empirically it is captured by the degree to which a firm's patents cite previous patents that belong to a wide set of technologies. It is similar to a Herfindahl concentration index, indicating whether the firm targets its R&D effort in a focused manner within a narrow technology domain or whether R&D activities cut across multiple technology boundaries (Geiger & Makri, 2006; Makri, Hitt & Lane, 2010).

Consistent with the arguments preceding Hypothesis 1, technological diversification would tend to dilute the family's SEW because this demands a much larger and complex knowledge base and a more heterogeneous set of specialized and esoteric skills. The talent and expertise needed to create and manage such a diverse set of knowledge domains would force the high technology firm to actively recruit from outside the family circle. As such, information asymmetries between family owners and the rest of the organization would increase accordingly. Such diversity would also suggest the adoption of the multidivisional structure which firms are likely to be slow to adopt because it requires decentralization of decision control to division managers (Palmer et al., 1993). Technological diversification is also more resource intensive and hence to pursue it family owners would need to become even more dependent on external funding sources. Lastly, the family business literature reveals that family firms are more path dependent when it comes to a particular process, technology or product line (e.g., Dreux, 1990; Astrachan & Jaskiewicz, 2008), a finding that is mirrored in the diversification literature (Anderson & Reeb, 2003; Jones et al., 2008; Gomez-Mejia et al.,2010). As per our earlier arguments concerning R&D investments, much of this may be rooted in a strong emotional commitment or attachment by the family to a narrower course of action or core that has been successful in the past and that allows the family to maintain tighter control with less dependence on outsiders.

In short, to the extent that technological diversification results in potential SEW loss to family owners they would frame this as a negative choice and thus remain wedded to a narrower technological path. This leads to our second hypothesis:

*Hypothesis 2: Family controlled high technology firms diversify less technologically than their non-family controlled counterparts.*

**Increasing the Family Owners' Influence: Family Member-CEO**

While the influence of owners on firm strategy can be strong, managers, especially the Chief Executive Officer (CEO), retain the most direct influence on the firm's strategies. Thus, the desires of certain stakeholders, including different groups of owners, are more likely to be followed when the CEO is supportive (Tosi et al., 1999). In the family firm context, several factors, including familial protection, rich information exchange, and unusually high firm-specific human capital, suggest that a family member-CEO is especially beholden to the family's desires.

Protection refers to the support that family member owners provide a family member-CEO from typical market forces that would tend to shorten a CEO's tenure. Schulze et al. argue that familial protection allows a family member-CEO "freedom from the oversight and discipline provided by the market for corporate control" (2003: 182). Moreover, this sort of protection mitigates the risk an individual faces when asked to make highly firm-specific human capital investments (Wang & Mahoney, 2009), thus encouraging such non-transferable investments. In addition to making such investments, family member-CEOs have also been shown to be more committed to the firm than their non-family member counterparts, while requiring less remuneration (Gomez-Mejia, Larraza-Kintana, & Makri, 2003). Thus, a mutually beneficial dependence develops between the family member-CEO and the family. And this builds upon relatively deep relationships developed over years of socialization that encourages "reciprocal altruism" (Becker, 1974), which supports and facilitates rich information exchange among family members (Arregle, Hitt, Sirmon, & Very, 2007). From a behavioral agency perspective, how problem framing is perceived (in terms of potential SEW losses ) should be more similar between the CEO and the controlling family when the CEO is also a member of that family. It seems logical that the family CEO will then make strategic decisions that are closely aligned with the SEW preservation objectives of family owners.

In total then, we expect that the desires of the family will be more clearly reflected in the firm's strategy when the CEO is also a family member. Formally:

*Hypothesis 3: The negative relationship between family ownership in high technology firms and R&D investment is moderated by the CEO's affiliation, such that when the CEO is a family member the firm invests less in R&D than when the CEO is not a family member.*

**Factors Decreasing the Family Owners' Influence: Performance Threats and Other Owners**

So far we have argued that high technology firms where the family has a dominant interest prefer to deemphasize R&D investments and technological diversification, despite the fact that the family's financial risk is concentrated in a single firm and the fact that innovation efforts should reduce business risk. That is, because potential SEW losses are of paramount concern to family owners, the high technology firm would be willing to forego the risk-reducing advantages of innovation as this strategic choice would be framed negatively from a SEW perspective. Moreover, we have argued that this effect is stronger when the CEO is also a family member.

Research in finance shows that firms that underinvest in R&D relative to competitors lose market value relative to such competitors (Sundaram et al., 1996).This suggests that as the high technology firm is exposed to greater performance hazard the utility of preserving SEW vis-à-vis investing in R&D (which might help save the firm from potential failure, an unfriendly takeover, or a merger) becomes a lesser priority to family owners. That is, the return to innovation should have greater value to the family as the performance threat to the firm becomes more evident and thus, the family principal should be more willing to trade off SEW for increased R&D investments in hopes that this concession will shield the firm from an impending menace. For example, Dell's recent declining performance has not only led to the return of Michael Dell as CEO, but has also led to increased R&D investment. In fact, despite worsening macro-economic conditions, early in 2009 Dell increased its R&D spending by 8% in comparison to the same quarter in 2008 (Hickins, 2009).

As per the behavioral agency model arguments, decision makers are loss averse and the framing to gauge losses is subjective, depending on the utilities that are most critical to the parties involved. High performance hazard that dually jeopardizes SEW and the family´s economic welfare should induce the controlling family owners to frame the situation differently. After all, if the high technology firm is dissolved as a viable independent entity, the family principal would lose both SEW and its financial welfare. Hence, as the threat to the viability of the firm increases, the pivotal reference point for family owners may shift from SEW preservation to firm survival and this would increase the family's willingness to invest in R&D. This leads to the fourth hypothesis:

*Hypothesis 4: The negative relationship between family ownership in high technology firms and R&D investment is moderated by poor performance, such that such that family firms invest in R&D at lower rather than higher levels of ROA.*

As noted earlier, principal self-interest is not a homogeneous economic construct and its meaning and strategic implications are strongly influenced by the ownership configuration of the firm. The corporate governance literature is replete with examples of internal struggle among owners who often scramble to pursue their personal utilities-- short term gains, the pursuit of "pet projects", the satisfaction of narcissistic needs, increased prestige through greater firm size, and risk minimization--perhaps at the expense of other shareholders (e.g., Ahimud & Lev, 1981; Dyl, 1988, 1989; Kochhar & David, 1996; Tosi & Gomez-Mejia, 1989, Kroll et al., 1993; Werner, Tosi & Gomez-Mejia 2005).

That is, corporate governance researches have focused on the firm as a conflicting set of interests and the notion that public corporations represent a dialectic set of forces and contested objectives has a long history in the organizational sciences. As noted by Schneper and Guillen (2004: 264), "publicly held corporations are beset by perennial conflict as to who should participate and who benefits." This raises the question of what happens when various owners of the publicly traded high technology firm have different degrees of discretion and divergent motives for expanding or restricting innovation activities. While Hambrick, Finkelstein and colleagues have explored discretion in terms of managerial freedom to make decisions subject to industry, regulatory and organizational constraints (Haleblian & Finkelstein, 1993; Hambrick et al., 1993; Hambrick & Abrahamson, 1995), in the tradition of Berle and Means (1932) discretion reflects the power of one corporate player to impose its will on another as a function of the distribution of equity holdings (e.g., McEachern, 1975; Coffee, 1988; Werner et al., 2005). From this perspective, the ability of "Owner A" to impose its agenda on "Owner B" depends on the extent to which "Owner B" has sufficient equity power to restrict or constrain the initiatives of "Owner A". In other words, the ability of specific types of equity holders to pursue their particularistic agendas depends on their ownership position.

