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Patents, trade secrets and performance aspirations in family firms

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ABSTRACT

We investigate whether family ownership is associated with a preference for patents or trade secrets. Using a sample of S&P 500 firms, we show that family ownership is negatively associated with patenting and positively associated with the usage of trade secrets. We further show that both relationships are moderated by firm performance below the aspiration level, i.e. the performance benchmark level that an organization sets. These results can be explained with a mixed gambles behavioral agency framework. When family firms perform below their aspiration level, prospective financial gains become relatively more important as compared to current socio-emotional wealth so that patents become more and trade secrets less attractive.

Keywords: Family firms, patents, trade secrets, mixed gambles, aspiration gap

JEL: O34, O32, G32, M14

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1. Introduction

Family firms have been found to be reluctant investors in research and development (R&D) (Chrisman & Patel, 2012; Block et al., 2022; Hussinger & Issah, 2024). The most commonly stressed reason for this attitude is the uncertainty about the future returns of R&D projects in combination with the high initial investment costs which threatens family firms' socio-emotional wealth (SEW) (Anderson et al., 2012; Block, 2012; Miroshnychenko & De Massis, 2020).[1] Defined as the stock of non-financial benefits or values that family owners derive from their controlling stake in a particular firm, SEW is a value dimension that occurs particularly to family firms and distinguishes them from non-family firms (e.g. Gomez-Mejia et al., 2018; Duran et al., 2016; Gomez-Mejia et al., 2014).

While family firms' concerns about financial uncertainty and SEW preservation are well-documented (e.g. Chrisman & Patel, 2012; Gomez-Mejia et al., 2018; Duran et al., 2016; Block et al., 2022), another critical yet underexplored factor contributing to family firms' reluctance to invest in R&D is the uncertainty surrounding the appropriability of R&D returns. Appropriability refers to the extent to which a firm can capture and protect the economic benefits generated by its innovations (Levin et al., 1987; Cohen et al., 2000; Czarnitzki & Toole, 2011; Xia et al., 2023). This issue is particularly salient in family firms, as the challenges of safeguarding innovation outputs may exacerbate their cautious approach to R&D investments. We explore this dimension in this paper which provides valuable insights into family firms' IP strategies. Since knowledge is non-rival in use (Arrow, 1972; Edris et al., 2024) because one person's use or consumption of knowledge does not diminish the ability of others to use it simultaneously, it is a central concern for each innovating firm to capture the returns of their R&D investments

[1] Evidence in line with this argument shows that family firms avoid, in particular, radical innovation projects (Nieto et al., 2015; Hu et al., 2020) and exploratory projects (Ceipek et al., 2021).

(Levin, 1988; Levin et al., 1987; Harabi, 1995; Cohen et al., 2000; Arundel, 2001; Mezzanotti & Simcoe, 2003; Edris et al., 2022). The most prominent appropriation means are patents which grant temporary exclusivity rights to the patent owner, i.e. the right to exclude others from using the protected invention without permission (Hall, 2007; Sampat, 2018; Hou et al., 2022; Jin et al., 2022). The decision to patent is, however, complex for family firms since patenting is costly (Bannò, 2016; Chirico et al., 2020; Gimenez-Fernandez et al., 2020). In exchange for temporary legal protection, patenting involves administrative costs such as application and renewal fees (e.g. De Rassenfosse & Jaffe, 2018), potentially high infringement costs (Somaya, 2012), organizational costs which concern the reallocating of efforts and resources towards the patenting process (Foss & Foss, 2005) and, most important, the costs associated with the disclosure of the protected technology through the publicly available patent documents (Arundel, 2001; Hussinger, 2006; Hall et al., 2014; Crass et al., 2019). For family firms, these costs are not purely financial, but also affect their SEW (Chirico et al., 2020; Gimenez-Fernandez et al., 2020).

Trade secrets are an alternative to protect technical inventions (Levin et al., 1987; Cohen et al., 2000; Arundel, 2001; Hall et al., 2014).[2] Other than patents, trade secret protection is not associated with administrative costs and does not require the disclosure of the protected technology (Arundel, 2001; Hall et al., 2014; Hussinger & Issah, 2024). In addition, there is no temporal restriction for the duration of trade secret protection. Trade secrets can, hence, at least in theory, last forever (Arundel, 2001; Hussinger, 2006; Hall et al., 2014; Boot & Vladimirov, 2025). Those factors appeal to family firms' desire to keep control over their valuable assets, protecting their SEW (Gomez-Mejia et al., 2007; 2014; 2016; Villalonga and Amit, 2020). Prior

[2] Note that other types of protection modes such as trademarks and copyrights are not suitable for protecting technical inventions.

evidence shows that family firms increase their R&D investment in response to strengthened legal trade secret protection (Hussinger & Issah, 2022) and decrease their R&D investment when the disclosure requirement for patents becomes more severe (Hussinger & Issah, 2024), but is largely silent about the actual extent to which family firms rely on trade secrets.[3] This study, therefore, directly targets the question whether family firms prefer trade secret or patent protection.

Drawing on a mixed gambles behavioral agency model (BAM) (Martin et al., 2013), we derive that family firms should display a preference for trade secret protection as this type of protection promises superior safeguard of their current SEW. We further acknowledge that family firms' preferences for current SEW over prospective financial gains is impacted by their performance relative to their aspiration level, i.e. if the actual firm performance meets, exceeds or falls below the expectations (Wiseman & Gomez-Mejia, 1998; Chrisman & Patel, 2012; Umans et al., 2024). We derive from a mixed gamble logic that, when family firms perform below their expectations and prospective financial wealth increases gain in importance, the attractiveness of trade secret protection decreases while patents become more attractive. This is because firms prioritize strategies that maximize financial returns when prospective financial wealth becomes more critical, as in situations of underperformance. Patents, which provide enforceable legal protection and opportunities for monetization through licensing or partnerships, become more attractive despite their costs and risks. In contrast, trade secrets, while preserving

[3] An exception is the study by Gimenez-Fernandez et al. (2020) which focuses on a small sample of 300 small and medium-sized family firms in the wine industry located in three European countries and the U.S. Gimenez-Fernandez et al. (2020) investigate how family and non-family SMEs decide between patents and trade secrets, emphasizing proactive orientation as a moderating factor. They find that family SMEs prefer trade secrets due to their SEW focus, but highly proactive family SMEs are more likely to pursue patents, demonstrating a willingness to take risks and innovate. In contrast, our study examines large, publicly listed S&P 500 firms, showing that family ownership is negatively associated with patenting and positively with trade secret usage, with performance relative to aspiration levels moderating this preference. Underperformance shifts family firms' focus toward financial wealth, making patents more attractive. We derive our results from a mixed gamble behavioral agency framework.

SEW through confidentiality and control, may lack enforceability and financial scalability, making them less appealing when financial gains are prioritized over SEW, i.e. in a situation of perceived underperformance.

With focus on a sample of U.S. S&P 500 firms, we find support for our hypotheses that family ownership is associated with a preference for trade secrets and a disinclination for patenting. We further show that the attractiveness of trade secrets and the disinclination for patents are affected by family firms' performance relative to the aspiration level. A negative aspiration gap, i.e. when the firm underperforms, renders trade secrets less and patents more attractive. These results can be explained by the mixed gambles logic, which predicts that family firms give more weight to short-term SEW than to potential long-term financial gains in stable financial situations, while they change their risk taking behavior in situations of financial underperformance prioritizing financial gains (Chrisman & Patel, 2012; Gomez–Mejia et al., 2014; Eddleston & Mulki, 2021; Umans et al., 2024).

Our study makes three important contributions to the literature. First, we enrich the literature on intellectual property (IP) protection and family firms which has mostly focused on patenting (e.g. Anderson et al., 2012; Block et al., 2013; Bannò, 2016; Chirico et al., 2020) by exploring whether family firms have a preference for trade secrets (Gimenez-Fernandez et al., 2020). Prior evidence on family firms' fondness for trade secret remains indirect (Hussinger & Issah, 2022), treats trade secrets as the unobserved alternative to patenting (Bannò, 2016) or relies on self-reported information on trade secrets (Gimenez-Fernandez et al., 2020). In this study, we directly observe the usage of trade secrets by publicly listed U.S. firms through their 10-K filings. These annual reports are mandated by the U.S. Securities and Exchange Commission (SEC) and, by

U.S. federal securities laws, must discuss the risk of misappropriation of their trade secrets (Glaeser, 2018).

Second, we exemplify the role of SEW in family firms' strategic choices of IP protection modes. By applying the concept of mixed gambles, we show how changes in the preference for current SEW versus prospective financial wealth influence the decision about IP modes. By doing so, we shed light on the broader implications of SEW for strategic decisions in family businesses (Chirico et al., 2020), illustrating the nuanced interplay between emotional attachment and economic rationality in the context of IP management.

Third, by leveraging a mixed gambles BAM framework, we reconcile previous findings that show substantial heterogeneity for a self-reported preference for trade secrets or patenting (Gimenez-Fernandez et al., 2020). We show that family firms' preferences change according to their performance relative to their aspiration level which can explain prior heterogenous findings.

2. Theory and hypotheses

2.1. A behavioral agency framework

The BAM (Wiseman & Gomez-Mejia, 1998) which traces its origin to prospect theory and agency theory postulates that behavioral choices of individuals are influenced by problem framing and loss aversion (Kahneman & Tversky, 1979; Kahneman et al., 1991). Loss aversion describes when individuals are more interested in avoiding losses as compared to obtaining gains (Kahneman & Tversky, 1979).

In the context of a family firm, loss aversion describes the tendency among family members involved in decision-making to prioritize avoiding SEW losses over pursuing equivalent or greater financial gains (Chrisman & Patel, 2012; Umans et al; 2024). This psychological bias can significantly shape the strategies, behaviors, and dynamics within the family firm (Chrisman & Patel, 2012; Al-Tabbaa et al., 2023; Gomez-Mejia et al., 2024). Notable areas where loss

aversion manifests for family firms are succession planning and leadership where family members may prefer to appoint a successor who is seen as a safe, familiar choice over a potentially more capable but less known external candidate or delay the retirement of family members (Åberg et al., 2024). In terms of business strategy, family firms often avoid making bold strategic moves, such as investing in innovation, due to the fear of the potential impact on the family firm's wealth and legacy (Block et al., 2022; Duran, 2016; Hussinger and Issah, 2022, 2024).

Problem framing means that in reference to current asset endowments, choices are conceived from a viewpoint of gains or losses (Kahneman & Tversky, 1979). When family firm leaders engage in problem framing, they assess the potential outcomes of various decisions through the lens of gains and losses relative to the family's existing assets and SEW (Chrisman & Patel, 2012; Åberg et al., 2024). This process is influenced by factors such as the family's values, traditions, and aspirations, which shape their perceptions of success, risk, and opportunity within the business (Chrisman & Patel, 2012; Erdogan et al., 2020; Eddleston & Mulki, 2021). For example, when considering whether to invest in innovation, family firm leaders may frame the decision in terms of the potential gains to be achieved, such as increased revenue or market share. Conversely, they may also evaluate the decision in terms of potential losses, such as financial risks, reputational damage, or the strain on family relationships that could result from failure (Chrisman & Patel, 2012; Muñoz-Bullón et al., 2020).

