DISCUSSION PAPER SERIES

DP11472

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FINANCIAL ECONOMICS

ISSN 0265-8003

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Discussion Paper DP11472
Published 29 August 2016
Submitted 29 August 2016

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This paper examines the incentives for family firms to innovate. We argue that, due to the wealth concentration of major shareholders, family firms are incentivized to diversify their risk through innovation. In particular, family firms use innovation to explore new (as opposed to existing) fields of business. Using a comprehensive sample of U.S. family-owned public firms and patents for the period from 1998 to 2010, we confirm that family ownership is positively (negatively) related to exploratory (exploitative) innovation. Tests based on instrumental variables regression (divorce laws of family firms' headquarter states or neighboring states) and regulatory shocks in inheritance taxes further offer a causal interpretation. Market prices, however, respond negatively to family firms' exploratory innovation, suggesting that such innovation may benefit major shareholders of family firms at the cost of minority shareholders. Our results suggest that risk-mitigation incentives play an important role in affecting innovation strategies, which may have subtle implications for investors in financial markets.

JEL Classification: G32, O32

Keywords: family firms, innovation, under-diversification, innovation strategies

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When is Good News Not Good News?

Opening Up the Black Box of Innovation for Family Firms

Po-Hsuan Hsu, Sterling Huang, Massimo Massa, Hong Zhang[†]

Abstract

This paper examines the incentives for family firms to innovate. We argue that, due to the wealth concentration of major shareholders, family firms are incentivized to diversify their risk through innovation. In particular, family firms use innovation to explore new (as opposed to existing) fields of business. Using a comprehensive sample of U.S. family-owned public firms and patents for the period from 1998 to 2010, we confirm that family ownership is positively (negatively) related to exploratory (exploitative) innovation. Tests based on instrumental variables regression (divorce laws of family firms' headquarter states or neighboring states) and regulatory shocks in inheritance taxes further offer a causal interpretation. Market prices, however, respond negatively to family firms' exploratory innovation, suggesting that such innovation may benefit major shareholders of family firms at the cost of minority shareholders. Our results suggest that risk-mitigation incentives play an important role in affecting innovation strategies, which may have subtle implications for investors in financial markets.

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Introduction

As perhaps the most common type of global business organization, family ownership is of great interest to both academic researchers and practitioners. One of the most important distinctions between family and non-family firms lies in the wealth concentration of the major shareholders. As controlling families concentrate most of their wealth in a single firm, their risk exposure is tied to a single asset: the family firm (e.g., Shleifer and Vishny, 1986; La Porta, Lopez-de-Silanes, and Shleifer, 1999; Claessens et al., 2002; Anderson and Reeb, 2003a). This induces family-owned firms to engage in business diversification (Shleifer and Vishny, 1992; Faccio and Lang, 2002), such as investment in unrelated industries (i.e., "conglomerates") or adoption of risk-reducing organizational structures (i.e., "pyramids," or "business groups") (e.g., Almeida and Wolfenzon, 2006; Villalonga and Amit, 2006; Masulis, Pham, and Zein, 2011).

Less noticed is the notion that innovation may provide another effective way for family firms to achieve business diversification. Indeed, if the goal of a firm is to expand to an unrelated industry, innovations could help the firm build up necessary technologies and expertise internally. Given the wide recognition of the importance of innovation with respect to entry barriers (Hambrick and MacMillan, 1985; Baysinger and Hoskisson, 1989; Cohen and Levinthal, 1990), sustainable competitive advantages (Dierickx and Cool, 1989; Hall, 1993a), and both short-term operating performance and long-run survival likelihood (Levinthal and March, 1993; Jansen, Van den Bosch, and Volberda, 2006), it is surprising that the link between business diversification incentives and innovation has been thus far ignored in the literature. Yet a deep understanding of this link is crucial in opening up the black box of innovation and helping identify its exact influences on various types of market participants. For instance, although innovation is generally heralded as good news in the literature, diversification-induced innovation, similar to the case of diversification-motivated acquisitions, may be helpful to the controlling family of a firm, but may be considered suboptimal from minority investors' perspective.

Our paper aims to bridge this gap by examining how family firms innovate and how the market reacts to their innovations—and why. To achieve this goal, we focus on the two main forms of innovation: exploration and exploitation – or exploratory and exploitative innovation (March, 1991; Levinthal and March, 1993, Manso, 2011; Balsmeier, Fleming, and Manso, 2016).