To the extent that framing varies across principals, from a behavioral agency perspective, the less discretion a principal has to make unilateral decisions in pursuit of his utilities, the more he has to come to terms with the interests of the constraining parties. In our particular scenario, while in publicly traded high technology firms controlling families can elevate their desires (namely preservation of SEW as discussed in prior hypotheses) while suppressing those of others (who may be interested in innovation as a source of competitive advantage), the family may need to compromise on the pursuit of its particularistic motives when it has to contend with the presence of other investors. That is, given that owners' preferences for investments in innovation may be heterogeneous, the resulting strategic choices from this actual or latent struggle depends on who has the power to voice its concerns and actively influence the firm to restrict or expand this investment.

There is general agreement among scholars that innovation efforts are long term in nature and thus are the returns to this investment (see Ahuja et al., 2008). Recent research in finance by Aghion, Van Reenen and Zingales (2009) found that the presence of longer term oriented investors was positively related to R&D investments. Related work by Hoskisson et al. (2002) found that longer term owners are more likely to encourage major strategic moves, often entailing major investments in R&D. On the other hand, transient owners should not oppose or block the desires of long term institutional investors in this regard. This is because R&D investments may not only create substantive long term value for the firm but also send positive market signals which may have beneficial effects on the firm´s short term share prices. Hence, when confronted with concentrated institutional owners holding a large share of company stock, the family owners may have little choice but to compromise and make innovation choices that cater to the institutional shareholders' preferences. It is also of note that institutional investor ownership has been growing significantly over the last few decades and thus this effect should be increasing (Gillan and Starks, 2007). Interestingly, Gillan and Stark (2007) note that this trend has led to more active investors who would logically tip the balance of power towards the desires of such institutional investors. In short, the overall influence of the dominant family on the R&D investments of high technology firms depends on the concentration of non-family owners and their preferences, with the negative impact of family ownership becoming weaker as institutional investors gain strength. This leads to our last hypothesis:

*Hypothesis 5: The negative relationship between family ownership in high technology firms and R&D investment is moderated by institutional investor ownership, such that increasing institutional investor ownership weakens the relationship.*

## METHODS

### Sample and Data

The hypotheses were tested using a sample of 402 firms, 201 of them being family controlled and the rest (201) non-family controlled. The starting point for identifying the list of family firms was the list of firms first identified as family controlled by Anderson and Reeb (2003), as well as the list of firms identified as such by Gomez-Mejia, Makri and Larraza (2010). Two hundred and one firms met the two conditions (board control and ownership) often identified in the literature as necessary conditions in order for a firm to be considered as family controlled (more on this below). The sub-sample of 201 non-family firms was randomly selected from the large group of firms that do not meet any of those conditions. The period of our study spans years 1994-2002 (402 firms over 9 years). Information for each firm was obtained from three sources: a) firms' proxy statements were used to collect data about firm characteristics, ownership structure, board composition, and CEO stock ownership, b) financial information for the same time period was downloaded from the COMPUSTAT database, and c) institutional ownership data was collected from the Spectrum III database**.** The availability of institutional ownership data limits our sample size to 2405. Other missing data results in the final sample size of 2101.

**Dependent Variables**

***R&D investments*.** Consistent with prior literature, we calculated R&D expenditures divided by sales as an indicator of R&D investments (Balkin, Markman, & Gomez-Mejia, 2000; Baysinger & Hoskisson, 1989; Devers et al., 2008). While R&D may also be measured from an outcomes perspective (such as number of patents or patent citations; e.g., Makri et al., 2007; Hall, Jaffe, & Trajtenberg, 2005) we restricted ourselves to R&D investments for two reasons. First, as noted by Ahuja et al. (2008), R&D inputs (i.e., expenditures) are highly correlated with R&D outcomes (e.g., number of patents). Second, our theoretical logic suggests that the causal linkage between R&D expenditures and potential SEW losses for the family is more compelling than would be the case of family ownership and volume of patenting activity. The latter might reflect strategic choices that are unrelated to SEW losses such as the firm's patenting policy or patent-related incentives provided to executives and R&D staff (e.g., Balkin et al., 2000; Makri et al., 2006). R&D expenditures and annual sales were collected from COMPUSTAT. Following SEC rules, COMPUSTAT does not report "very small R&D amounts that are not material to a firm's decision-making" (NSF, 2010). Thus, following prior studies (e.g., Coles, Daniel, & Naveen, 2006), we replace missing R&D values with a 0, treating extremely low levels as zero investment. We include a dummy variable '*R&D not reported*' to control for any potential effect of that treatment[1].

***Technological diversification.*** The U.S. Patent and Trademark Office (USPTO) classifies technologies into 417 main (3-digit) patent classes (Hall et al., 2001). Hall et al. (2001) aggregated these 417 classes into 36 two-digit technological subcategories, which in turn are further aggregated into 6 main categories. They also constructed a measure that reflects the extent to which a firm's patent cites previous patents that belong to a wide set of technologies. We utilize this measure, which reflects the technology breadth of a firm's patent portfolio. Note that technological diversification data was available for only a part of our sample (90 firms). Patents can be a very rich source of data for studying innovation because they contain very detailed information about the innovation and the technological area to which it belongs. However, using patent data to capture a firm's technological diversification is not a panacea since not all inventors/firms chose to patent their work. As such, if a firm did not appear in the USPTO database during our study period thereby not having a technological diversification

[1] We also ran all models using only data with reported R&D values (non-missing in Compustat). All of our results remain substantively unchanged (available upon request).

measure reported, we coded that as zero.

**Independent Variable**

***Family firm.*** Consistent with prior studies on family firms, a firm is considered "family-owned" if both of the following conditions are met: two or more directors must have a family relationship, and family members must hold a substantial block of voting stock (e.g., Daily & Dollinger, 1993; Allen & Panian, 1982; Gomez-Mejia, Larraza-Kintana, & Makri, 2003; Gomez-Mejia, Makri & Larraza-Kintana, 2010). While the selection of the ownership threshold is arbitrary, studies on this topic suggest that public corporations with family groups that control 5% or more of voting stocks confer family owners significant influence over the firm's executive compensation practices (Gomez-Mejia et al., 2003), growth strategies (Gomez-Mejia et al., 2010), business strategies (Daily & Dollinger, 1991, 1992), permanence of family values and culture created by founders (Anderson & Reeb, 2003b). While several authors have used a 5% threshold for family ownership (see, for instance, Allen & Panian, 1982) others have proposed a more stringent ownership threshold of at least 10% (Gomez-Mejia et al.,2010; Astrachan & Kolenko, 1994; La Porta, Lopez-De-Silanes & Shleifer, 1999). In order to assure that the family group holds a substantial block of voting stock, we adopted the more conservative cut-off point of 10% to determine if a firm should be included in the sample of family firms. Specifically, we created a dummy variable that takes the value of 1 if at least two members on the board were family members and the family owned 10% or more of voting stock in 1998. Those firms that did not meet both criteria were considered non-family and coded as 0.

**Moderator Variables**

***Performance hazard.*** Performance hazard is measured by the firm´s relative performance in terms of return on assets. This simple heuristic is often used by family owners to make threat assessments (Gomez-Mejia et al., 2007, 2010). We use the interaction term of return on assets (ROA) and family control to determine if family owners are more prone than non-family shareholders to invest in R&D at lower (when the performance threat increases) rather than higher (when the performance threat decreases) levels of ROA.

***Institutional ownership.*** Institutional ownership data, specifically pension fund and mutual fund ownership data, were collected from the Spectrum III database. Public pension funds were identified from Pensions and Investments. The institutional ownership measure was operationalized using 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.

***Family CEO***. This variable was coded as 1 if the CEO was also a family member and 0 otherwise.

**Controls**

***Product diversification.*** The level of product diversification has been shown to affect both R&D and new product introductions (Hitt et al., 1996) and it is measured using the entropy index (Hoskisson, Hitt, Johnson & Moesel, 1993). This index 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. Following Hitt et al. (1997) that measure is calculated as follows:

$$Entropy = \sum_i \left[P_i \times \ln\left(1/P_i\right)\right]$$

Where *Pi* represents the proportion of sales attributed to business segment “i”.