The framing of problems in terms of gains or losses can have significant implications for decision making in family firms as a focus on potential gains may lead to a willingness to take calculated risks and pursue growth opportunities, even in the face of uncertainty, while a heightened sensitivity to potential losses may result in a more cautious approach, with a greater

emphasis on preserving existing assets and avoiding actions perceived to carry significant risks (Al- Tabbaa et al., 2023). Hence, problem framing can influence strategic decisions of the family firm, shaping priorities, resource allocation, and long-term goals. A family firm that frames decisions in terms of potential gains may be more inclined to pursue ambitious growth strategies and innovation initiatives, while one that is more focused on avoiding losses may prioritize stability, resilience, and risk mitigation (Gomez-Mejia et al., 2014; Al- Tabbaa et al., 2023). BAM suggests that family firms are merely incentivized by the aversion to the loss of SEW, thus are willing to forgo uncertain prospective financial performance to preserve current certain SEW (Chrisman & Patel, 2012; Gomez–Mejia et al., 2014; Duran et al., 2016). This preference is, however, also dependent on the time horizon orientation of family centered goals. Near-term family goals such as keeping ownership and control within the family (Gómez-Mejía et al., 2007; Chrisman & Patel, 2012) are typically preferred to long-term goals of financial wealth which would reduce the likelihood of bankruptcy (Gentry et al., 2016) and foster dynastic succession (Williams Jr et al., 2018).

2.2. Aspirations

BAM further states that firms appraise their performance in comparison to an aspiration level (Wiseman & Gomez-Mejia, 1998). Firmly anchored in the behavioral theory of the firm (Shou et al., 2020; Saridakis et al., 2023), the aspiration level is the level of performance that firms consider acceptable or satisfactory during performance appraisal (Cyert & March, 1963; Wiseman & Gomez-Mejia, 1998; Tyler & Caner, 2016; Umans et al., 2024). Performance at and above the aspiration level indicates satisfactory performance or positive performance while performance below the aspiration level connotes unacceptable performance (Bromiley & Harris, 2014; Ref & Shapira, 2017; Shou et al., 2020).

It follows that strategic decisions are significantly influenced by performance relative to the aspiration level (Greve, 2008; Ref & Shapira, 2017; Xu et al., 2020). Family firms tend to become risk averse when performance is above the aspiration level (Iyer & Miller, 2008) because superior performance reassures decisions makers that their strategic decisions are appropriate, which in turn discourages any form of change (Shou et al., 2020). Performance below the aspiration level, in contrast, incentivizes risk taking behavior such as exploratory R&D investments (Patel & Chrisman, 2014), selecting a non-family outsider chief executive officer (Calabro et al., 2023), mergers and acquisitions (Gomez-Mejía, Patel, & Zellweger, 2018; Hussinger & Issah, 2019), etc.

2.3. Mixed gambles

Martin et al. (2013) introduced the concept of mixed gambles into the BAM framework proposed by Wiseman and Gomez-Mejia (1998). Mixed gambles recognize that there hardly exists any strategic decision comprised of lose-lose or win-win outcomes (Martin et al., 2013). Instead, strategic decisions are conceived as trade-offs based on two value dimensions of current financial endowment and prospective future financial wealth (Martin et al., 2013; Kahneman & Tversky,1979; Tversky & Kahneman, 1992), where a loss in one value dimension often corresponds to a gain in the other dimension (Eddleston & Mulki, 2021). Decision makers aim to preserve the current wealth endowment at the cost of potential losses for future wealth, but may reverse their priorities when the future expected wealth gains exceed the status quo (Martin et al., 2013).

Family firms' wealth endowment consists of two dimensions, financial wealth and SEW (Gómez-Mejía et al., 2007; Gomez–Mejia et al., 2014). Therefore, in taking strategic decisions, family firms need to weigh the potential gains and losses of both simultaneously (e.g. Gomez-

Mejia et al., 2014; Gomez-Mejia et al., 2018; Martin et al., 2013). Previous studies have shown that, depending on the specific situation, family firms give priority to either SEW or financial wealth (e.g. Gomez-Mejia et al., 2010; Chrisman & Patel, 2012; Gomez-Mejia et al., 2018). Family firms typically prioritize SEW when preserving family control, legacy, and reputation is central to their decision-making, particularly when their performance is above aspiration levels (Chrisman & Patel, 2012). In these situations, the desire to maintain non-financial benefits outweighs financial considerations, leading to more conservative or risk-averse strategies. Conversely, family firms prioritize financial wealth when performance falls below aspiration levels or when the firm's survival is at risk (Chrisman & Patel, 2012). Under such conditions, the need to secure financial gains and stabilize the business becomes more critical, leading to decisions that may temporarily de-emphasize SEW, such as adopting aggressive innovation strategies or seeking external funding (Kellermanns et al., 2012; Martin et al., 2013; Gomez–Mejia et al., 2014; Gomez-Mejia et al., 2018).

2.4. IP protection modes

One of the most strategic decisions for any firm is the decision to invest in R&D. Part of the costs of R&D is sunk and subject to indivisibilities and the returns are uncertain and only occur in the long run (Arrow, 1962). For family firms, R&D related decisions are more complex than for non-family firms since investments in R&D impact financial wealth as well as SEW (Anderson et al., 2012; Block, 2012; Chrisman & Patel, 2012; Gomez–Mejia et al., 2014; Miroshnychenko & De Massis, 2020; Hussinger and Issah 2022, 2024).

A central issue for the decision to invest in R&D is the ability to effectively appropriate value from newly generated inventions (Levin et al., 1987; Cohen et al., 2000; Hussinger, 2006; Hall, 2007). Appropriation involves protecting inventions from imitation through a range of

formal (e.g. patents, copyrights, trademarks etc.) and informal (e.g. trade secrets, complex product designs etc.) protection mechanisms (Levin et al., 1987; Cohen et al., 2000; Arundel, 2001; Appio et al., 2019). Informal IP protection mechanisms and particularly trade secrets have gained widespread acceptance as an efficient strategy for appropriating value of inventions (Levin et al., 1987; Cohen et al., 2000; Arundel, 2001). Survey evidence for manufacturing industries reveals that trade secret protection is the most important mechanism for value appropriation and largely preferred over patents (Levin et al., 1987; Arundel & Kabla, 1998; Cohen et al., 2000; EUIPO, 2017; Morikawa, 2019; Shackelford et al, 2021). Patents are found more important as strategic tools to hinder competitors' inventions or as a bargaining chip in IP negotiations (Levin et al., 1987; Cohen et al., 2000; Czarnitzki et al., 2020).

A trade secret refers to any information that derives potential or real economic value from being held secret, and is reasonably maintained as a secret that is not readily obtainable by any proper means by persons who can gain economic value from its disclosure or use (UTSA, 1985). Trade secret is a broad term that comprises the know-how about manufacturing processes and methods as well as confidential information relating to business such as price lists, marketing strategies or customer lists (Linton, 2016). Trade secrets can also cover technical information such as chemical formulae, recipes, algorithms and blue prints (Hannah, 2005; Linton, 2016). This implies that trade secrets provide a much broader scope of protection than patents since they also encompass inventions and knowledge and knowhow that does not fulfill the patentability requirements (Liebeskind, 1997; Bannò, 2016; Wadhwa et al., 2017; Ding et al., 2021). The rationale of trade secrets is prevent imitation or to make it difficult and costly (Arundel & Kabla, 1998). In comparison to patents which are strongly associated with infringement (Grimpe & Hussinger, 2014), trade secrets are a rather preventive measure that seeks to eradicate or delay

the imitation of inventions (Bos et al., 2015). As the term suggests, trade secret protection does not involve the mandatory information disclosure of the underlying technology that patents require and, thus, makes it more difficult for rivals to learn about the technology and to invented around it (Hall et al., 2014).

The promulgation of the Uniform Trade Secrets Act (UTSA) during the 1980s, 1990s and 2000s gave impetus to an increase in awareness about trade secrets (Png, 2017; Hussinger & Issah, 2022; Wang, 2023; Arroyabe et al., 2025). This legal change strengthened trade secret protection by declaring the mere acquisition of a trade secret as misappropriation and introduced greater consistency in trade secret laws across the different U.S. states (Almeling, 2012).
Next to the fact that they do not require disclosure of the protected technology or information, a fundamental strength of trade secrets as compared to patenting is the cost element. The cost of designing, monitoring as well as of the enforcement of trade secrets are considerably low as compared to patenting (de Faria & Sofka, 2010). Short-term SEW is, hence, not significantly affected by trade secrets. Patenting, in contrast, reduces short term SEW by the implied costs, shift of attention towards patenting and the potential need for external expertise, while the short- and long-term SEW gains of patenting such as a positive impact on family firm identity and reputation increase seem rather small (Chirico et al., 2020).

In terms of the duration of protection, trade secrets offer, in theory, an unlimited duration of protection. Therefore, trade secrets can provide firms with the lead-time to further develop a particular invention or product without any threat of competition (Hurmelinna-Laukkanen & Puumalainen, 2007). The maximum length of patent protection is pre-defined to 20 years at the United States Patent and Trademark Office.[4]

[4] https://www.uspto.gov/web/offices/pac/mpep/s2701.html

Despite of these inherent benefits of trade secrets, there is always the risk of leakage (Arundel & Kabla, 1998) especially in cooperative relationships (Hannah, 2005, 2006; Delerue & Lejeune, 2011; Bos et al., 2015). The knowledge may spill over to third parties who may then proceed to introduce related new products to the market (Hall et al., 2014; Png, 2017). Employee mobility exacerbates the risks of leakage as former employees move on to work for other organizations (Hannah, 2007). In response, many firms employ measures to restrict disclosure of secrets to third parties such as nondisclosure agreements, noncompete agreements and provisions that assign legal rights over ideas produced during an employee's tenure at the firm (Hannah, 2005, 2007; Sussman, 2008; Marx et al., 2009). Other successful ways of restricting leakage through employee mobility includes adequate employee compensation to discourage mobility (Delerue & Lejeune, 2011) or firm level administrative and operational procedures that promote trust and loyalty and thus reduces the likelihood of leakage (Hannah, 2005, 2007).

2.5. Hypotheses

The choice of the IP protection means can be formulated as a mixed gamble. Choosing between patenting and trade secrets presents a trade-off between prioritizing current SEW or prospective financial wealth. The short term cost of patenting include the costs associated with disclosing proprietary knowledge as well as the financial resources needed for the patenting process (Chirico et al., 2020; Hussinger & Issah, 2024). These short-term costs are certain and can be substantial. The prospective financial benefits from patenting such as the commercial success of the innovation, licensing revenue and increased competitiveness remain uncertain and only occur in the long run (Chirico et al., 2020; Hussinger & Issah, 2024).

Family firms recognize that patenting can pose a serious hazard to the family's current SEW as it diverts resources from traditional business lines, implies the disclosure of knowledge,

increases reputational risks, and may create dependence on external sources of finance and specialized human capital which is otherwise not available within the family group (Chirico et al., 2020). Patenting is, thus, likely to be perceived from a loss perspective as it puts current SEW at risk, while it requires significant resource commitment with uncertain future financial returns. In terms of the mixed gamble BAM logic (Martin et al., 2013; Gomez–Mejia et al., 2014; Gomez-Mejia et al., 2018), given the potential loss of current SEW, family firms are more likely to sacrifice potential, yet uncertain prospective financial wealth to preserve current SEW and decide against patenting (Chirico et al., 2020). Accordingly, we hypothesize that:

Hypothesis 1a: Family ownership is negatively associated with patenting.