"*Exploration*" denotes the creation of new knowledge substantially different from a firm's current expertise through remote search, radical experimentation, and revolutionary moves. This approach of knowledge creation pursues innovation that deviates from a firm's trajectories of expertise and typically leads to variation and diversity in terms of technology areas and product lines. In contrast, "*exploitation*" denotes the creation of new knowledge closely related to a firm's current expertise, typically through local search, marginal experimentation, and incremental moves. Since this approach pursues innovation that follows a firm's current trajectories of expertise, it tends to strengthen the firm's dependence on existing technology areas and product lines. We will label them "innovation strategies" when there is no confusion.

While both innovation strategies help firms create new intellectual property, owners of family firms can benefit more from exploration than from exploitation if the goal is to diversify the business risk of undiversified family owners. Given that families are typically reluctant to give up control—e.g., due to financial and non-financial benefits related to the private value of controlling a firm, emotional attachment to family business, social status of control, and cultural and legacy motives (Burkart, Panunzi, and Shleifer, 2003; Chen, Chen, Cheng, and Shevlin, 2010)—exploratory innovation provides a nice operational mechanism for families to mitigate associated business risk without sacrificing their ownership. These considerations suggest that family-owned firms engage in more exploratory innovation and less exploitative innovation to diversify their concentrated business risk, which we refer to as the "*risk-diversification hypothesis*".

Alternatively, family firms may be more attracted to exploitative innovation due to their unique organizational structure. Nepotism – i.e., the tendency for family firms to hire and promote top managers who are family members or friends (Gomez-Mejia, Hoskisson, Makri, and Campbell, 2011) – and centralized decision systems, for instance, are common features of the kinship-based organizational structure of family firms. Both are more suitable for exploitative innovation that entails routine experimentation and less flexible feedbacks (Lavie, Stettner, and Tushman, 2010). If these effects dominate the risk-diversification incentives, then family-owned firms will engage more in exploitative innovation and less in exploratory innovation. We refer to this set of considerations as the "*adaption to organization*" hypothesis.

These hypotheses are tested against the null that family firms, just like other types of firms, may dynamically adopt innovation strategies that best fit their shifting competitive environment rather than conditioning innovation on risk diversification or their existing organizational structures. Under this null, we should find no *ex ante* relationship between family ownership and exploratory innovation (or between family ownership and exploitative innovation) as no innovation strategy *ex ante* dominates the other.[1]

But how should the market respond to these innovation strategies? If a new technology is adopted simply to achieve business diversification, then minority shareholders may feel unsatisfied because they can achieve business diversification more effectively via portfolio investment (e.g., Faccio and Lang, 2002; Anderson and Reeb, 2003b). In this regard, the market may discount diversification-induced innovation in the same way it discounts conglomerates – i.e., business diversification does not serve the best interest of minority shareholders. By contrast, if an innovation is developed as the best fit for a firm's competitive conditions in the null hypothesis, then investors would welcome such innovation by pushing up the firm's stock price upon its announcement. Similarly, the influence of innovation adaptive to the specific organizational structure of family firms is likely to be positive, because innovation reveals new growth opportunity conditioning on the existing organizational structure.

To test these hypotheses, we construct a comprehensive dataset containing public U.S. firms' family ownership, patent information, and financial and accounting information for the period from 1998 to 2010. We retrieve the information about family ownership of U.S. public firms from the Osiris and Amadeus (from 2000 to 2007) and Orbis (from 2007 onward) databases from Bureau Van Dijk. We measure a firm's family ownership either by a dummy variable indicating the existence of a controlling family with at least 20% voting rights or by the actual percentage voting rights of the controlling family, if any. We then proxy for the two distinct innovation strategies, exploration and exploitation, as the logarithm of the number of *exploratory patents* and *exploitative patents*, respectively, based on the detailed information of all patents granted by the U.S. Patent and Trademark Office (USPTO) from 1976 to 2010.

[1] Roughly speaking, exploitative innovation leads to productivity and efficiency for short-term performance, while exploration generates new opportunities and adaptive abilities to survive in the long run (Hannan and Freeman, 1984; Lant and Mezias, 1992; Levinthal and March, 1993; McGrath, 2001). Firms may select the best-fit strategy, as the adoption of these strategies has different implications in terms of cost (Lavie, Stettner, and Tushman, 2010), risk (e.g., Levinthal and March, 1993), and financial performance (Jansen, Van den Bosch, and Volberda, 2006; Uotila, Maula, Keil, and Zahra, 2009).

We articulate our analysis in four steps. In the first step, we link family ownership to exploratory and exploitative innovation, and find that the former is positively related to (the number of) exploratory patents and is negatively related to exploitative patents. These relations are not only statistically significant, but also economically sizable: a one-standard-deviation increase in family ownership is associated with a 13.6% increase in the filing of exploratory patents, and associated with an 8.5% decrease in the filing of exploitative patents.[2] These results suggest that family firms are more exploratory and less exploitative with respect to innovation than nonfamily firms, which lends initial support to the *risk-diversification hypothesis*.