***Firm risk.*** This variable is operationalized as volatility, or the log of the variance of the firm’s stock return during the year (Aggarwal & Samwick, 1999; Coles, Daniel & Naveen, 2006;

Demsetz & Lehn, 1985).

***Additional control variables.*** We control for other firm characteristics that may influence innovation decisions, R&D investments, and/or corporate value These include *firm size*, measured as the natural logarithm of the firms' number of employees (Anderson & Reeb, 2003a,b), *cash* on hand (Brown & Petersen, 2010), and *firm age* (Berrone et al., 2010). We also included measures of organizational slack. *Available slack* was measured using a firm's assets to liabilities ratio as it has been found to influence the amount of funds available for R&D (Baysinger & Hoskisson, 1989). *Potential slack* was measured using the debt-to-equity ratio of the firm (Geiger & Makri, 2006). Finally, when testing the technological diversification hypothesis, we also control for the *number of patents* a firm applied for during the study period (Makri, Hitt & Lane, 2010).

**Analysis**

To test our hypotheses, we used tobit panel data analysis because both of our dependent variables are limited dependent variables (cannot take a negative value) and censored (contain a large number of observations equal to 0). Specifically, we employ tobit random effect models using industry as the group variable (at the 2-digit SIC level). "There is no command for a conditional fixed-effects model, as there does not exist a sufficient statistic allowing the fixed effects to be conditioned out of the likelihood. Unconditional fixed-effects tobit models may be fitted with a tobit command with indicator variables for the panels (Stata 10)." However, because unconditional fixed-effects estimates are biased (Stata 10), we ran the fixed-effects models as a robustness check only; all the results remain substantively unchanged (untabulated and available upon request).

For each equation, the dependent variables were measured two years after the independent and control variables. Moreover, year dummy variables were included in all specifications, controlling for fluctuations in general macroeconomic conditions and other time-dependent variation. Finally, all significance tests in the models reflect a two-tailed test.

All the continuous variables used in creating interaction terms were first mean-centered. We ran multicollinearity diagnostics using a linear regression model because the functional form of the model is irrelevant for the purposes of diagnosing collinearity (Menard, 2001). All the individual variable VIF values were below 4 (mean VIF was below 2.2 for all models), which is well below the recommended cutoff of 10, indicating that multicollinearity did not affect our results.

## RESULTS

Research comparing family controlled and non-family controlled firms generally suggests some differences and some similarities between the two (e.g., Anderson & Reeb, 2003b; Gomez-Mejia et al., 2010). Table 1 reflects descriptive statistics and correlations for both groups of firms. Mean comparison t-tests reveal that our samples of family and non-family firms do not significantly differ in terms of important firm characteristics such as industry sector, size, age, or firm risk. Significant differences appear for leverage, product diversification, institutional investors' ownership, and ROA. Note that the average R&D intensity for all firms in our sample is about 10% (18.8% for all reported values). This is clearly above the 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, 1984, 1987; Balkin et al., 2000; Gomez-Mejia & Saura, 1997; Trembley & Chenevert, 2008).

---------------------------------------
Insert Table 1 about here
---------------------------------------

The first hypothesis argues that high technology family controlled firms are less likely to invest in R&D. As can be seen in Model 1 (the first column of Table 2), the beta coefficient of the family firm dummy shows a negative and significant ($p = 0.013$) relationship with R&D investment, which provides strong support for Hypothesis 1. Hypothesis 2 argues that high technology family controlled firms are less likely to pursue technological diversification than their non-family controlled counterparts. As can be seen in Model 2 of Table 2, the beta coefficient of the family firm dummy shows a negative and significant ($p = 0.003$) relationship with technological diversification which provides strong support for Hypothesis 2.

---------------------------------------
Insert Table 2 about here
---------------------------------------

Hypothesis 3 argues that family firms where the CEO is a family member will invest less in R&D than family firms with a non-family CEO at the helm. By its very nature this hypothesis could only be tested on the sample of family firms. As can be seen in Model 2 of Table 3, the coefficient on the family CEO variable is negative and highly significant ($p = 0.000$), providing strong support for Hypothesis 3.

Hypothesis 4 suggests that the negative relationship between family control and R & D investment is positively moderated by poor performance, such that family firms become more likely to invest in innovation as firm performance deteriorates. Put differently, this hypothesis suggests that family firms would tend to invest more in R&D when their hand is forced by strong performance hazard (i.e., at lower performance levels). Conversely, when firm performance is at high levels, family firms would invest less in R&D than non-family firms. As can be seen in Model 3 of Table 4, the beta coefficient for the multiplicative interaction term of family firm dummy times ROA is negative and statistically significant ($p= 0.037$), providing support for Hypothesis 4.

Finally, Hypothesis 5 proposes that the negative relationship between family ownership and R&D investment in high technology firms becomes weaker as institutional investors own a larger portion of the company shares. Put differently, this hypothesis suggests that family firms are more likely to invest in R&D when they are constrained or forced by external investors with a long term orientation to do so (i.e., owners are concentrated and active investors). As shown in Model 3 of Table 4, the beta coefficient on the interaction between the family firm dummy and institutional ownership shows a positive (p=0.078) relationship with R&D investments, which provides moderate support for Hypothesis 5.

---------------------------------------
Insert Tables 3 and 4 about here
---------------------------------------

**Robustness checks**

The analysis described above may be subject to self-selection and endogeneity biases because we have deliberately restricted our sample to high technology firms (which might affect the probability of family controlled firms being in the sample) and there is the possibility that some unobservable elements could be related to both the choice of R & D investments and family-controlled status. Following the lead of Villalonga and Amit (2006) and Berrone et al. (2010) we conducted several additional analyses to address these biases. A detailed explanation of the empirical procedure is found in the Appendix. The main conclusion from that analysis is that the supporting findings for our hypotheses hold even if we account for endogeneity and that the OLS estimates were not biased.

## DISCUSSION

We have argued that publicly traded high technology firms tend to invest less in R&D and exhibit lower technological diversification when families are in control. This occurs even though in high technology industries R&D investments and technological diversification are important mechanisms to reduce firm risk because these organizations compete through innovation. Hence, by adopting a low R&D investment/low technological diversification strategy, family controlled firms in the high technology sector are more willing to place the firm at risk. This is paradoxical from an agency theory perspective given the fact that much of the family's financial wealth is tied to a single organization and thus a risk aversion motive should be particularly strong. This paradox may be explained, according to our behavioral agency logic, because for family owned firms the risk of losing socioemotional wealth tends to take precedence over the risk of losing financial wealth. We have argued that a high R&D/high technological diversification strategy jeopardizes the family's SEW and hence the family is willing to avoid these strategic choices (despite the financial risk implications of doing so in the high technology sector) in order to preserve SEW. More broadly, by utilizing socioemotional wealth as the primary frame of reference, to avoid SEW losses the family is willing to make risky strategic choices with lower rather than higher expected values. As a whole, empirical results provide strong support for these hypotheses.

We have also argued that for family owners the relative importance of SEW preservation (in comparison to the reduction of financial risk) lessens when threats to firm performance increase[2]. Thus, as firm performance threats increase, the family may be faced with a dual situation of losing both SEW and economic security (that is, everything could be lost unless the family takes some proactive steps to reverse this situation). This means that the family is more willing to make economically driven strategic choices as firm performance deteriorates. Our empirical results provide strong support to this expectation. This is consistent with the argument

[2] At this point, we would like to note that we did not hypothesize a performance threat effect for technological diversification because (unlike R&D expenditures which can be readily adjusted in response to performance changes) such a policy (as captured in the type of patents applied for) require many years to implement thus making it difficult to assess the temporal cause-effect relation.

made by Shapira (1995) that decision makers are more inclined to change their loss averse preferences when firm survival is in question. It is also consistent with the empirical findings of Gomez-Mejia et al. (2007) showing that family owned olive oil mills are more willing to join a coop (and lose much family control or socioemotional wealth by doing so) as the prospect of mill's failure increases.