The mixed gamble for trade secrets looks very different from a family firm's perspective. The short-term costs are quite low as there is no need for disclosure and no administrative costs. The chance of leakage of the trade secret is, in addition, low in the short run. There is also no threat to family control because no external finance or expertise is required. Hence, the impact on short-term SEW is very limited (Gimenez-Fernandez et al., 2020; Hussinger & Issah, 2022). In addition, there is the potential of trade secrets to enhance both SEW and financial wealth in the long run through the realization of lead time advantages (Hurmelinna-Laukkanen & Puumalainen, 2007). Following the preceding arguments, we hypothesize that:

Hypothesis 1b: Family ownership is positively associated with the usage of trade secrets.

In the next step, we take aspiration levels into account to develop our theoretical arguments further. Aspiration levels can change the strategic decisions of family firms (Chrisman & Patel, 2012). The BAM perspective suggests that, as the economic risks facing a family firm increase, the precedence of SEW considerations over economic considerations decreases. As the negative

gap between actual performance and the aspiration level increases, economic goals take priority because performance declines accelerate the risk of firm failure which implies a total loss of SEW (Gomez-Mejia et al., 2010; Chrisman & Patel, 2012). Faced with an increasingly untenable tradeoff between a desire to preserve SEW and unsatisfactory firm performance, family firms become less risk averse and increase investments in risky projects with a long-run financial wealth perspective. In other words, in such situations economic and family goals begin to converge, increasing the attractiveness of rather risky investments (Chrisman & Patel, 2012; Gomez-Mejia et al., 2018; Hussinger & Issah, 2019).

This has implications for the mixed gamble of family firms concerning IP protection. Facing a negative performance gap, family firms' concerns about potential losses of current SEW are likely to diminish as concerns over the long-term economic performance gain priority. Family firms performing below their aspiration level start valuing the long-term benefits of patenting which implies relatively safe long-term protection of the invention and start recognizing some long-term SEW benefits from patenting such as identity and reputation gains (Chirico et al., 2020). Thus, patenting becomes a relatively more appealing choice with a perceived higher upside potential in terms of prospective financial gains and a perceived lower downside potential in terms of current SEW losses.

Family firms in a loss frame start recognizing that patents can be a source of financial advantage thereby facilitating continuity of the family dynasty. Hence, in a loss frame, the positive long-term effects on the family's prospective financial wealth and the related future SEW will receive more attention. In short, applying a mixed gamble BAM logic (Martin et al., 2013), an increase of the family firm's negative performance gap renders patenting relatively more attractive as long-term financial and SEW gains are prioritized. A loss frame aligns SEW

and financial considerations (Chrisman & Patel, 2012; Martin & Gomez-Mejia, 2016). We hypothesize:

Hypothesis 2a: The relationship between family ownership and patenting is positively moderated by performance below aspiration levels.

We further argue that family firms' mixed gamble regarding trade secrets changes as well for family firms in a loss frame, but in a different way. In a loss frame, family firms' attach a higher value to the long-term downside potential of trade secrets through leakages which can impact long-term financial wealth as well as long-term SEW. Being less concerned about current SEW, the short-term SEW advantage of trade secrets over patents in form of lower costs becomes less important in a loss frame. Thus, trade secrets become a relatively less attractive choice with a perceived lower and less certain upside potential in terms of prospective financial gains and related SEW benefits. Family firms in a loss frame consider trade secrets a less safe source of financial advantage as compared to patents. In mixed gamble terms (Martin et al., 2013), an increase of the family firm's negative performance gap renders trade secrets relatively less attractive as safer long-term financial and SEW gains are prioritized. We hypothesize:

Hypothesis 2b: The relationship between family ownership and the usage of trade secrets is negatively moderated by performance below aspiration levels.

3. Data, variables and methodology

3.1. Data

Our sample is based on the U.S. part of the NRG Metrics Family Firms database. NRG Metrics' database provides corporate governance information for publicly traded family firms. The data provider employs expert analysts to manually collect information on ownership and governance

from corporate annual reports dating back to 2007. The database has recently started to gain attention by the family firm literature and has been used for empirical analysis in this domain recently (e.g. Attig et al., 2021; Miroshnychenko et al., 2021; Lozano-Reina et al., 2022; Eugster & Wang, 2023; Miroshnychenko et al., 2023).

From NRG Metrics, we receive a list of all family firms that have been part of the S&P 500 firms since 2007 as defined by a family ownership stake larger than zero.

We linked the NRG Metrics data to the Compustat database to retrieve financial information for the family firms in our sample and for adding information for non-family firms. Data on firms' patents is taken from Kogan et al. (2017) who provide a link between firm and patent identifiers.[5] This database is to the best of our knowledge the most recent and most complete patent database that includes firm identifiers so that it can be linked to the Compustat database.[6] It has been used extensively in recent studies such as Cabral et al. (2024), Choudhury et al. (2025), Arroyabe et al. (2025), He et al. (2025), Lim et al. (2025) and Park et al. (2025).Lastly, we retrieve data on trade secrets from Glaeser (2018).[7] Glaeser's (2018) data allows to directly observe the usage of trade secrets by publicly listed firms through their 10-K filings. The annual report on form 10-K is one of the reporting requirements for publicly listed firms required by the U.S. federal securities law. It provides a comprehensive overview of the firm's business and financial conditions and includes audited financial statements. Regulation S-K, which lays out the reporting requirements for several SEC filings,[8] requires firms with valuable trade secrets to

[5] https://github.com/KPSS2017/Technological-Innovation-Resource-Allocation-and-Growth-Extended-Data
[6] The firm identifiers available are the permco and permno from the Center for Research in Security Prices (CRSP) database which can be linked to the Compustat database using the CUSIP identifiers.
[7] https://stephenglaeser.web.unc.edu/data/
[8] Regulation S-K is a set of SEC rules that standardizes the content and format of disclosures public companies must provide in their filings, ensuring transparency for investors. It covers a range of topics, including business operations, financial performance, risk factors, and executive compensation. SEC filings are official documents submitted to the U.S. Securities and Exchange Commission by public companies, mutual funds, and certain insiders, detailing financial performance and other significant information to help investors make informed decisions.

discuss the risk of misappropriation in the 10-K filing (Glaeser, 2018). Glaeser's (2018) data has been used by several recent studies such as Ettredge et al. (2018), Rahman et al. (2021), Kang & Lee (2022) and Floros et al. (2023). Since Glaeser's (2018) data is available until 2017, our database covers the period 2007 to 2017.

3.2. Variables

The first dependent variable, *Patents*, captures the number of patent applications at the United States Patent and Trademark Office (USPTO) that has been granted in later years (Kogan et al., 2017). Our second dependent variable is a binary indicator that takes the value one if the firm employs *Trade Secrets* according to its 10-K filings (Glaeser, 2018).

A firm is considered as being influenced by a family if the family owns a minimum of .01 percent of the shares. Following Gomez-Mejia et al. (2023), and Maso et al. (2019), we measure family ownership stake *(FOS)* as the percentage of family ownership. This definition is consistent with the definition used by prior studies in the field (e.g., Miroshnychenko et al., 2023). To provide evidence for the robustness of our results regarding other family firm definitions, we use a second measure where we measure family ownership as the shares held by the family firm as long as the family holds at least 10% or has at least one family member on the boards mimicking the measurement of family ownership used by Anderson & Reeb (2023), Chen et al. (2010) and Villalonga and Amit (2006).

Performance below the aspiration level *(PBA)* is measured as a negative deviation of the firm's return on assets (*ROA*) in year *t* as compared to the three-digit SIC level industry average as gathered from the entire Compustat database in *t-3*, divided by the three-digit SIC level

Common examples include annual reports (Form 10-K), quarterly reports (Form 10-Q), and disclosures of major events (Form 8-K).

industry average in *t-3* (e.g., Titus Jr et al., 2020; Ref et al., 2021). We use *ROA* because it is an internally focused measure over which managers have control (McConnel & Servaes, 1990; Chrisman & Patel, 2012). ROA is also a widely used measure of performance in the management and family business literature (e.g., Chrisman & Patel, 2012; Gomez-Mejia et al., 2018; Chirico et al., 2020) and allows for comparability across studies (Titus Jr et al., 2020; Ref et al., 2021).

We employ a set of control variables. We use the logarithm of *Total Assets* as a firm size measure (e.g. Scherer, 1965a, 1965b). R&D over assets is used to control for the amount the firm invests in R&D (*R&D/Assets*) (e.g. Hall et al., 2005; Block, 2012). We also control for the patent stock of the previous year divided by R&D (*Patent stock/R&D*) to control for the firms' preference for patent protection (e.g. Hall et al., 2005; Czarnitzki et al., 2020). The patent stock is calculated for granted patent based on their application year. We calculate firm *i*s' patent stock as:

$$patent\ stock_{it} = number\ of\ patents_{it} + (1-\delta)\ patent\ stock_{it-1} \quad (1)$$

where δ is a depreciation rate of 15% (Hall & Mairesse, 1995; Hall, 2007)

We further control for firms' return on assets (*ROA*), cash over assets (*Cash/Assets*) and debt over assets (*Debt/Assets*) to take into account their financial fitness (Bonilla et al., 2010; Shim & Okamuro, 2011; Michiels et al., 2013; Graves & Shan, 2014).

Next, we control for environmental *Munificence* to account for the abundance of resources in firms' environment (Chirico et al., 2020). Environmental *Munificence* can influence firm's strategic choices towards growth and technology development (Rios, 2021) as a high munificence signifies easier access to resources needed for carrying out inventive activities (Peng et al., 2020). This variable is defined as the estimated standardized coefficients of the year dummies from a regression of the logarithm of firm sales on those dummies on the three-digit

SIC level for all Compustat firms (e.g. Fernhaber & Patel, 2012, Wales et al., 2013, Chirico et al., 2020).

Lastly, we include a set of *Year fixed effects*. Note that industry fixed effects are absorbed by our firm specific fixed effects since we use linear fixed effects regression.

3.3. Descriptive statistics

Table 1 shows the descriptive statistics for our sample. We distinguish between family firms by family ownership stake and non-family firms. On average, the family ownership stake is 9.80%. It appears that our family and non-family firms are very comparable in terms of the means of most of the variables since the mean differences are small although often significant. The unconditional mean values show that 42% of the family firms and 46% of the non-family firms use trade secrets. Family firms apply for more patents than non-family firms if we do not control for any differences in firm characteristics.

Table 1 about here

We observe a considerable mean difference for *Munificence* for family firms and non-family firms. Family firms, with a mean of 0.19 appear to have more resources within their environment than the non-family firms with a mean of -0.05. A correlation table is presented in the Appendix (see Table 7)

4. Results

4.1. Main results

Table 2 shows fixed effects poisson regressions for the patents and fixed effects linear regressions for trade secrets. The results show that there is a significant negative relationship between *FOS* and patents [model 1 (β = -0.022, p <.01), model 2 (β = -0.021, p <.01) and model

3 (β = -0.023, p <.01)]. This shows that the larger the family ownership stake the higher the chance that family firms will not patent their new inventions. This provides support for hypothesis 1a. It can also be seen that there is a positive relationship between *FOS* and the usage of trade secrets [model 4 (β = 0.006, p <.05), model 5 (β = 0.006, p <.05) and model 6 (β = 0.007, p <.01)] indicating that the larger the family's ownership stake, the higher the chance that the firm uses trade secrets. This supports hypothesis 1b.