To explore whether the above results imply a causal relationship, we integrate four endogeneity tests into our second step of the analysis. The first endogeneity test utilizes state-level divorce laws and divorce rates as instrumental variables because these variables can introduce exogenous variations in family ownership across states but are unlikely to directly affect the preference of firms favoring one innovative approach over another.[3] Consistent with the literature (e.g., Roussanov and Savor, 2014; Voena, 2015), divorce laws that mandate an equal division of assets (i.e., the community property standard) and a higher *ex ante* divorce rate are negatively related to family ownership. The observation that instrumented family ownership also has significantly positive (negative) explanatory power for exploratory innovation (exploitative innovation) lends support to a causal interpretation of the relationship between family ownership and their specific approaches to innovation.

To further alleviate the potential concern that divorce laws could themselves be associated with some unobservable state characteristics, we conduct a second endogeneity test that explores neighboring states with different divorce laws. To see our intuition, consider two firms located in the same state adopting community property standards, which dis-incentivize family ownership.

[2] Family firms in general produce more patents than comparable non-family firms due to the increase in exploratory innovation. Other ownership types, such as institutional ownership, may also have such a positive influence. What is unique here is that family ownership influences exploratory and exploitative innovation in exactly the opposite direction. This pattern is not observed for institutional ownership, which suggests a unique role for family ownership in explaining innovation strategies.

[3] Nine U.S. states, such as Arizona and California, adopt the community property standard that mandates an equal division of assets, while other states adopt the equitable distribution standard in which the division of wealth is determined by a judge and is based on a range of factors, including the relative contributions of spouses to household wealth. State divorce laws regarding the division of wealth acquired during marriage affect the inter-temporal behavior of married couples (Voena, 2015) and, thus, marital status (Roussanov and Savor, 2014). Moreover, divorce rates also negatively influence the sustainability of families (e.g., Stafford et al., 1999; Danes and Amarapurkar, 2001; Olson et al., 2003; Rutherford et al., 2006).

These two firms are identical, except that one of them (say, the second firm) is located near the border of the state, whereas the neighboring state adopts the other (more flexible) divorce law (i.e., equitable distribution standard). Since the implementation of divorce law is based on residential address, the entrepreneur of the second firm can live in the neighboring state but work at the firm's physical location in order to mitigate the impact of divorce law with respect to the firm's location.

In other words, among all firms located in states adopting community property law, we can use geographic proximity to more flexible divorce laws (i.e., whether a firm is located within driving distance to a neighboring state with more flexible divorce laws) as an instrument to identify the influence of divorce law on family ownership, while directly controlling for the fixed effects of the states where firms locate. Our empirical tests yield consistent results: geographic proximity leads to more family ownership among all firms located in states adopting community property laws, and instrumented family ownership leads to more (less) exploratory (exploitative) innovation.

Our third approach to endogeneity uses the Economic Growth and Tax Relief Reconciliation Act (EGTRRA) as an exogenous event. Given that inheritance taxes negatively affect the growth and sustainability of family firms (e.g., Brunetti, 2006; Ellul, Pagano, and Panunzi, 2010), we expect the 2001 EGTRRA (the "Bush Tax Cut") that introduced radical reductions to the federal estate tax[4] to serve as an exogenous event for the relationship between family ownership and exploratory innovation, because the marginal benefit of the tax cut incentivizes controlling families to both maintain their concentrated ownership and use exploratory innovation to diversify associated business risk. Differences-in-differences tests based on EGTRRA confirm

[4] The maximum estate tax rate of 55% in 2001 was reduced to 50% in 2002, and was further cut by an additional reduction of 1% each year to reach 45% in 2007. Moreover, the tax exemption amount was increased from $675,000 in 2001 to $1,000,000 in 2002, to $1,500,000 in 2004, and to $2,000,000 in 2006. Note that there is little cross-state variation in estate taxes because the federal estate tax rate is higher and provides full credit toward state estate taxes (Francis, 2012). The state estate tax credit, which effectively shared part of the estate tax payable to the federal government, was phased out between 2002 and 2005 by EGTRRA. The 2001 tax act introduced by EGTRRA itself would have repealed the estate tax for one year (2010) and then readjusted it in 2011 to the 2002 exemption level with a 2001 maximum rate. In other words, had no further legislation been passed, the estate of a person who died in 2010 would have been entirely tax-exempt, while that of a person who died in 2011 or later would have been taxed as heavily as it would have been in 2001. However, on December 17, 2010, Congress passed the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010. Section 301 of the 2010 Act reinstated the federal estate tax, and the new law set the exemption for U.S. citizens and residents at $5 million per person and the maximum tax rate at 35 percent for 2011 and 2012. On January 1, 2013, the American Taxpayer Relief Act of 2012 permanently established an exemption of $5 million (with 2011 as the basis for inflation adjustment) per person for U.S. citizens and residents and a maximum tax rate of 40% after 2013.

that a decline in federal estate tax significantly increases (reduces) family firms' exploratory (exploitative) patents, which again supports a causal interpretation of family firms' exploratory innovation.