To the extent that in a public corporation the family is not a single owner and has to contend with other owners with conflicting interests, the family may have little choice but to reach some sort of compromise on the dissenting issues. We have argued that this is likely to occur when the family faces institutional owners who are important stakeholders in the firm. We found moderate support for this expectation: as institutional ownership increases, the family controlled high technology firm tends to invest more in R&D. This suggests that in publicly traded firms the family's discretion to pursue an SEW agenda may be constrained by the presence of other stakeholders with conflicting interests (Hypothesis 5).

A closer reexamination of the findings concerning Hypothesis 5 shows that institutional investors own a surprisingly small amount of shares when the family is the major owner (approximately 12 % of the total shares, or less than half of the proportion observed in non-family controlled firms). Whatever the reasons for this disparity (which is probably a good subject for a different study), unless there is concerted effort among the small group of atomistic institutional investors who are co-owners with the family, it is unlikely that we would find a strong moderating effect. The fact that the multiplicative term for family dummy/institutional investor ownership is significant at .07 and in the expected direction indicates that institutional investors prefer to see higher R&D in these firms even though as a whole they may not have sufficient influence or interest to forcefully push their agenda.

Prior studies have documented the role of sociopolitical factors in strategic decisions and organizational practices that favor the interests of particular parties (such as the Chief Executive Officer and board members) rather than the economic welfare of all shareholders. Much of this literature focuses on such activities as ingratiation, impression formation, symbolic rather than substantive action, data manipulation and the like (see, for instance, much of the research by Westphal and colleagues: Westphal & Zajac, 2001; Westphal & Khanna, 2003; Westphal & Zajac, 1994; Bednar & Westphal, 2008; Westphal & Graebner, 2010). In that stream of research, the clear focus is on private gains by the actors involved, which directly or indirectly reflect the pursuit of financial interests (such as greater pay, lower compensation risk, or job security decoupled from performance). In this study, we consider an entirely different non-economic motive for organizational choices (such as R&D investments and technological diversification), namely the preservation of socioemotional wealth, which is a key driver when families exercise significant control (as it is the case in the majority of organizations around the world and across most industries; c.f. La Porta et al., 1999; Anderson & Reeb, 2003a,b), even when the firm is publicly traded. More broadly, this study provides additional confirming evidence for the behavioral agency model's prediction that problem framing and willingness to take risks depend on the subjective utilities that are given the highest priority by the decision maker (Wiseman & Gomez-Mejia, 1998).

In the case of family controlled organizations the preservation of socioemotional wealth represents a key non-economic reference point for decision making, which may drive the firm into a high financial risk mode (in our study lower R&D and less technological diversification, which we have argued are SEW preservation choices). Our study is limited to technology intensive firms that have succeeded in reaching the publicly traded stage and thus many may have failed before reaching this point. This raises the question of what happens at earlier, non-public stages. Most likely, family owners were willing to invest in R&D at earlier stages in order to survive and prosper, otherwise they may not be in our population. We speculate that in earlier stages information asymmetries are low, R&D spending can be monitored more easily and the family is intimately involved in the discovery process so that it faces little threat to its socioemotional wealth. Furthermore, it is the founder and his/her family that has developed the original idea to launch the firm; hence, specialized knowledge is largely contained within the family circle without the need to depend on and secure external esoteric talents. If this is the case, the effect reported here may only become important at later stages when SEW may be threatened as organizational complexity and the breadth of knowledge requirements increases, eroding the family´s sphere of influence. This poses another paradox in that according to conventional wisdom most high technology ventures start as family firms (including such venerable names as Microsoft, Intel, Hewlett-Packard, and Cray Computers), yet, once these firms succeed and become established, the family may put breaks on R&D and technological diversification, possibly jeopardizing the firm's future.

In most social science research within group variance on any dimension tends to be large (Hannan & Bursrtein, 1974; Crombach & Webb, 1975), and family controlled high technology firms are probably no exception. This means that the effects shown here represent general tendencies and it could well be that many family owned high technology firms do not follow the same pattern, thereby fostering a high R&D/high technological diversification strategy. Albeit in a different population, Gomez-Mejia et al. (2007) found that a significant proportion of family owned olive oil mills relinquished control in search of financial gains by joining a coop (even though they were in the minority). The factors that lead some family firms to place a higher priority on financial rather than SEW concerns still remain clouded in mystery and represent an important area for future research.

We did not examine the firm performance implications of our findings because it is extremely difficult to show in any compelling fashion the singular impact of specific variables (such as R&D) on firm performance. Prior research has shown mixed effects of family ownership on firm performance (for recent review see Miller et al., 2008), probably because the latter depends on a myriad factors that are endogenously determined. Most scholars would agree however, that R&D investments and technological diversification are decisions made by top management and that these decisions eventually should have a bearing on competitive advantage. The fact that family ownership in publicly traded high technology firms is negatively related to these variables suggests that the family is willing to trade higher financial risks for the preservation of SEW.

## REFERENCES


Aggarwal, R. K., & Samwick, A. A. 1999. The other side of the trade-off: The impact of risk on executive compensation. ***Journal of Political Economy***, 107(1): 65-105.

Aghion, P., Van Reenen, J. & Zingales, L. 2009. Innovation and institutional ownership. Working Paper 14769, National Bureau of Economic Research, http://www.nber.org/papers/w14769, November.

Ahuja, G., Lampert, C. M., & Tandon, V. 2008. Moving beyond Schumpeter: Management research on the determinants of technological innovation. ***Academy of Management Annals***, 2: 1-98.

Allen, M. P., & Panian, S. K. 1982. Power, performance and succession in the large corporation. ***Administrative Science Quarterly***, 27: 538-547.

Amihud, Y., & Lev, B. 1981. Risk reduction as a managerial motive for conglomerate mergers. ***Bell Journal of Economics***, 12: 605-617.

Anderson, R. C., & Reeb, D.M. 2003a. Founding-family ownership and firm performance: Evidence from the S&P 50. ***Journal of Finance***, 58: 1301-1328.

Anderson, R. C., & Reeb, D.M. 2003b. Founding-family ownership, corporate diversification, and firm leverage. ***Journal of Law and Economics***, 46: 653-684.

Angrist, J. D., & Krueger, A. B. 2001. Instrumental variables and the search for identification: From supply and demand to natural experiments. ***Journal of Economic Perspectives***, 15(4): 69-85.

Arregle, J-L., Hitt, M.A., Sirmon, D.G., & Very, P. 2007. The development of organizational social capital: Attributes of family firms. ***Journal of Management Studies***, 44(1): 73-95.

Astrachan, J. H., & Jaskiewicz, P. 2008. Emotional returns and emotional costs in privately held family businesses: Advancing traditional business valuation. ***Family Business Review***, 21(2): 139-149.

Astrachan, J. H., & Kolenko, T. A. 1994. A neglected factor explaining family business success: Human resource practices. ***Family Business Review,*** 7 (3): 251-262.

Balachandra, R., & Friar, J. H. 1997. Factors for success in R&D projects and new product innovation: A contextual framework. ***IEEE Transactions on Engineering Management***, 44(3): 276-287.

Balkin, D. B., & Gomez-Mejia, L. R. 1987. Toward a contingency theory of compensation strategy. ***Strategic Management Journal***, 8(2): 169-182.

Balkin, D. B., Markman, G. D., & Gomez-Mejia, L. R. 2000. Is CEO pay in high-technology firms related to innovation? ***Academy of Management Journal***, 43(6): 1118-1129.

Bantel, K. A., & Jackson, S. E. 1989. Top management and innovations in banking: Does the composition of the top team make a difference? ***Strategic Management Journal***, 10: 107-124.

Baum, J. A. C., Calabrese, T., & Silverman, B. S. 2000. Don't go it alone: Alliance network composition and startups' performance in Canadian biotechnology. ***Strategic Management Journal***, 21(3): 267-294.

Baysinger, B., & Hoskisson, R. E. 1989. Diversification strategy and R&D intensity in multiproduct firms. ***Academy of Management Journal***, 32(2): 310-332.