Table 2 about here

Models 2 and 5 of Table 2 add the negative performance gap. The estimated coefficients show the intuitive result that firms operating below their aspired performance level are more likely to employ both, patents and trade secrets. The larger the performance gap, the larger the taste for IP protection.

Model 3 of Table 2 (β = 0.001, p <.05) provides support for hypothesis 2a indicating that the relationship between family ownership and patents is positively moderated by the performance gap. Furthermore, model 6 of Table 2 (β = -0.001, p <.05) shows that the relationship between family ownership and trade secrets is negatively moderated by performance below aspiration levels, thus, providing support for hypothesis 2b.

The control variables show the expected effects. For instance, *R&D/Assets* is positively associated with patents and trade secrets. *Total Assets, Patent Stock/Assets*, *ROA* and Cash/Assets are significantly related to patents. Trade secrets, in contrast, are not very well explained by firm characteristics which is evident in many insignificant coefficients. Lastly, the effects of *Munificence* are statistically negatively significant in all models indicating that firms in a resource-rich environment rely less on patents and trade secrets.

The uncentered variance inflation factors (VIFs) for the patent models are 2.70, 2.63 and 2.64. The centered VIFs for the trade secrets models are 1.66, 1.63 and 1.69, respectively. This means that the VIFs indicate a moderate correlation between the independent variables, so that there is no reason for concern.[9,10]

4.2. Robustness checks and further analysis

We show two robustness checks and one section of further analysis. First, we show that our results hold when using a matched sample where we request that family firms and non-family firms do not differ significantly in the means of some key observable characteristics. The second robustness check section shows that our results hold for a different definitions of family firms. The last section investigates the effect of a positive performance gap above aspirations on the reliance on patents and trade secrets.

4.3. Robustness check: Matched sample

Family firms may differ from non-family firms in various dimensions such as their age and R&D intensity (e.g., Hussinger & Issah, 2024). Therefore, we created a matched sample where we use coarsened exact matching, which requires that the matched firms are identical with respect to the chosen matching criteria, for ten equally sized age categories defined along the firm age distribution, seven *R&D/Asset* classes defined along the *R&D/Asset* distribution and the 2-digit

[9] As it is not straightforward to calculate the VIFs after panel models, we use the following approach: VIFs are calculated based on poisson models with clustered standard errors using the panel idea as a clustering factor for the patent models. We report uncentered VIFs here. The threshold value for the uncentered VIFs is 10 which means that there is moderate correlation between our independent variables only. For the trade secret models, centered VIFs are calculated based on a linear regression model with clustered standard errors using the panel idea as a clustering factor. The critical value is 5 for centered VIFs so that, again, there is only moderate correlation between our independent variables.

[10] We present likelihood ratio Chi squared (LR Chi^2) statistics and R^2 statistics at the bottom of each regression table. The LR Chi^2 statistics show that the regressors added in each model improve the model fit as compared to a restricted model which, in our case only includes the year dummies. The R^2 statistics are rather low which means that most of the variance of the trade secret model is explained by time-invariant fixed effects.

SIC industry classification. The matched sample is smaller than the original sample because not all firms could be matched. The results for the matched sample regressions are presented in Table 3 and resemble our main findings. Table 3 shows fixed effects poisson regressions for the patents and fixed effects linear regressions for trade secrets. This suggests that our findings are not driven by differences in firm age and size and industry affiliation between family and non-family firms.

Table 3 about here

4.4. Robustness checks: Alternative definitions for family firms

The next robustness checks show that our results hold for a different definition of family firm ownership. Here, we measure family ownership as the shares held by the family firm as long as the family holds at least 10% or has at least one family member on the boards[11] mimicking the measurement of family ownership used by Anderson & Reeb (2023), Chen et al. (2010) and Villalonga and Amit (2006) (Table 4). We also apply a stricter ownership threshold of 50% family ownership following Cascino et al. (2010) or require that the firm has at least one family member on the board (Table 5). Table 4 and Table 5 show fixed effects poisson regressions for the patents and fixed effects linear regressions for trade secrets. Table 4 and Table 5 show that our results are qualitatively the same as the main results.

Table 4 and Table 5 about here
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[11] In case a family firm has at least one family member on the board but holds fewer shares than 10%, family ownership is set to 11%.

4.5. Further analysis: Performance above the aspiration level

Lastly, we investigate what happens if firms perform above their aspiration level as further analysis. This means that the realized performance exceeds the expectations. We measure firm performance above the aspiration level (PAA) analogously to firm performance below the aspiration level (PBA) as benchmarked by the three-digit SIC level industry average as gathered from the entire Compustat database in *t-3.* The mean (standard deviation) of this variable is 0.67 (0.07) for family firms and 1.16 (0.15) for non-family firms, respectively. The difference is statistically significant at the 10% level. If compared to Table 1, the descriptive statistics show that family firms have, on average, a larger negative aspiration gap than non-family firms which is in line with theory emphasizing their focus on SEW rather than on financial performance.

The results for the effect of a positive aspiration gap are presented in Table 6. They indicate that firm performance above the aspiration level (PAA) is associated with a significant positive reliance on both, trade secrets and patents. From a mixed gamble perspective (Martin et al., 2013), the finding that a positive performance gap makes trade secrets relatively more attractive for family firms is not surprising since family firms with a positive aspiration gap have the financial stability which allows them to focus on long-term competitive advantage and knowledge protection. When performing well, they have the resources to invest in advanced secrecy measures, such as internal controls, legal protections, and employee retention strategies, ensuring that proprietary knowledge remains within the firm. Moreover, success reinforces their confidence in their unique capabilities, making them more committed to safeguarding trade secrets as a way to sustain their market leadership and secure their legacy for future generations. Interestingly, the effect seems to be symmetric: the larger the deviation from the aspiration level, the stronger the reliance on patents and trade secrets.

Table 6 about here
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5. Discussion

5.1. General discussion

Family firms' disinclination for patents has been noted in the literature, as family firms perceive patenting through a loss frame (Chirico et al., 2020). This is rooted in the unique characteristics of family firms, which prioritize the preservation of SEW over financial gains (e.g. Gomez-Mejia et al., 2018; Duran et al., 2016; Gomez-Mejia et al., 2014). Broadening our understanding of the implications of this unique feature of family firms can strengthen both theory and practice in the field of family firm research. While family firms' unique characteristics may support or inhibit performance (Miller et al., 2003), it is family firms' strategical decision making which determines if and how they sustain and enhance their SEW and financial performance levels. The dual value dimensions of SEW and financial wealth is evident in basically every strategic decision a family firm takes so as in their approach to IP strategy, where decisions regarding the use of patents versus trade secrets reflect careful consideration of SEW and financial objectives. Patenting threatens current SEW by diverting resources from investment in core, traditional business lines central to family identity (Foss & Foss, 2005), by public disclosure of critical proprietary knowledge, which may be perceived as a risk to family control (e.g. Hall et al., 2014), by posing a threat to family reputation through any failure in the patenting process, including legal disputes or unsuccessful commercialization (Chirico et al., 2020); fourth, by fostering reliance on external financial capital and specialized expertise, potentially diminishing the family's autonomy (Chirico et al., 2020).

In contrast, trade secrets align more closely with family firms' SEW objectives as they involve minimal upfront costs, no formal disclosure requirements, and lower risks of involuntary knowledge dissemination (Hussinger & Issah, 2024), allow retaining knowledge within the family preserving autonomy and reducing dependence on external stakeholders and support lead-time advantages and sustained financial performance without jeopardizing SEW.

Building on the concept of mixed gambles (Martin et al., 2013), we explain how family firms navigate the dual value dimensions of SEW and financial wealth for IP strategy. Decisions regarding IP strategy involve trade-offs between these dimensions, particularly in situations where gains in financial wealth are associated with potential losses in SEW. We derive that when performance is above aspiration levels, family firms operate within a gain frame, prioritizing SEW preservation over prospective financial wealth, and hence, trade secrets over patents. When performance falls below aspiration levels, in contrast, the shift towards a loss frame prompts greater risk-taking as attention shifts toward financial recovery so that family firms will prefer patents over secrecy.

These predictions are empirically supported as our empirical results show that family firms have a preference for trade secrets and a disinclination for patents under stable or above-aspiration performance. As firm performance falls below aspiration levels, family firms are more likely to prioritize financial wealth over SEW, increasing their willingness to choose patents and disregard trade secrets for their IP strategy. This aligns with the mixed gambles logic, where the potential for financial recovery outweighs concerns about SEW (Wiseman & Gomez-Mejia, 1998; Chrisman & Patel, 2012). Our findings underscore the importance of framing effects and performance thresholds in shaping family firms' IP strategies.

5.2. Contribution to research

This study makes three important contributions to the literature. This is the first study to explore the association between family ownership stake and the choice of trade secret protection. Prior studies focused on patenting as IP protection mode only (e.g., Anderson et al., 2012; Block et al., 2013; Bannò, 2016; Duran et al., 2016; Chirico et al., 2020). Existing evidence on family firms' preference for trade secret remains scare and indirect (Hussinger & Issah, 2022) or treats trade secrets as the unobserved alternative to patenting (Bannò, 2016). The only study that focuses explicitly on trade secrets relies on self-reported information on trade secrets which by definition are to be kept secret by the firm and focuses on small and medium-sized firms in a specific sector, the wine industry (e.g. Gimenez-Fernandez et al., 2020). Our study directly observes the use of trade secrets by publicly traded U.S. firms through their 10-K filings (Glaeser, 2018). Therewith, our study enriches the literature on the choice of IP protection by family firms which has mostly focused on patenting (Bannò, 2016; Chirico et al., 2020).

Second, we provide a detailed example of the role of SEW in influencing family firms' strategic choices regarding IP protection modes. By applying the concept of mixed gambles, we demonstrate how variations in the preference for preserving current SEW can significantly affect the decision-making process related to IP protection (Chrisman & Patel, 2012; Chirico et al., 2020). Our analysis highlights the balance family firms must maintain between their SEW and financial objectives. This balance is crucial as it determines whether they opt for more protective and possibly costlier IP strategies or lean towards less secure but more financially conservative approaches. By examining these dynamics, we shed light on the broader implications of SEW for strategic decisions in family businesses, illustrating the nuanced interplay between emotional attachment and economic rationality in the context of IP management.

Third, by leveraging a mixed gambles BAM framework, we reconcile previous findings that shows heterogeneity regarding the preference for trade secrets or even a preference for patenting (Gimenez-Fernandez et al., 2020). The mixed gamble logic posits that family firms' preferences for different IP protection modes shift according to their performance relative to their aspiration levels. This framework elucidates why some family firms might favor trade secrets while others might prefer patents, depending on their current performance and strategic goals.