Our final approach is based on a matched sample (i.e., to match family firms with a sample of non-family firms with similar observable characteristics) in order to mitigate the concern that some characteristics of family firms may be spuriously related to more exploratory opportunities. We find consistent and robust results in this test. A one-standard-deviation increase in family ownership is associated with 11% more exploratory patents and 9.8% less exploitative patents. Overall, our identification tests collectively support a causal influence of family ownership on innovation strategies in the U.S.

After the causality is established, in the third step of the analysis, we investigate the impact of the degree of existing business concentration on family incentives to innovate. That is, we test whether more concentrated family firms are indeed more incentivized to pursue exploratory innovation. We find that family firms with a single product segment are significantly more exploratory and less exploitative, while those with multiple segments are indifferent from non-family firms with respect to innovation strategies. Moreover, the effect of family ownership on innovation strategy is more pronounced among families that control only one firm as opposed to families that control multiple firms. Both observations confirm that the incentives to innovate in family firms are indeed linked to risk diversification.

Then, in the last step of our analysis, we move on to examine the market reaction to innovation. More specifically, we use the cumulative abnormal stock returns (CAR) in a three-day window around the date on which patents of exploratory innovation are announced as a proxy for the short-term market response. Since the controlling family typically does not trade in the market around major events, the market response reflects minority shareholders' view on the value of patents. We find that while the CAR is generally positive for exploratory patents (0.2%),[5] it becomes negative with similar magnitude when the exploratory innovation comes from a family firm. Moreover, this effect does not reverse after the initial response. Jointly, these results suggest that not all innovation is perceived to be beneficial to minority shareholders. In

[5] The economic magnitude on the value of an exploratory patent is consistent with Kogan, Papanikolaou, Seru, and Stoffman (2015) and quite sizable considering that the median market capitalization of firms is $17.49 Billion in the U.S. Roughly speaking, the market expect an exploratory patent to create a value of as high as $3.50 million.

fact, business diversification-induced exploratory innovation appears suboptimal to minority shareholders.

To further verify that the negative market response is related to the diversification incentives of the firm, we interact the announcement of a family firm's exploratory patent with indicators describing whether the family firm is already diversified in terms of the total number of firms the family controls. We find that the negative market response to family firms' exploratory innovation concentrates in undiversified firms/families. In other words, the market discounts stock price when an originally concentrated family firm innovates in unrelated business fields likely for business diversification.

Overall, these results suggest potential conflicts of interest between different types of shareholders. On one hand, more concentrated family firms are incentivized to pursue more exploratory innovation. On the other hand, the market dislikes family firms' exploratory innovation. The gap between the innovation decision of family firms and the preference of investors in the market illustrates a novel normative implication that innovation may help exaggerate the existing conflicts between majority and minority shareholders for family firms (e.g., Burkart, Panunzi, and Shleifer, 2003).

Our study contributes to several strands of the literature. First, we contribute to the literature on family firms, which starts with the social value of family ties (Banfield, 1958; Coleman, 1988; Putnam, Leonardi, and Nanetti, 1993; Fukuyama, 1995; Hall and Jones, 1999) and then explores how family ownership affects firm value and performance (e.g., Anderson and Reeb, 2003a; Villalonga and Amit, 2006; Feldman, Amit, and Villalonga, 2016) as well as the organizational structure (e.g., Almeida and Wolfenzon, 2006; Villalonga and Amit, 2006; Masulis, Pham, and Zein, 2011).[6] We show that, based on the incentives for diversifying concentrated business risk (Shleifer and Vishny, 1992; Faccio and Lang, 2002), innovation can be as essential to the real operation of family firms as pyramids and business groups.