Berle, A. A., & Means, G. 1932. ***The modern corporation and private property***. New York: Commerce Clearing House.

Bernstein, J. I. 1989. The structure of Canadian inter-industry R-and-D spillovers, and the rates of return to R-and-D. ***Journal of Industrial Economics***, 37(3): 315-328.

Berrone, P., Cruz, C., Gomez-Mejia, L. R., & Larraza-Kintana, M. 2010. Ownership structure and corporate response to institutional pressures: Do family-controlled firms pollute less? ***Administrative Science Quarterly***, 55(1): XXXX

Bradach, J. L., & Eccles, R. G. 1989. Price, authority, and trust – from ideal types to plural forms. ***Annual Review of Sociology***, 15: 97-118.

Bourgeois, L. J. 1981. On the measurement of organizational slack. ***Academy of Management Review,*** 6(1): 29-39.

Brown, S. L., & Eisenhardt, K. M. 1995. Product development: Past research, present findings, and future-directions. ***Academy of Management Review***, 20(2): 343-378.

Burns, T., & Stalker, G. M. 1994. ***The management of innovation.*** New York: Oxford University Press.

Capon, N., Farley, J. U., Lehmann, D. R., & Hulbert, J. M. 1992. Profiles of product innovators among large United States manufacturers. ***Management Science***, 38(2): 157-169.

Caranikas-Walker, F., Goel, S., Gomez-Mejia, L. R., Cardy, R. L., & Grabke-Rundell, A. 2008. An empirical investigation of the role of subjective performance assessments versus objective performance indicators as determinants of CEO compensation. ***Management Research***, 6(1): 7-26.

Coffee, J. C. 1988. The uncertain case for takeover reform: An essay on stockholders, stakeholders and bust-ups. ***Wisconsin Law Review***, (3): 435-465.

Cohen, W. M., & Levinthal, D. A. 1989. Innovation and learning: The 2 faces of R-and-D. ***Economic Journal***, 99(397): 569-596.

Coles, J. L., Daniel, N. D., & Naveen, L. 2006. Managerial incentives and risk-taking. ***Journal of Financial Economics***, 79(2): 431-468.

Connelly, B. L., Tihanyi, L., Certo, S. T., & Hitt, M. A. In press. Marching to the beat of different drummers: The influence of institutional ownership on competitive actions. ***Academy of Management Journal***

Cyert, R. M., & March, J. G. 1963. ***A behavioral theory of the firm***. Englewood Cliffs, N.J.: Prentice-Hall.

Daily, C. M., & Dollinger, M. J. 1993. Alternative methodologies for identifying family- versus non-family-managed businesses. ***Journal of Small Business Management***, 31(2): 79-9.

Day, D. L. 1994. Raising radicals: Different processes for championing innovative corporate ventures. ***Organization Science***, 5(2): 148-172.

Deci, E. L. ***Intrinsic motivation***. New York, NY: Plenum Press.

Demsetz, H. & Lehn, K., 1985. The structure of corporate ownership: Causes and consequences. ***Journal of Political Economy***, 93: 1155-1177.

Devers, C. E., McNamara, G., Wiseman, R. M., & Arrfelt, M. 2008. Moving closer to the action: Examining compensation design effects on firm risk. ***Organization Science***, 19(4): 548-566.

DiMaggio, P. J., & Powell, W. W. 1983. The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. ***American Sociological Review***, 48(2): 147-160.

Dougherty, D., & Hardy, C. 1996. Sustained product innovation in large, mature organizations: Overcoming innovation-to-organization problems. ***Academy of Management Journal***, 39(5): 1120-1153.

Dreux, D. R. 1990. Financing family business: Alternatives to selling out or going public. ***Family Business Review***, 3(3): 225-243.

Dushnitsky, G., & Lenox, M. J. 2005. When do firms undertake R&D by investing in new ventures? ***Strategic Management Journal***, 26(10): 947-965.

Dyl, E. A. 1988. Corporate-control and management compensation: Evidence on the agency problem. ***Managerial and Decision Economics***, 9(1): 21-25.

Dyl, E. A. 1989. Agency, corporate-control and accounting methods: The LIFO-FIFO choice. ***Managerial and Decision Economics***, 10(2): 141-145.

Eisenberger, R., Pierce, W. D., & Cameron, J. 1999. Effects of reward on intrinsic motivation: Negative, neutral, and positive. ***Psychological Bulletin***, 125(6): 677-691.

Eisenmann, T. 2002. The effects of CEO equity ownership and firm diversification on risk taking. ***Strategic Management Journal,*** 23: 513-534.

Finkelstein, S., Hambrick, D. C., & Cannella, A. A. 2009. ***Strategic leadership: Theory and research on executives, top management teams, and boards.*** New York: Oxford University Press.

Franko, L. G. 1989. Global corporate competition: Who's winning, who's losing, and the R&D factors as one reason why. ***Strategic Management Journal***, 10: 449-474.

Gabbay, S. M., & Zuckerman, E. W. 1998. Social capital and opportunity in corporate R&D: The contingent effect of contact density on mobility expectations. ***Social Science Research***, 27(2): 189-217.

Galbraith, C. S., & Merrill, G. B. 1991. The effect of compensation program and structure on SBU competitive strategy: A study of technology-intensive firms. ***Strategic Management Journal***, 12(5): 353-370.

Galve Górriz, C., & Salas Fumás, V. 2002. ***La empresa familiar en España: fundamentos económicos y resultados***. Madrid: Fundación BBVA.

Geiger, S. W., & Makri, M. 2006. Exploration and exploitation innovation processes: The role of organizational slack in R&D intensive firms. ***Journal of High Technology Management Research***, 17(1): 97-108.

Gersick, K. E, Davis, J. A., Hampton, M. M., & Landsberg, I. 1997. ***Generation to generation: Life cycles of the family business***. Boston: Harvard Business School Press.

Gillan, S. L., & Starks, L. T. 2007. The evolution of shareholder activism in the United States. ***Journal of Applied Corporate Finance***, *19*(1): 55–73.

Gomez-Mejia, L. R., Larraza-Kintana, M., & Makri, M. 2003. The determinants of executive compensation in family-controlled public corporations. ***Academy of Management Journal***, 46: 226-237.

Gomez-Mejia, L. R., Makri, M. & Larraza, M. In press. Diversification decisions in family controlled firms. ***Journal of Management Studies***.

Gomez-Mejia, L. R., Takacs Haynes, K., Nunez-Nickel, M., Jacobson, K., & Moyano-Fuentes, J. 2007. Socioemotional wealth and business risks in family controlled firms: Evidence from Spanish olive oil mills. ***Administrative Science Quarterly***, 52: 106-137.

Greene, W. H. 1993. ***Econometric analysis***. New York: McMillan.

Haleblian, J., & Finkelstein, S. 1993. Top management team size, CEO dominance, and firm performance: The moderating roles of environmental turbulence and discretion. ***Academy of Management Journal***, 36(4): 844-863.

Hall, B. H., Jaffe, A., & Trajtenberg, M. 2005. Market value and patent citations. ***RAND Journal of Economics***, 36 (1): 16-38.

Hambrick, D. C., & Abrahamson, E. 1995. Assessing managerial discretion across industries: A multimethod approach. ***Academy of Management Journal***, 38(5): 1427-1441.

Hambrick, D. C., Cho, T. S., & Chen, M. J. 1996. The influence of top management team heterogeneity on firms' competitive moves. ***Administrative Science Quarterly***, 41(4): 659-684.

Hambrick, D. C., Geletkanycz, M. A., & Fredrickson, J. W. 1993. Top executive commitment to the status-quo: Some tests of its determinants. ***Strategic Management Journal***, 14(6): 401-418.

Hambrick, D. C., & Mason, P. A. 1984. Upper echelons: The organization as a reflection of its top managers. ***Academy of Management Review***, 9(2): 193-206.