Specifically, the mixed gamble logic suggests that when family firms perform below their aspiration levels, they may become more risk-averse or risk-seeking in their IP protection strategies, contingent on their desire to preserve SEW or achieve economic gains. This extends prior evidence which has predominantly focused on how sub-aspirational performance levels influence the decision to invest in R&D (Chrisman & Patel, 2012). By leveraging the mixed gambles BAM framework, we provide a more comprehensive understanding of the strategic choices family firms make concerning IP protection and also a more nuanced perspective on the decision-making processes within family firms. By accounting for both socio-emotional and economic factors, showcasing the complex interplay between a firm's performance, its aspiration levels, and its strategic decisions related to IP management. Consequently, this framework enhances our understanding of the dynamic nature of family firms' strategic behavior and their adaptation to changing performance outcomes. Our study suggests that a firm's relative performance below aspiration levels drives the decision towards the use of trade secrets and patents as an IP protection strategy. In this light, we highlight the role of financial distress (e.g., Gómez-Mejia et al., 2023) in IP protection choices. Specifically, we reveal that performance below aspiration levels incentivizes formal IP protection mechanisms such as patenting over informal strategies such as secrecy.

5.3. Practical implications

Our research has significant practical implications, in particular for family-owned firms navigating the complexities of IP management. First, our findings underscore the importance of tailoring IP strategies to align with the unique characteristics and aspirations of family firms. Specifically, family firms should leverage their understanding of their inherent preference for trade secrets over patents, which varies based on their performance relative to aspiration levels. By developing this nuanced perspective, family firms can better align their IP management practices with their broader business objectives and SEW priorities. This alignment ensures that their IP strategy not only protects innovation but also supports the long-term sustainability of family-centric values. Moreover, family firms should adopt a dynamic approach to IP protection by recognizing how external business conditions and internal performance benchmarks influence their strategic choices. This adaptability can enable family firms to pivot effectively between trade secrets and patents, optimizing their innovation protection strategies in response to fluctuating market conditions and competitive pressures.

Second, the complexity of family firms' IP strategies necessitates a proactive approach to transparency with investors, partners, and stakeholders. Clear communication about their IP strategy, including the role of family governance, performance metrics, and SEW considerations can help build credibility and trust. By demonstrating a well-informed and intentional approach to IP management, family firms can attract investment and strengthen relationships with stakeholders who value stability and foresight in governance.

Third, family firms should invest in education and training to enhance their understanding of IP strategy among family members and non-family executives alike. Developing internal capabilities to evaluate and adapt IP strategies ensures that decisions are informed by data and

aligned with the evolving needs of the firm. Collaborative decision-making processes that include diverse perspectives from family members and professional managers can further refine their approach to innovation protection.

Finally, policymakers and external advisors should recognize the distinct needs of family firms when crafting regulations or offering guidance. Understanding that family firms balance innovation goals with SEW priorities can lead to the development of support mechanisms that better cater to their unique challenges, ultimately fostering a more conducive environment for innovation and growth.

5.4. Limitations and future research

Our research, while offering valuable insights, is not without limitations which open avenues for future inquiry. First, like prior studies (e.g., Chirico et al., 2020), our theorizing about family ownership and aspiration gaps is grounded in the SEW perspective. However, consistent with most existing research, we do not directly measure SEW. This reliance on inferred SEW constructs limits our ability to capture the nuanced and diverse dimensions of SEW across different family firms. Future studies could address this limitation by incorporating direct measures of SEW, such as survey-based assessments of its salience to family firm decision-makers. In a similar vein, we do not observe the actual performance aspirations of the firms. Aspiration levels are firm specific and cannot be observed on a large scale. We, hence, follow a large literature that defined the aspiration levels using ROA in comparison to the industry performance (e.g. Chrisman & Patel, 2012; Tyler & Caner, 2016; Ref & Shapira, 2017; Gomez-Mejia et al., 2018; Hussinger & Issah, 2019; Saridakis et al., 2023; Umans et al., 2024). Second, our empirical analysis is based on a sample of publicly listed, U.S.-based, large, and R&D-intensive firms. While this focus enhances the internal validity of our findings, it limits their

generalizability to other types of family firms, particularly to small and medium-sized enterprises (SMEs) or family firms in regions with different institutional contexts. For example, in countries with weaker IP protection regimes or underdeveloped legal systems (e.g., De Massis et al., 2018), family firms may exhibit distinct patterns of IP strategy, potentially relying more heavily on trade secrets as a mechanism to safeguard innovation. Future research could explore these variations by investigating how family firms adapt their IP strategies to institutional environments with varying levels of regulatory strength, cultural norms, and economic development.

Finally, our study does not fully capture the dynamic nature of IP strategies over time. Family firms may adjust their reliance on trade secrets or patents in response to shifts in competitive pressures, regulatory changes, or internal priorities. Longitudinal studies that track changes in IP strategy across different performance cycles and ownership transitions could provide a deeper understanding of how family firms navigate these challenges.

5.5. Conclusion

This study investigates to which extend family firms rely on trade secret and patent protection for their IP. Our results show family firms, in general, have a preference for trade secrets and a disinclination for patent protection. Performance metrics mitigate these preferences. These results can be explained by a mixed gambles logic that allows illustrating the trade-off between SEW and financial wealth for family firms and performance aspirations.

References

Åberg, C., Calabrò, A., Valentino, A., & Torchia, M. (2024). Socioemotional Wealth and Family Firm Performance: The Moderating Role of CEO Tenure and Millennial CEO. *British Journal of Management*.

Almeling, D. S. (2012). Seven reasons why trade secrets are increasingly important. *Berkeley Technology Law Journal*, 1091-1117.

Al-Tabbaa, O., Nasr, A., Zahoor, N., & De Silva, M. (2022). Socio-emotional Wealth Preservation and Alliance Success in Family Firms: The Role of Political Instability and Alliance Management Capability. *British Journal of Management*, *00*, 1-27. https://doi.org/10.1111/1467-8551.12626

Anderson, R. C., Duru, A., & Reeb, D. M. (2012). Investment policy in family controlled firms. *Journal of Banking & Finance*, *36*(6), 1744-1758. https://doi.org/10.1016/j.jbankfin.2012.01.018

Anderson, & Reeb, D. M. (2003). Founding-family ownership and firm performance: evidence from the S&P 500. *The journal of finance*, *58*(3), 1301-1328.

Appio, F. P., De Luca, L. M., Morgan, R., & Martini, A. (2019). Patent portfolio diversity and firm profitability: A question of specialization or diversification? *Journal of Business Research*, *101*, 255-267.

Arroyabe, M., Grimpe, C. and K. Hussinger (2025), Safeguarding secrets, shaping acquisitions: Trade secret protection and the role of distance between acquirer and target, *Strategy Science*, *forthcoming*.

Arrow, K. J. (1962). Economic welfare and the allocation of resources for invention. In *Readings in industrial economics* (pp. 219-236). Springer.

Arrow, K. J. (1972). Economic welfare and the allocation of resources for invention. In *Readings in industrial economics* (pp. 219-236). Springer.

Arundel, A. (2001). The relative effectiveness of patents and secrecy for appropriation. *Research policy*, *30*(4), 611-624.

Arundel, A., & Kabla, I. (1998). What percentage of innovations are patented? Empirical estimates for European firms. *Research Policy*, *27*(2), 127-141.

Attig, N., El Ghoul, S., Guedhami, O., & Zheng, X. (2021). Dividends and economic policy uncertainty: International evidence. *Journal of Corporate Finance*, *66*, 101785.

Bannò, M. (2016). Propensity to patent by family firms. *Journal of Family Business Strategy*, *7*(4), 238-248. https://doi.org/10.1016/j.jfbs.2016.07.002

Benartzi, S., & Thaler, R. H. (1995). Myopic loss aversion and the equity premium puzzle. *the Quarterly journal of Economics*, *110*(1), 73-92.

Block, J. (2012). R&D investments in family and founder firms: An agency perspective. *Journal of Business Venturing*, *27*(2), 248-265.

Block, J., Hansen, C., & Steinmetz, H. (2022). Are family firms doing more innovation output with less innovation input? A replication and extension. *Entrepreneurship Theory and Practice*, 10422587221084249.

Block, J., Miller, D., Jaskiewicz, P., & Spiegel, F. (2013). Economic and technological importance of innovations in large family and founder firms: An analysis of patent data. *Family Business Review*, *26*(2), 180-199.

Boot, A., & Vladimirov, V. (2025). Disclosure, patenting, and trade secrecy. *Journal of Accounting Research*, *63*(1), 5-56.

Bonilla, C. A., Sepulveda, J., & Carvajal, M. (2010). Family ownership and firm performance in Chile: A note on Martinez et al.'s evidence. *Family Business Review*, *23*(2), 148-154.

Bos, B., Broekhuizen, T. L. J., & de Faria, P. (2015). A dynamic view on secrecy management. *Journal of Business Research*, *68*(12), 2619-2627. https://doi.org/10.1016/j.jbusres.2015.04.009

Bromiley, P., & Harris, J. D. (2014). A comparison of alternative measures of organizational aspirations. Strategic Management Journal, 35(3), 338-357. https://doi.org/https://doi.org/10.1002/smj.2191

Cabral, J. J., Kumar, M. V. S., & Park, H. D. (2024). The value of a reputation for sustaining commitment

in interfirm relationships: The inclusion of corporate venture capitalists in investment syndicates. *Journal of Business Venturing, 39*(3), 106391.
Cascino, S., Pugliese, A., Mussolino, D., & Sansone, C. (2010). The influence of family ownership on the quality of accounting information. Family Business Review, 23(3), 246-265.
Ceipek, R., Hautz, J., De Massis, A., Matzler, K., & Ardito, L. (2021). Digital transformation through exploratory and exploitative internet of things innovations: The impact of family management and technological diversification. *Journal of Product Innovation Management*, *38*(1), 142-165.
Chen, S., Chen, X., Cheng, Q., & Shevlin, T. (2010). Are family firms more tax aggressive than non-family firms? *Journal of Financial Economics*, *95*(1), 41-61.
Chirico, F., Criaco, G., Baù, M., Naldi, L., Gomez-Mejia, L. R., & Kotlar, J. (2020). To patent or not to patent: That is the question. Intellectual property protection in family firms. *Entrepreneurship Theory and Practice*, *44*(2), 339-367. https://doi.org/10.1177/1042258718806251
Choudhury, A., Jandhyala, S., & Nandkumar, A. (2025). Economic nationalism and the home court advantage. *Strategic Management Journal, 46(1),* 1-272
Chrisman, J. J., & Patel, P. C. (2012). Variations in R&D investments of family and nonfamily firms: Behavioral agency and myopic loss aversion perspectives. *Academy of management Journal*, *55*(4), 976-997.
Cohen, W. M., Nelson, R. R., & Walsh, J. P. (2000). *Protecting their intellectual assets: Appropriability conditions and why US manufacturing firms patent (or not)*.
Crass, D., Garcia Valero, F., Pitton, F., & Rammer, C. (2019). Protecting innovation through patents and trade secrets: Evidence for firms with a single innovation. *International Journal of the Economics of Business*, *26*(1), 117-156.
Cyert, R. M., & March, J. G. (1963). A behavioral theory of the firm. *Englewood Cliffs, NJ*, *2*(4), 169-187.
Czarnitzki, D., Hussinger, K., & Leten, B. (2020). How valuable are patent blocking strategies? *Review of Industrial Organization*, *56*(3), 409-434.
Czarnitzki, D., & Toole, A. A. (2011). Patent protection, market uncertainty, and R&D investment. *The Review of Economics and Statistics*, *93*(1), 147-159.
de Faria, P., & Sofka, W. (2010). Knowledge protection strategies of multinational firms—A cross-country comparison. *Research Policy*, *39*(7), 956-968. https://doi.org/10.1016/j.respol.2010.03.005
De Massis, A., Ding, S., Kotlar, J., & Wu, Z. (2018). Family involvement and R&D expenses in the context of weak property rights protection: an examination of non-state-owned listed companies in China. *The European Journal of Finance*, *24*(16), 1506-1527.
De Rassenfosse, G., & Jaffe, A. B. (2018). Are patent fees effective at weeding out low-quality patents? *Journal of Economics & Management Strategy*, *27*(1), 134-148.
Delerue, H., & Lejeune, A. (2011). Managerial secrecy and intellectual asset protection in SMEs: The role of institutional environment. *Journal of International Management*, *17*(2), 130-142. https://doi.org/10.1016/j.intman.2010.10.002
Ding, R., Sainani, S., & Zhang, Z. J. (2021). Protection of trade secrets and corporate tax avoidance: Evidence from the inevitable disclosure doctrine. *Journal of Business Research*, *132*, 221-232.
Dong, J. Q. (2021). Technological choices under uncertainty: Does organizational aspiration matter? *Strategic Management Journal*. https://doi.org/10.1002/smj.3253
Duran, P., Kammerlander, N., Van Essen, M., & Zellweger, T. (2016). Doing more with less: Innovation input and output in family firms. *Academy of management Journal*, *59*(4), 1224-1264.
Eddleston, K. A., & Mulki, J. P. (2021). Differences in family-owned SMEs' ethical behavior: A mixed gamble perspective of family firm tax evasion. *Entrepreneurship Theory and Practice*, *45*(4), 767-791.
Edris, S., Belderbos, R., & Gilsing, V. (2024). Types of common R&D partners and knowledge leakage to rivals: The role of IP litigation reputation. *Technovation*, *131*, 102955.
Edris, S., Belderbos, R., & Gilsing, V. (2022). R&D collaborations with common partners and knowledge leakage to rivals: The role of IP litigation. In *Academy of Management Proceedings* (Vol. 2022, No. 1, p. 17342). Briarcliff Manor, NY 10510: Academy of Management.