Hambrick, D.C., Werder, A., & Zajac, E.J. 2008. New directions in corporate governance research. ***Organization Science***, 19(3): 381-385.

Hickins, M. May 20, 2009 Technology blog http://industry.bnet.com/technology/10001812/hp-lagging-in-innovation-race/. Accessed March X, 2010.

Hill, C. W. L., & Snell, S. A. 1988. External control, corporate-strategy, and firm performance in research-intensive industries. ***Strategic Management Journal***, 9(6): 577-590.

Hitt, M. A., Hoskisson, R. E., & Ireland, R. D. 1990. Mergers and acquisitions and managerial commitment to innovation in M-form firms. ***Strategic Management Journal***, 11: 29-47.

Hitt, M. A., Hoskisson, R. E., Ireland, R. D., & Harrison, J. S. 1991. Effects of acquisitions on research-and-development inputs and outputs. ***Academy of Management Journal***, 34(3): 693-706.

Hitt, M. A., Hoskisson, R. E., Johnson, R. A., & Moesel, D. D. 1996. The market for corporate control and firm innovation. ***Academy of Management Journal***, 39(5): 1084-1119.

Hitt, M. A., Hoskisson, R. E., & Kim, H. 1997. International diversification: Effects on innovation and firm performance in product-diversified firms. ***Academy of Management Journal***, 40: 787-798.

Hoskisson, R. E., Harrison, J. S., & Dubofsky, D. A. 1991. Capital-market evaluation of M-form implementation and diversification strategy. ***Strategic Management Journal***, 12(4): 271-279.

Hoskisson, R. E., & Hitt, M. A. 1988. Strategic control systems and relative R-and-D investment in large multiproduct firms. ***Strategic Management Journal***, 9(6): 605-621.

Hoskisson, R. E., Hitt, M. A., Johnson, R. A., & Grossman, W. 2002. Conflicting voices: The effects of institutional ownership heterogeneity and internal governance on corporate innovation strategies. ***Academy of Management Journal***, 45(4): 697-716.

Hoskisson, R. E., Hitt, M. A., Johnson, R. A., & Moesel, D. S. 1993. Construct validity of an objective (entropy) categorical measure of diversification strategy. ***Strategic Management Journal*,** 14: 215-335

Jones, C. D., Makri, M., & Gomez-Mejia, L. R. 2008. Affiliate directors and perceived risk bearing in publicly traded, family-controlled firms: The case of diversification. ***Entrepreneurship Theory and Practice***, 32(6): 1007-1026.

Kelejian, H. H. 1971. Two-stage least squares and econometric systems linear in parameters but nonlinear in endogenous variables. ***Journal of the American Statistical Association***, 66: 373-374.

Kepner, E. 1983. The family and the firm: A co-evolutionary perspective. ***Organization Dynamics***, Summer: 57-7.

Kets-De-Vries, M. F. R. 1993. The dynamics of family-controlled firms. ***Organizational Dynamics***, 21(3): 59-71.

Kochhar, R., & David, P. 1996. Institutional investors and firm innovation: A test of competing hypotheses. ***Strategic Management Journal***, 17(1): 73-64.

Kroll, M., Wright, P., & Theerathorn, P. 1993. Whose interests do hired top managers pursue: An examination of select mutual and stock life insurers. ***Journal of Business Research***, 26(2): 133-148.

La Porta, R., Lopez-De-Silanes, F., & Shleifer, A. 1999. Corporate ownership around the world. ***Journal of Finance***, 54: 471-517.

Li, D., Eden, L., Hitt, M. A., & Ireland, R. D. 2008. Friends, acquaintances, or strangers? Partner selection in R&D alliances. ***Academy of Management Journal***, 51: 315-334.

Ling, Y, & Kellermanns, F.W., The effects of family firm specific sources of TMT diversity: The moderating role of information exchange frequency. ***Journal of Management Studies****,* 47(2): 322-344.

Littunen, 2002.

Majundar, 2000.

Makri, M., Hitt, M. & Lane, P. J. 2010. Complementary technologies, knowledge relatedness and innovation outcomes in high-technology M&As. ***Strategic Management Journal.*** 31(6): 602-628.

Makri, M., Junkunc, M., & Eckhardt, J. 2007. Technological diversification, cumulativeness and venture capital exit: M&A versus IPO. ***Frontiers of Entrepreneurship Research***, 27(1): 1-14. Wellesley, MA: Babson College Press.

Makri, M., Lane, P. J., & Gomez-Mejia, L. R. 2006. CEO incentives, innovation, and performance in technology-intensive firms: A reconciliation of outcome and behavior-based incentive schemes. ***Strategic Management Journal***, 27(11): 1057-1080.

McEachern, W. A. 1975. ***Managerial control and performance.*** New York: D.C. Heath.

Menard, S. 2001. ***Applied logistic regression analysis (2nd ed.)***. Thousand Oaks, CA: Sage.

Nelson, R. 1959. The simple economics of basic scientific research. ***Journal of Political Economy***, 67(2): 297–306.

Nohria, N., & Gulati, R. 1996. Is slack good or bad for innovation? ***Academy of Management Journal***, 39(5): 1245-1264.

NSF. 2010. U.S. Corporate R&D: Volume 1: Top 100 Firms in R&D in Industry Category. http://www.nsf.gov/statistics/nsf00301/purpose.htm. Accessed on April 30, 2010.

Owen-Smith, J., & Powell, W. W. 2004. Knowledge networks as channels and conduits: The effects of spillovers in the Boston biotechnology community. ***Organization Science***, 15(1): 5-21.

Palmer, D. P., Jennings, D., & Zhou, X. 1993. Late adoption of the multidivisional form by large U.S. corporations: A further exploration of the institutional, political, and economic accounts. ***Administrative Science Quarterly***, 37(1):100-131.

Palmer, T. B., & Wiseman, R. M. 1999. Decoupling risk taking from income stream uncertainty: A holistic model of risk. ***Strategic Management Journal***, 20(11): 1037-1062.

Rothwell, R. 1991. External networking and innovation in small and medium-sized manufacturing firms in Europe. ***Technovation***, 11(2): 93-112.

Saura Diaz, M. D., & Gomez-Mejia, L. R. 1997. The effectiveness of organizationwide compensation strategies in technology intensive firms. ***Journal of High Technology Management Research***, 8(2): 301-315.

Schneper, W. D., & Guillen, M. F. 2004. Stakeholders rights and corporate governance: A cross-national study of hostile takeovers. ***Administrative Science Quarterly***, 49(2): 263-295.

Schulze, W. S., Lubatkin, M. H., & Dino, R. N. 2003. Toward a theory of altruism in family firms. ***Journal of Business Venturing***, 18: 473-45.

Schulze, W. S., Lubatkin, M. H., Dino, R. N., & Buchholtz, A. K. 2001. Agency relationships in family firms: Theory and evidence. ***Organization Science***, 12(2): 85–105.

Schumpeter, J. A. 1934. ***The theory of economic development: An inquiry into profits, capital, credit, interest and the business cycle***. Cambridge, MA: Harvard University Press.

Sirmon, D. G., Arregle, J-L., Hitt, M. A., & Webb, J. W. 2008. The role of family influence in firms' strategic response to competitive threat. ***Entrepreneurship Theory & Practice***, 32(6): 979-998.

Staiger, D., & Stock, J. H. 1997. Instrumental variables regression with weak instruments. Econometrica, 65(3): 557-586.

Sundaram, A. K., John, T. A., & John, K. 1996. An empirical analysis of strategic competition and firm values: The case of R&D competition. ***Journal of Financial Economics***, 40(3): 459-486.

Tosi, H. L., & Gomez-Mejia, L. R. 1989. The decoupling CEO pay and performance: An agency theory perspective. ***Administrative Science Quarterly***, 34: 169-189.

Trembley, M., & Chenevert, D. 2008. Influence of compensation strategies in Canadian technology-intensive firms on organizational and human resources performance. ***Group & Organization Management,*** 33(3): 269-302.