Erdogan, I., Rondi, E., & De Massis, A. (2020). Managing the tradition and innovation paradox in family firms: A family imprinting perspective. *Entrepreneurship Theory and Practice.*, *44*(1), 20-54.
Ettredge, M., Guo, F., & Li, Y. (2018). Trade secrets and cyber security breaches. *Journal of Accounting and Public Policy*, *37*(6), 564-585.
Eugster, N., & Wang, Q. (2023). Large blockholders and stock price crash risk: An international study. *Global Finance Journal*, *55*, 100799.
European Union Intellectual Property Office (EUIPO). (2017). *Protecting Innovation Through Trade Secrets and Patents: Determinants for European Union Firms.* https://www.euipo.europa.eu.
Fernhaber, S. A., & Patel, P. C. (2012). How do young firms manage product portfolio complexity? The role of absorptive capacity and ambidexterity. *Strategic Management Journal*, *33*(13), 1516-1539.
Floros, I. V., Sivaramakrishnan, K., & Zufarov, R. (2023). Proprietary costs and the equity financing choice. *Review of Accounting Studies*, 1-44.
Foss, K., & Foss, N. J. (2005). Resources and transaction costs: how property rights economics furthers the resource-based view. *Strategic Management Journal*, *26*(6), 541-553.
Gentry, R., Dibrell, C., & Kim, J. (2016). Long–term orientation in publicly traded family businesses: Evidence of a dominant logic. *Entrepreneurship Theory and Practice*, *40*(4), 733-757.
Gimenez-Fernandez, E. M., Beukel, K., Tyler, B. B., Spielmann, N., Cerrato, D., Discua Cruz, A. F., & Minciullo, M. (2020). Should we patent it or keep it a secret? The moderating role of proactive orientation in family versus non-family SMEs. *International Small Business Journal*, 0266242620965394.
Glaeser, S. (2017). *Updated trade secret data from Glaeser (2018)*. Retrieved 05/2023 from https://stephenglaeser.web.unc.edu/data/
Glaeser, S. (2018). The effects of proprietary information on corporate disclosure and transparency: Evidence from trade secrets. *Journal of Accounting and Economics*, *66*(1), 163-193. https://doi.org/10.1016/j.jacceco.2018.04.002
Gómez-Mejia, L. R., Chirico, F., Martin, G., & Baù, M. (2023). Best among the worst or worst among the best? Socioemotional wealth and risk-performance returns for family and non-family firms under financial distress. *Entrepreneurship Theory and Practice*, *47*(4), 1031-1058.
Gómez-Mejía, L. R., Haynes, K. T., Núñez-Nickel, M., Jacobson, K. J., & Moyano-Fuentes, J. (2007). Socioemotional wealth and business risks in family-controlled firms: Evidence from Spanish olive oil mills. *Administrative Science Quarterly*, *52*(1), 106-137.
Gómez-Mejía, L. R., Cruz, C. , Berrone, P. & De Castro, J. (2016). Ties that bind: Socioemotional wealth preservation in family firms. *Academy of Management Annals*, 51(4), 409–411.
Gomez-Mejia, L. R., Patel, P. C., & Zellweger, T. M. (2018). In the horns of the dilemma: Socioemotional wealth, financial wealth, and acquisitions in family firms. *Journal of Management*, *44*(4), 1369-1397.
Gómez-Mejía, L. R., Sanchez-Bueno, M. J., Miroshnychenko, I., Wiseman, R. M., Muñoz-Bullón, F., & De Massis, A. (2023). Family Control, Political Risk and Employment Security: A Cross-National Study. *Journal of management studies*.
Gomez-Mejia, L. R., Makri, M., & Kintana, M. L. (2010). Diversification decisions in family-controlled firms. *Journal of management studies*, *47*(2), 223-252.
Gomez–Mejia, L. R., Campbell, J. T., Martin, G., Hoskisson, R. E., Makri, M., & Sirmon, D. G. (2014). Socioemotional wealth as a mixed gamble: Revisiting family firm R&D investments with the behavioral agency model. *Entrepreneurship Theory and Practice*, *38*(6), 1351-1374.
Graves, C., & Shan, Y. G. (2014). An empirical analysis of the effect of internationalization on the performance of unlisted family and nonfamily firms in Australia. *Family Business Review*, *27*(2), 142-160.
Greve, H. R. (2008). A Behavioral Theory of Firm Growth: Sequential Attention to Size and Performance Goals. *The Academy of Management Journal*, *51*(3), 476-494. https://doi.org/10.2307/20159522
Grimpe, C., & Hussinger, K. (2014). Pre-empted patents, infringed patents and firms' participation in markets for technology . *Research Policy*, *43(3),* 543-554

Hall, Helmers, C., Rogers, M., & Sena, V. (2014). The choice between formal and informal intellectual property: a review. *Journal of Economic Literature*, *52*(2), 375-423.
Hall, B. H. (2007). Patents and patent policy. *Oxford Review of Economic Policy*, *23*(4), 568-587. https://doi.org/10.1093/oxrep/grm037
Hall, B. H., Jaffe, A., & Trajtenberg, M. (2005). Market value and patent citations. *RAND Journal of economics*, 16-38.
Hall, B. H., & Mairesse, J. (1995). Exploring the relationship between R&D and productivity in French manufacturing firms. *Journal of Econometrics*, *65*(1), 263-293.
Hannah, D. R. (2005). Should I keep a secret? The effects of trade secret protection procedures on employees' obligations to protect trade secrets. *Organization Science*, *16*(1), 71-84.
Hannah, D. R. (2006). Keeping trade secrets secret. *MIT Sloan Management Review*, *47*(3), 17.
Hannah, D. R. (2007). An examination of the factors that influence whether newcomers protect or share secrets of their former employers. *Journal of Management Studies*, *44*(4), 465-487.
Harabi, N. (1995). Appropriability of technical innovations an empirical analysis. *Research Policy*, *24*(6), 981-992.
He, Q., Leung, H., Qiu, B., & Zhou, Z. (2025). The effect of social media on corporate innovation: Evidence from Seeking Alpha coverage. *Management Science*, *forthcoming*.
Hou, Q., Chen, Z., & Teng, M. (2022). Today's baton and tomorrow's vision: The effect of strengthening patent examination system on corporate innovation strategies. *Journal of Business Research*, *144*, 614-626.
Hu, Q., & Hughes, M. (2020). Radical innovation in family firms: a systematic analysis and research agenda. *International Journal of Entrepreneurial Behavior & Research*, *26*(6), 1199-1234.
Hurmelinna-Laukkanen, P., & Puumalainen, K. (2007). Nature and dynamics of appropriability: strategies for appropriating returns on innovation. *R&D Management*, *37*(2), 95-112.
Hussinger, K. (2006). Is silence golden? Patents versus secrecy at the firm level. *Economics of Innovation and New Technology*, *15*(8), 735-752.
Hussinger, K., & Issah, A.-B. (2019). Firm Acquisitions by Family Firms: A Mixed Gamble Approach. *Family Business Review*, *32*(4), 354-377. https://doi.org/10.1177/0894486519885544
Hussinger, K., & Issah, W. (2022). Trade Secret Protection and R&D Investment of Family Firms. *Family Business Review*, *35*(4), 361-382.
Hussinger, K., & Issah, W. B. (2024). Early patent disclosure and R&D investment in family firms. *British Journal of Management*, *0*, 1-14, forthcoming.
Iyer, D. N., & Miller, K. D. (2008). Performance feedback, slack, and the timing of acquisitions. *Academy of management Journal*, *51*(4), 808-822.
Jin, P., Mangla, S. K., & Song, M. (2022). The power of innovation diffusion: How patent transfer affects urban innovation quality. *Journal of Business Research*, *145*, 414-425.
Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1991). Anomalies: The endowment effect, loss aversion, and status quo bias. *Journal of Economic Perspectives*, *5*(1), 193-206.
Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *47*(2), 263-291.
Kang, H., & Lee, W. (2022). How innovating firms manage knowledge leakage: A natural experiment on the threat of worker departure. *Strategic Management Journal*, *43*(10), 1961-1982.
Kellermanns, F. W., Eddleston, K. A., & Zellweger, T. M. (2012). Article commentary: Extending the socioemotional wealth perspective: A look at the dark side. *Entrepreneurship Theory and Practice*, *36*(6), 1175-1182.
Kogan, L., Papanikolaou, D., Seru, A., & Stoffman, N. (2017). Technological innovation, resource allocation, and growth. *the Quarterly journal of Economics*, *132*(2), 665-712.
Kogan, L., Papanikolaou, D., Seru, A., & Stoffman, N. (2023). *KPSS2017 /Technological-Innovation-Resource-Allocation-and-Growth-Extended-Data* Retrieved 05/2023 from https://github.com/KPSS2017/Technological-Innovation-Resource-Allocation-and-Growth-Extended-Data

Kotlar, J., Signori, A., De Massis, A., & Vismara, S. (2018). Financial wealth, socioemotional wealth, and IPO underpricing in family firms: A two-stage gamble model. *Academy of management Journal*, *61*(3), 1073-1099.

Levin, R. C., Klevorick, A. K., Nelson, R. R., Winter, S. G., Gilbert, R., & Griliches, Z. (1987). Appropriating the returns from industrial research and development. *Brookings papers on economic activity*, *1987*(3), 783-831.

Liebeskind, J. P. (1997). Keeping organizational secrets: Protective institutional mechanisms and their costs. *Industrial and Corporate Change*, *6*(3), 623-663.