Wang, H., He, J., & Mahoney, J. 2009. Firm-specific knowledge resources and competitive advantage: The roles of economic- and relationship-based employee governance mechanisms. ***Strategic Management Journal***, 30: 1265-1285.

Werner, S., Tosi, H. L., & Gomez-Mejia, L. R. 2005. Organizational governance and employee pay: How ownership structure affects the firm's compensation strategy. ***Strategic Management Journal***, 26: 377-384.

Westphal, J. D., & Khanna, P. 2003. Keeping directors in line: Social distancing as a control mechanism in the corporate elite. ***Administrative Science Quarterly***, 48(3): 361-398.

Westphal, J. D., & Zajac, E. J. 1994. The costs and benefits of managerial incentives and monitoring in large U.S. corporations: When is more not better? ***Strategic Management Journal***, 15: 121-142

Westphal, J. D., & Zajac, E. J. 2001. Decoupling policy from practice: The case of stock repurchase programs. ***Administrative Science Quarterly***, 46(2): 202-228.

Wiseman, R. M., & Gomez-Mejia, L. R. 1998. A behavioral agency model of managerial risk taking. ***Academy of Management Review***, 23: 133-153.

Wooldridge, J. M. 2002. ***Econometric analysis of cross section and panel data***. Cambridge, MA: MIT Press.

Wu, S. B., Levitas, E., & Priem, R. L. 2005. CEO tenure and company invention under differing levels of technological dynamism. ***Academy of Management Journal***, 48(5): 859-873.

Zahra, S. A. 1996. Governance, ownership, and corporate entrepreneurship: The moderating impact of industry technological opportunities. ***Academy of Management Journal***, 39(6): 1713-1735.

Zahra, S. A. 2001. Handbook of entrepreneurship. ***Administrative Science Quarterly***, 46(2): 348-351.

Zahra, S. A. 2003. International expansion of US manufacturing family businesses: The effect of ownership and involvement. ***Journal of Business Venturing***, 18(4): 495-512.

Zahra, Gomez-Mejia, Cruz & DeCastro. In press.

**TABLE 1**
**Descriptive Statistics and Correlations**

| Variable | Mean | s.d. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.** R&D Investments | 0.10 | 0.86 | | | | | | | | | | | | | | |
| **2.** R&D not Reported | 0.48 | 0.50 | -0.11 | | | | | | | | | | | | | |
| **3.** Tech. diversification | 0.03 | 0.12 | -0.00 | -0.19 | | | | | | | | | | | | |
| **4.** Family firm | 0.43 | 0.50 | -0.01 | 0.03 | -0.08 | | | | | | | | | | | |
| **5.** ROA | 0.03 | 0.17 | -0.34 | 0.03 | 0.06 | -0.05 | | | | | | | | | | |
| **6.** Institutional ownership | 0.17 | 0.13 | -0.04 | -0.08 | 0.09 | -0.34 | 0.19 | | | | | | | | | |
| **7.** Family CEO | 0.21 | 0.40 | -0.03 | 0.01 | -0.09 | 0.48 | -0.07 | -0.16 | | | | | | | | |
| **8.** Product diversification | 0.77 | 0.74 | 0.00 | -0.02 | -0.14 | -0.06 | -0.03 | 0.05 | 0.03 | | | | | | | |
| **9.** Firm risk | -7.00 | 0.96 | 0.12 | -0.24 | -0.14 | 0.07 | -0.26 | -0.12 | 0.18 | 0.11 | | | | | | |
| **10.** Firm size[b] | 0.84 | 1.82 | -0.14 | 0.09 | 0.07 | -0.21 | 0.19 | 0.28 | -0.19 | 0.17 | -0.38 | | | | | |
| **11.** Cash | 125.78 | 569.63 | -0.00 | -0.04 | 0.09 | 0.00 | 0.00 | 0.02 | -0.06 | 0.01 | -0.07 | 0.29 | | | | |
| **12.** Firm age | 29.35 | 25.58 | -0.07 | 0.04 | 0.18 | 0.02 | 0.10 | -0.05 | -0.09 | 0.17 | -0.33 | 0.28 | 0.09 | | | |
| **13.** Available slack | 2.94 | 3.01 | 0.04 | -0.22 | 0.01 | 0.07 | 0.08 | 0.01 | 0.11 | -0.07 | 0.22 | -0.37 | -0.07 | -0.15 | | |
| **14.** Potential slack | 0.66 | 3.95 | 0.02 | 0.04 | -0.02 | -0.05 | 0.08 | -0.01 | -0.02 | 0.03 | -0.03 | 0.06 | 0.09 | 0.02 | -0.08 | |
| **15.** Number of patents | 1.52 | 14.36 | 0.00 | -0.10 | 0.36 | -0.02 | 0.03 | 0.03 | -0.03 | -0.05 | -0.09 | 0.13 | 0.38 | 0.12 | -0.02 | 0.01 |

Pairwise correlations equal to or greater than .02 are statistically significant at the α=.05 level.
[a] Logarithm

**TABLE 2**
**Results of Tobit Random-Effects Regression Models for Family Firm Ownership – Full Sample**

| | **Model 1** ***R&D Investments*** | **Model 2** ***Technological Diversification*** |
|---|---|---|
| R&D not reported | -9.76 | |
| Product diversification | -0.08 | $-0.18^{*}$ |
| Firm risk | -0.13 | $-0.13^{*}$ |
| Firm size [a] | $-0.26^{***}$ | $0.06^{+}$ |
| Cash | $0.00^{*}$ | 0.00 |
| Firm age | -0.00 | $0.01^{***}$ |
| Available slack | -0.03 | 0.00 |
| Potential slack | -0.01 | -0.01 |
| ROA | $-1.92^{***}$ | -0.24 |
| Institutional ownership | $0.78^{+}$ | $1.34^{***}$ |
| Number of patents | | 0.00 |
| *Independent Variable* | | |
| Family Firm | $-0.28^{*}$ | $-0.22^{**}$ |
| Constant | $-1.08^{+}$ | -5.31 |
| Log-likelihood | -1440.65 | -260.80 |
| Wald $\chi^2$ | $185.46^{***}$ | $125.95^{***}$ |
| $\chi^2$ DF | 19 | 19 |
| *N* | 2101 | 2101 |

Year-dummies are included in both models.
[a] Logarithm.
$^{+}$ $p < 0.10$; $^{*}$ $p < 0.05$; $^{**}$ $p < 0.01$; $^{***}$ $p < 0.001$

**TABLE 3**
**Results of Tobit Random-Effects Regression Models for Family Member-CEO – Family Firm Sample**

| | **Model 1** ***R&D Investments*** | **Model 2** ***R&D Investments*** |
|---|---|---|
| R&D not reported | -12.18 | -11.99 |
| Product diversification | -0.05 | -0.14 |
| Firm risk | $-0.37^{*}$ | $-0.38^{**}$ |
| Firm size [a] | $-0.30^{**}$ | $-0.33^{***}$ |
| Cash | $0.00^{*}$ | $0.00^{+}$ |
| Firm age | -0.00 | $-0.01^{+}$ |
| Available slack | $-0.06^{+}$ | $-0.05^{+}$ |
| Potential slack | -0.08 | -0.08 |
| ROA | $-2.25^{***}$ | $-2.29^{***}$ |
| Institutional ownership | 0.76 | 0.80 |
| *Family member CEO* | | $-1.02^{***}$ |
| Constant | $1.50^{***}$ | $1.45^{***}$ |
| Log-likelihood | -614.92 | -605.14 |
| Wald $\chi^2$ | $103.39^{***}$ | $129.44^{***}$ |
| $\chi^2$ DF | 18 | 19 |
| *N* | 902 | 902 |

Year-dummies are included in both models.
[a] Logarithm.
$^{+}$ $p < 0.10$; $^{*}$ $p < 0.05$; $^{**}$ $p < 0.01$; $^{***}$ $p < 0.001$