Linton, K. (2016). The importance of trade secrets: new directions in international trade policy making and empirical research. *J. Int'l Com. & Econ.*, 1.

Lim, S.-Y., & Jeong, S.-H. (2025). Multi-founding family firms: Effects on firm governance, innovation, and performance. *Entrepreneurship Theory and Practice, forthcoming*.

Loewenstein, G., & Thaler, R. H. (1989). Anomalies: intertemporal choice. *Journal of Economic Perspectives*, *3*(4), 181-193.

Lozano-Reina, G., Sánchez-Marín, G., & Baixauli-Soler, J. S. (2022). Say-on-Pay voting dispersion in listed family and non-family firms: A panel data analysis. *Journal of Family Business Strategy*, *13*(1), 100423.

Martin, G., & Gomez-Mejia, L. (2016). The relationship between socioemotional and financial wealth: Re-visiting family firm decision making. *Management Research: Journal of the Iberoamerican Academy of Management*, *14*(3), 215-233.

Martin, G., Gözübüyük, R., & Becerra, M. (2015). Interlocks and firm performance: The role of uncertainty in the directorate interlock-performance relationship. *Strategic Management Journal*, *36*(2), 235-253. https://doi.org/10.1002/smj.2216

Martin, G. P., Gomez-Mejia, L. R., & Wiseman, R. M. (2013). Executive stock options as mixed gambles: Revisiting the behavioral agency model. *Academy of management Journal*, *56*(2), 451-472.

Marx, M., Strumsky, D., & Fleming, L. (2009). Mobility, skills, and the Michigan non-compete experiment. *Management Science*, *55*(6), 875-889.

Miller, D., Steier, L., & Le Breton-Miller, I. (2003). Lost in time: intergenerational succession, change and failure in family business. *Journal of Business Venturing, 18*, 513–531.

Morikawa, M. (2019). Innovation in the service sector and the role of patents and trade secrets: Evidence from Japanese firms. *Journal of the Japanese and International Economies*, *51*, 43-51.

Dal Maso, L., Basco, R., Bassetti, T., & Lattanzi, N. (2020). Family ownership and environmental performance: The mediation effect of human resource practices. *Business Strategy and the Environment*, *29*(3), 1548-1562.

McConnel, J., & Servaes, H. (1990). H, S.(1990). Additional Evidence on Equity Ownership and Corporate Value. *Journal of Financial Economics*, *27*(2), 595-692.

Mezzanotti, F., & Simcoe, T. (2023). *Innovation and appropriability: Revisiting the role of intellectual property*.

Michiels, A., Voordeckers, W., Lybaert, N., & Steijvers, T. (2013). CEO compensation in private family firms: Pay-for-performance and the moderating role of ownership and management. *Family Business Review*, *26*(2), 140-160.

Miroshnychenko, I., & De Massis, A. (2020). Three decades of research on corporate governance and R&D investments: a systematic review and research agenda. *R&D Management*, *50*(5), 648-666.

Miroshnychenko, I., De Massis, A., Miller, D., & Barontini, R. (2021). Family business growth around the world. *Entrepreneurship Theory and Practice*, *45*(4), 682-708.

Miroshnychenko, I., Vocalelli, G., De Massis, A., Grassi, S., & Ravazzolo, F. (2023). The COVID-19 pandemic and family business performance. *Small Business Economics*, 1-29.

Muñoz-Bullón, F., Sanchez-Bueno, M. J., & De Massis, A. (2020). Combining internal and external R&D: The effects on innovation performance in family and nonfamily firms. *Entrepreneurship Theory and Practice*, *44*(5), 996-1031.

Nieto, M. J., Santamaria, L., & Fernandez, Z. (2015). Understanding the Innovation Behavior of Family Firms. *Journal of Small Business Management*, *53*(2), 382-399. https://doi.org/10.1111/jsbm.12075

Park, M., Wu, S., & Funk, R. J. (2025). Regulation and innovation revisited: How restrictive environments can promote destabilizing new technologies. *Organization Science, forthcoming.*

Patel, P. C., & Chrisman, J. J. (2014). Risk abatement as a strategy for R&D investments in family firms. *Strategic Management Journal*, *35*(4), 617-627.

Peng, C.-H., Wu, L.-L., Wei, C.-P., & Chang, C.-M. (2020). Intrafirm network structure and firm innovation performance: the moderating role of environmental uncertainty. *IEEE Transactions on Engineering Management*, *69*(4), 1173-1184.

Png, I. P. L. (2017). Law and Innovation: Evidence from State Trade Secrets Laws. *Review of Economics and Statistics*, *99*(1), 167-179. https://doi.org/10.1162/REST_a_00532

Rahman, D., Kabir, M., & Oliver, B. (2021). Does exposure to product market competition influence insider trading profitability? *Journal of Corporate Finance*, *66*, 101792.

Ref, O., Feldman, N. E., Iyer, D. N., & Shapira, Z. (2021). Entry into new foreign markets: Performance feedback and opportunity costs. *Journal of World Business*, *56*(6), 101258.

Ref, O., & Shapira, Z. (2017). Entering new markets: The effect of performance feedback near aspiration and well below and above it. *Strategic Management Journal*, *38*(7), 1416-1434. https://doi.org/https://doi.org/10.1002/smj.2561

Rios, L. A. (2021). On the origin of technological acquisition strategy: The interaction between organizational plasticity and environmental munificence. *Strategic Management Journal*, *42*(7), 1299-1325.

Sampat, B. N. (2018). A survey of empirical evidence on patents and innovation. *National Bureau of Economic Research* Working Paper No. 25383.

Saridakis, C., Angelidou, S., & Woodside, A. G. (2023). How historical and social aspirations reshape the relationship between corporate financial performance and corporate social responsibility. *Journal of Business Research*, *157*, 113553.

Scherer, F. M. (1965a). Corporate inventive output, profits, and growth. *journal of political economy*, *73*(3), 290-297.

Scherer, F. M. (1965b). Firm size, market structure, opportunity, and the output of patented inventions. *The American Economic Review*, *55*(5), 1097-1125.

Shackelford B, Jankowski J; National Center for Science and Engineering Statistics (NCSES). 2021. *Three-Quarters of U.S. Businesses that Performed or Funded R&D Viewed Trade Secrets as Important in 2018*. NSF 21-339. Alexandria, VA: National Science Foundation.

Shim, J., & Okamuro, H. (2011). Does ownership matter in mergers? A comparative study of the causes and consequences of mergers by family and non-family firms. *Journal of Banking & Finance*, *35*(1), 193-203.

Shou, Y., Shan, S., Chen, A., Cheng, Y., & Boer, H. (2020). Aspirations and environmental performance feedback: a behavioral perspective for green supply chain management. *International Journal of Operations & Production Management*, *40*(6), 729-751.

Somaya, D. (2012). Patent Strategy and Management. *Journal of Management*, *38*(4), 1084-1114. https://doi.org/10.1177/0149206312444447

Sussman, L. (2008). Disclosure, leaks, and slips: Issues and strategies for prohibiting employee communication. *Business Horizons*, *51*(4), 331-339.

Thaler, R. H., Tversky, A., Kahneman, D., & Schwartz, A. (1997). The effect of myopia and loss aversion on risk taking: An experimental test. *the Quarterly journal of Economics*, *112*(2), 647-661.

Titus Jr, V., Parker, O., & Covin, J. (2020). Organizational aspirations and external venturing: The contingency of entrepreneurial orientation. *Entrepreneurship Theory and Practice*, *44*(4), 645-670.

Tyler, B. B., & Caner, T. (2016). New product introductions below aspirations, slack and R&D alliances: A behavioral perspective. *Strategic Management Journal*, *37*(5), 896-910.

Umans, I., Lybaert, N., Steijvers, T., Voordeckers, W., & Laveren, E. (2024). Performance below and above aspirations as an antecedent of succession planning in family firms: A socio-emotional wealth mixed gamble approach. *Review of Managerial Science*, *18*(5), 1427-1458.

UNIFORM TRADE SECRETS ACT WITH 1985 AMENDMENTS, (1985). https://www.wipo.int/edocs/lexdocs/laws/en/us/us034en.pdf

Villalonga, B., Amit, R. (2020). Family ownership. *Oxford Review of Economic Policy*, 36(2), 241–257.

Wadhwa, A., Bodas Freitas, I. M., & Sarkar, M. (2017). The paradox of openness and value protection strategies: effect of extramural R&D on innovative performance. *Organization Science*, *28*(5), 873-893.

Wales, W. J., Patel, P. C., Parida, V., & Kreiser, P. M. (2013). Nonlinear effects of entrepreneurial orientation on small firm performance: The moderating role of resource orchestration capabilities. *Strategic Entrepreneurship Journal*, *7*(2), 93-121.

Wang Y. (2023). Trade secrets laws and technology spillovers. *Research Policy* 52(7): 104794.

Williams Jr, R. I., Pieper, T. M., Kellermanns, F. W., & Astrachan, J. H. (2018). Family firm goals and their effects on strategy, family and organization behavior: A review and research agenda. *International Journal of Management Reviews*, *20*, S63-S82.

Wiseman, R. M., & Gomez-Mejia, L. R. (1998). A behavioral agency model of managerial risk taking. *Academy of Management Review*, *23*(1), 133-153.

Xia, Q., Hu, S., & Xie, Y. (2023). Trade policy uncertainty and corporate innovation: evidence from resource dependence perspective. *Technology Analysis & Strategic Management*, 1-14.

Xu, K., Hitt, M. A., & Dai, L. (2020). International diversification of family-dominant firms: Integrating socioemotional wealth and behavioral theory of the firm. *Journal of World Business*, *55*(3), 101071.

APPENDIX

Table 7 about here

TABLES

Table 1: Descriptive Statistics

	Family Firms		Non-Family Firms		
	Mean	**SD**	**Mean**	**SD**	**T Test**
Trade Secrets	0.42	0.49	0.46	0.50	**
Patents	100.41	490.79	76.25	398.22	*
FOS	9.80	12.42			
PBA	1.44	4.61	1.05	2.60	***
Total Assets	9.47	1.12	9.82	1.25	***
R&D/Assets	0.02	0.04	0.02	0.03	
Patents Stock/R&D	0.08	0.23	0.16	0.41	***
ROA	0.15	0.09	0.14	0.08	***
Cash/Assets	0.03	0.03	0.03	0.02	***
Debt/Assets	0.22	0.17	0.23	0.14	
Munificence	0.19	0.93	-0.05	0.85	***

Note: FOS: family ownership stake; PBA: performance below aspiration

Table 2: Family Ownership and the Usage of Trade Secrets

Variables	**Patents**			**Trade Secrets**		
Estimation approach	Fixed effects poisson regressions			Fixed effects linear regressions		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
FOS	-0.022***	-0.021***	-0.023***	0.006**	0.006**	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Total Assets	0.873***	0.873***	0.872***	0.005	0.002	0.001
	(0.012)	(0.012)	(0.012)	(0.024)	(0.024)	(0.024)
R&D/Assets	8.493***	8.477***	8.468***	2.386***	2.323***	2.318***
	(0.146)	(0.146)	(0.146)	(0.614)	(0.613)	(0.613)
Patents Stock/R&D	0.492***	0.493***	0.494***	0.025	0.024	0.022
	(0.005)	(0.005)	(0.005)	(0.032)	(0.032)	(0.032)
ROA	0.573***	0.541***	0.549***	-0.235*	-0.287**	-0.289**
	(0.051)	(0.051)	(0.051)	(0.129)	(0.130)	(0.130)
Cash/Assets	3.236***	3.218***	3.224***	-0.988*	-1.001*	-1.028*
	(0.229)	(0.229)	(0.229)	(0.579)	(0.579)	(0.579)
Debt/Assets	0.103***	0.099***	0.106***	-0.027	-0.024	-0.025
	(0.033)	(0.033)	(0.033)	(0.074)	(0.074)	(0.074)
Munificence	-0.116***	-0.120***	-0.122***	-0.025*	-0.026**	-0.026**
	(0.008)	(0.008)	(0.008)	(0.013)	(0.013)	(0.013)
PBA		0.017***	0.019***		0.023***	0.026***
		(0.003)	(0.003)		(0.007)	(0.007)
FOS*PBA			0.001**			-0.001**
			(0.000)			(0.001)
_cons				0.340	0.352	0.357
				(0.244)	(0.244)	(0.244)
LR-Chi^2	15945.64***	15964.40***	15969.10			
R^2				0.0620	0.0560	0.0653
N	2601	2601	2601	4832	4832	4832

Note: FOS: family ownership stake; PBA: performance below aspiration

Standard errors in parentheses

*p < .10. **p < .05. ***p < .01.

Table 3: Family Ownership and the Usage of Trade Secrets (Matched Sample)

Variables	**Patents**			**Trade Secrets**		
Estimation approach	Fixed effects poisson regressions			Fixed effects linear regressions		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
FOS	-0.027***	-0.025***	-0.028***	0.005**	0.005**	0.006***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Total Assets	0.952***	0.952***	0.951***	-0.002	-0.005	-0.006
	(0.013)	(0.013)	(0.013)	(0.027)	(0.027)	(0.027)
R&D/Assets	13.389***	13.379***	13.359***	1.416	1.372	1.365
	(0.235)	(0.236)	(0.236)	(0.946)	(0.945)	(0.945)
Patents Stock/R&D	0.462***	0.466***	0.467***	0.017	0.017	0.015
	(0.005)	(0.005)	(0.005)	(0.032)	(0.032)	(0.032)
ROA	-0.087	-0.141**	-0.131**	-0.186	-0.231*	-0.237*
	(0.061)	(0.061)	(0.061)	(0.138)	(0.139)	(0.139)
Cash/Assets	4.727***	4.653***	4.647***	-0.658	-0.679	-0.715
	(0.250)	(0.250)	(0.250)	(0.620)	(0.620)	(0.620)
Debt/Assets	0.006	0.008	0.019	0.052	0.051	0.049
	(0.036)	(0.036)	(0.036)	(0.084)	(0.084)	(0.084)
Munificence	-0.127***	-0.132***	-0.135***	-0.028*	-0.029**	-0.030**
	(0.009)	(0.009)	(0.009)	(0.014)	(0.014)	(0.014)
PBA		0.033***	0.039***		0.021**	0.028***
		(0.006)	(0.006)		(0.009)	(0.010)
FOS*PBA			0.001***			-0.001**
			(0.000)			(0.001)
_cons				0.382	0.398	0.407
				(0.272)	(0.272)	(0.272)
LR-Chi^2	13601.15***	13601.20***	13610.87***			
R^2				0.05	0.05	0.05
N	2003	2003	2003	3630	3630	3630

Note: FOS: family ownership stake; PBA: performance below aspiration

Standard errors in parentheses

*p < .10. **p < .05. ***p < .01.

Table 4: Family Ownership and the Usage of Trade Secrets (At least 10% Family Ownership Stake)

Variables	**Patents**			**Trade Secrets**		
Estimation approach	Fixed effects poisson regressions			Fixed effects linear regressions		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
FOS	-0.027***	-0.026***	-0.030***	0.005**	0.005**	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Total Assets	0.858***	0.858***	0.856***	0.004	0.000	-0.001
	(0.012)	(0.012)	(0.012)	(0.025)	(0.025)	(0.025)
R&D/Assets	9.625***	9.614***	9.603***	1.998***	1.936***	1.925***
	(0.184)	(0.184)	(0.184)	(0.742)	(0.742)	(0.741)
Patents Stock/R&D	0.483***	0.484***	0.485***	0.029	0.027	0.025
	(0.005)	(0.005)	(0.005)	(0.032)	(0.032)	(0.032)
ROA	0.523***	0.501***	0.520***	-0.241*	-0.295**	-0.298**
	(0.053)	(0.053)	(0.053)	(0.135)	(0.136)	(0.136)
Cash/Assets	3.351***	3.336***	3.350***	-0.895	-0.905	-0.937
	(0.231)	(0.231)	(0.231)	(0.600)	(0.599)	(0.599)
Debt/Assets	0.209***	0.205***	0.224***	-0.032	-0.029	-0.032
	(0.034)	(0.034)	(0.034)	(0.077)	(0.077)	(0.077)
Munificence	-0.126***	-0.129***	-0.133***	-0.028**	-0.030**	-0.030**
	(0.008)	(0.008)	(0.008)	(0.013)	(0.013)	(0.013)
PBA		0.012***	0.015***		0.023***	0.028***
		(0.003)	(0.003)		(0.007)	(0.007)
FOS*PBA			0.002***			-0.001**
			(0.000)			(0.001)
_cons				0.354	0.370	0.376
				(0.250)	(0.250)	(0.250)
LR-Chi^2	13983.12***	13987.62***	14003.99***			
R^2				0.07	0.07	0.07
N	2473	2473	2473	4696	4696	4696

Note: FOS: family ownership stake; PBA: performance below aspiration

Standard errors in parentheses

*p < .10. **p < .05. ***p < .01.

Table 5: Family Ownership and the Usage of Trade Secrets (At least 50% Family Ownership Stake)

Variables	**Patents**			**Trade Secrets**		
Estimation approach	Fixed effects poisson regressions			Fixed effects linear regressions		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
FOS	-0.029***	-0.029***	-0.032***	0.005*	0.005*	0.006**
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Total Assets	0.835***	0.835***	0.833***	-0.025	-0.028	-0.028
	(0.012)	(0.012)	(0.012)	(0.027)	(0.027)	(0.027)
R&D/Assets	9.296***	9.296***	9.291***	1.695**	1.669**	1.664**
	(0.186)	(0.186)	(0.186)	(0.797)	(0.796)	(0.796)
Patents Stock/R&D	0.466***	0.466***	0.467***	0.013	0.013	0.012
	(0.005)	(0.005)	(0.005)	(0.034)	(0.034)	(0.034)
ROA	0.510***	0.516***	0.533***	-0.252*	-0.300**	-0.303**
	(0.053)	(0.053)	(0.053)	(0.145)	(0.146)	(0.146)
Cash/Assets	3.633***	3.640***	3.651***	-0.852	-0.871	-0.900
	(0.231)	(0.232)	(0.232)	(0.641)	(0.641)	(0.641)
Debt/Assets	0.226***	0.227***	0.244***	-0.037	-0.037	-0.040
	(0.034)	(0.034)	(0.034)	(0.083)	(0.083)	(0.083)
Munificence	-0.120***	-0.119***	-0.122***	-0.023*	-0.025*	-0.025*
	(0.008)	(0.008)	(0.008)	(0.014)	(0.014)	(0.014)
PBA		-0.003	-0.000		0.021***	0.026***
		(0.003)	(0.003)		(0.008)	(0.008)
FOS*PBA			0.002***			-0.001**
			(0.000)			(0.001)
_cons				0.688**	0.692**	0.695**
				(0.277)	(0.277)	(0.276)
LR-Chi^2	13299.48***	13300.25***	13313.36***			
R^2				0.06	0.07	0.06
N	2464	2464	2464	4106	4106	4106

Note: FOS: family ownership stake; PBA: performance below aspiration

Standard errors in parentheses

*p < .10. **p < .05. ***p < .01.

Table 6: Family Ownership and the Usage of Trade Secrets (Performance Above Aspiration Levels)

Variables	**Patents**			**Trade Secrets**		
Estimation approach	fixed effects poisson regressions			fixed effects linear regressions		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
FOS	-0.022***	-0.024***	-0.031***	0.006**	0.006**	0.005*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Total Assets	0.873***	0.853***	0.835***	0.005	-0.027	-0.028
	(0.012)	(0.012)	(0.012)	(0.024)	(0.028)	(0.028)
R&D/Assets	8.493***	7.138***	7.174***	2.386***	1.551**	1.554**
	(0.146)	(0.163)	(0.163)	(0.614)	(0.740)	(0.740)
Patents Stock/R&D	0.492***	0.469***	0.469***	0.025	0.000	-0.000
	(0.005)	(0.005)	(0.005)	(0.032)	(0.034)	(0.034)
ROA	0.573***	0.607***	0.615***	-0.235*	-0.301**	-0.303**
	(0.051)	(0.051)	(0.051)	(0.129)	(0.139)	(0.139)
Cash/Assets	3.236***	3.985***	3.682***	-0.988*	-0.621	-0.623
	(0.229)	(0.230)	(0.232)	(0.579)	(0.635)	(0.635)
Debt/Assets	0.103***	0.140***	0.130***	-0.027	-0.024	-0.027
	(0.033)	(0.033)	(0.033)	(0.074)	(0.084)	(0.084)
Munificence	-0.116***	-0.110***	-0.115***	-0.025*	-0.024*	-0.024*
	(0.008)	(0.008)	(0.008)	(0.013)	(0.014)	(0.014)
PAA		0.027***	0.026***		0.011***	0.010***
		(0.006)	(0.006)		(0.003)	(0.003)
FOS*PAA			0.035***			0.001**
			(0.003)			(0.001)
Constant				0.340	0.716**	0.727***
				(0.244)	(0.281)	(0.281)
LR Chi2	15945.64***	-16796.96***	-16745.85***			
R2				0.0620	0.01	0.01
N	2601	2588	2588	4832	3916	3916

Note: FOS: family ownership stake; PAA: performance above aspiration
Standard errors in parentheses
*p < .10. **p < .05. ***p < .01.

Table 7 Correlation Matrix

		1	2	3	4	5	6	7	8	9	10
1	Trade secrets	1.0000									
2	Patents	0.1558	1.0000								
3	FOS	-0.0583	-0.0260	1.0000							
4	PBA	0.0867	0.0245	0.0350	1.0000						
5	Total Assets	-0.0182	0.1800	-0.0804	-0.1113	1.0000					
6	R&D/Assets	0.3444	0.2327	-0.0684	0.0544	-0.2012	1.0000				
7	Patents Stock/R&D	0.2283	0.4459	-0.0888	0.0969	-0.0287	0.2722	1.0000			
8	ROA	0.0320	0.0600	0.0751	0.0852	-0.4472	0.1084	0.0505	1.0000		
9	Cash/Assets	0.1380	0.0323	0.0678	0.0452	-0.5250	0.4206	0.1072	0.4792	1.0000	
10	Debt/Assets	-0.0731	-0.0542	-0.0388	0.0042	-0.0812	-0.1467	-0.0276	0.0424	-0.1163	1.0000
11	Munificence	0.0573	0.1278	0.0388	-0.0559	-0.0904	0.1329	0.0054	0.1175	0.1635	-0.0669