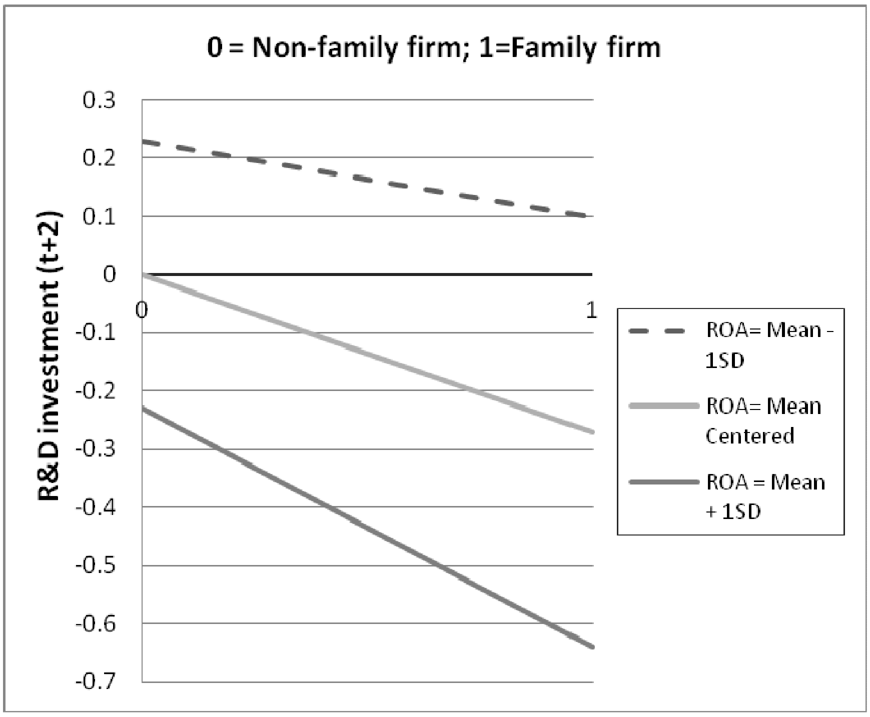
**TABLE 4**
**Results of Tobit Random-Effects Regression Models for Performance Threats and Other Owners – Full Sample**

| | **Model 1** ***R&D Investments*** | **Model 2** ***R&D Investments*** | **Model 3** ***R&D Investments*** |
|---|---|---|---|
| R&D not reported | -9.73 | -9.90 | -9.72 |
| Product diversification | -0.09 | -0.09 | -0.10 |
| Firm risk | -0.12 | -0.11 | -0.09 |
| Firm size [a] | $-0.26^{***}$ | $0.27^{***}$ | $-0.27^{***}$ |
| Cash | $0.00^{*}$ | $0.00^{*}$ | $0.00^{*}$ |
| Firm age | -0.00 | 0.00 | 0.00 |
| Available slack | -0.03 | 0.00 | $-0.03^{+}$ |
| Potential slack | -0.00 | -0.01 | -0.00 |
| ROA | $-1.45^{***}$ | $-1.90^{***}$ | $-1.33^{***}$ |
| Institutional ownership | $0.78^{+}$ | 0.44 | 0.34 |
| Family Firm | $-0.29^{*}$ | $-0.26^{*}$ | $-0.27^{*}$ |
| *Interactions* | | | |
| Family Firm*ROA | $-0.67^{+}$ | | $-0.81^{*}$ |
| Family Firm*Institutional Ownership | | 1.17 | $1.51^{+}$ |
| Constant | -0.96 | -0.96 | -0.78 |
| Log-likelihood | -1439.09 | -1439.71 | -1437.54 |
| Wald $\chi^2$ | $189.52^{***}$ | $187.49^{***}$ | $193.03^{***}$ |
| $\chi^2$ DF | 20 | 20 | 21 |
| *N* | 2101 | 2101 | 2101 |

Year-dummies are included in all specifications.
[a] Logarithm.
$^{+}$ $p < 0.10$; $^{*}$ $p < 0.05$; $^{**}$ $p < 0.01$; $^{***}$ $p < 0.001$

**FIGURE 1**

**Moderation Effect of ROA on the Relationship between Family Firm Ownership and R&D Investment**



## APPENDIX A

### Instrumental variable regression

One potential concern is the possibility that our main independent variable, the family firm indicator, is endogenous. We took steps to address this issue by performing instrumental variable regressions. As instruments, we selected two variables which are significantly correlated with family firm status: market-to-book value of equity (p =.000) and market-to-book value of assets (p =.007). The two requirements for a good instrument are that it is relevant (i.e., not a weak predictor of the (potentially) endogenous variable), and valid/exogenous (not correlated with the error term of the second stage equation). We test both assumptions. The F-statistic for the test for instrument relevance is equal to 16.35 (Prob>F = 0.0000), which exceeds the commonly accepted cutoff of 10, and provides strong evidence that our instruments are relevant and not weak predictors (Staiger & Stock, 1997). Moreover, because we have more instruments than endogenous regressors, we are able to perform the test of overidentifying restrictions for instrument exogeneity (Wooldridge, 2002). The Sargan test performs a investigation of the null hypothesis that all instruments are exogenous (i.e., uncorrelated with the error term of the second stage equation). The test fails to reject the null hypothesis (p =.4970), supporting the conclusion that our instruments are valid and exogenous. Thus, our instruments meet both conditions of a good instrumental variable.

The results of the first stage equation, and well as the second stage equation where the family firm dummy is treated as the endogenous regressor[3], are presented in Table 5. The results

[3] In 2SLS, the consistency of the second stage estimates is not dependent on achieving the correct first-stage functional form (Kelejian, 1971) and using linear regression for the first stage estimates is appropriate even with a dummy endogenous variable, and in fact reduces the danger of misspecification versus the use of logit or probit (Angrist & Krueger, 2001).

of Hypothesis 1 using 2-stage Least Squares fixed effects estimation still hold ($p = 0.042$)[4].

---------------------------------------
Insert Table 5 about here
---------------------------------------

Finally, we test whether there is any evidence that the family firm dummy is in fact endogenous. We perform two tests of endogeneity, where the null hypothesis is that the variable is exogenous. At $\alpha=.05$, both the Durbin chi-square and the Wu-Hausman F-statistic fail to reject the null hypothesis, suggesting that the family firm dummy does not create an endogeneity problem.

[4] As a robustness check, we perform instrumental variable limited-information likelihood estimation and our results are robust to this alternative specification ($p = 0.037$).

**TABLE 5**
**Results of 2-Stage Least Squares (2SLS) Fixed-Effects Regression Models**

| | **Stage 1** ***Family Firm*** | **Stage 2** ***R&D Investments*** |
|---|---|---|
| R&D not reported | 0.02 | -0.05 |
| Product diversification | $-0.11^{***}$ | -0.08 |
| Firm risk | 0.03 | 0.04 |
| Firm size [a] | $-0.04^{***}$ | $-0.05^{**}$ |
| Cash | $0.00^{**}$ | 0.00 |
| Firm age | $0.00^{***}$ | 0.00 |
| Available slack | $0.01^{+}$ | 0.01 |
| Potential slack | $-0.01^{+}$ | $0.02^{**}$ |
| ROA | $0.33^{**}$ | $-0.84^{***}$ |
| Institutional ownership | $-1.57^{***}$ | -0.84 |
| M-to-B value of equity | $-0.01^{**}$ | |
| M-to-B value of assets | $-0.00^{*}$ | |
| *Family Firm* | | $-0.72^{*}$ |
| Constant | $0.80^{***}$ | $0.83^{*}$ |
| R-squared | 0.24 | 0.05 |
| F (19) | $27.68^{***}$ | |
| Wald $\chi^2$ (18) | | $160.05^{***}$ |
| *N* | 1586 | 1586 |

Year-dummies are included in both models.
[a] Logarithm.
$^{+}$ $p < 0.10$; $^{*}$ $p < 0.05$; $^{**}$ $p < 0.01$; $^{***}$ $p < 0.001$