Our study also extends the literature on innovation. While previous studies have established a positive relation between patent activities and firm value (Lerner, 1994; Hall, Jaffe, and Trajtenberg, 2005a; Matolcsy and Wyatt, 2008; Hirshleifer, Hsu, and Li, 2013; Cohen, Diether, and Malloy, 2013), our unique contribution is to open up the black box of innovation for one

[6] Gomez-Mejia, Cruz, Berrone, and De Castro (2011) provide a recent survey in the management literature.

very important type of firms—i.e. to explore how and why family firms favor some innovation strategies and oppose others and to demonstrate that firms' incentives in pursuing innovation could largely affect minority investors' view on innovation. In other words, our results suggest that innovation is not immune to the general conflict between controlling and minority shareholders as modeled in Burkart, Panunzi, and Shleifer (2003) and that the relationship between innovation and investors could be more complex than documented in the literature (e.g., Aghion, Van Reenen, and Zingales, 2013; Francis and Smith, 1995).

Finally, our empirical evidence also extends the literature on the determinants of innovation strategies. Prior studies in the management literature have linked innovation strategies to myopic behavior (Levinthal and March, 1993; Smith and Tushman, 2005), economies of scale (Crossan, Lane, and White, 1999), imitation (Cohen and Levinthal, 1994) and business environment (McGrath, 2001). None of these studies, however, explore the fundamental incentives for firm owners to innovate. Our empirical findings suggest that considerations of firm owners related to corporate finance, such as business diversification, could fundamentally shape a firm's adoption of innovation strategies.

2. Data and Summary Statistics

2.1. Exploration and exploitation

We collect patent data from the Harvard Business School (HBS) Patent Inventor Database of Li et al. (2014). This includes the detailed information of all patents granted by the U.S. Patent and Trademark Office (USPTO) from 1976 to 2010. The information includes the identity of each owner/assignee (i.e., the firm that filed and owned the designated patent),[7] the primary and secondary technology classes to which the patent belongs, the filing date (i.e., the date on which the firm filed the patent), a list of prior patents that are cited by the patent, and a list of subsequent patents that cite the patent by the end of 2010. These citations allow researchers to understand a particular flow of knowledge: when Patent A is cited by Patent B, the latter can be

[7] To determine whether patent assignees in the HBS inventor database are public U.S. firms, we first use the NBER patent database originally developed by Hall, Jaffe, and Trajtenberg (2005b) to directly link patent assignees and the Compustat-matched firm identifiers (GVKEY) for patents granted from 1976 to 2006. For patents granted from 2007 to 2010, we determine the GVKEYs of their assignees by manually matching assignee names and locations in the HBS inventor database to corresponding information in the NBER patent database.

regarded as drawing the knowledge from the former (Trajtenberg, Henderson, and Jaffe, 1997; Jaffe, Trajtenberg, and Fogarty, 2000). Thus, Patent A is (a part of) the foundation of Patent B.

Following Benner and Tushman (2002) and Katila and Ahuja (2002), we define a firm's existing knowledge base as the patents it has filed over the past five years and the citations made by these patents. These patents and citations describe what has been created (in terms of new patents) and learned (from existing patents that are cited by these new patents) by a firm over a certain period. Similar to Benner and Tushman (2002), we then categorize a patent as "exploratory" if 60% or more of its citations are based on new knowledge outside of a firm's existing knowledge base (i.e., not citing the firm's existing patents or the citations made by those patents over the past five years); conversely, we categorize a patent as "exploitative" if 60% or more of its citations are based on a firm's existing knowledge base – i.e., the firm's existing patents and the citations made by those patents over the past five years.

At the firm level, we can then define the variable $Explore_{i,t}$ in year t as the logarithmic value of one plus the number of exploratory patents filed by firm i in year t. The variable $Exploit_{i,t}$ in year t is similarly defined, based on the number of exploitative patents filed by firm i in year t.

The construction of the two innovation variables merits further discussion. To better link these two innovation measures to the time when innovation activities were undertaken in a firm, we record exploratory and exploitative patents by their filing (application) years, rather than approval (grant) years (see Hall, Jaffe, and Trajtenberg, 2005b). To be consistent with most previous research, we use a *one-year* horizon to construct $Explore_{i,t}$ and $Exploit_{i,t}$ because patent flow is more informative of market value than patent stock (e.g., Hall, 1993b; Hall, Jaffe, and Trajtenberg, 2005a) and is less subject to long-term trends within firms.

As a robustness check, we also construct cumulative exploratory and exploitative patents with two- and three-year horizons (i.e., year t to year $t+1$ and year t to year $t+3$, respectively) and obtain consistent results. Also, following Lerner (1994) and Aghion, Van Reenen, and Zingales (2013), we use a logarithmic transformation to mitigate the skewness of the distribution of patent counts.

Also, given that the sum of $Explore_{i,t}$ and $Exploit_{i,t}$ does not necessarily equal the number of all patents filed by firm i in year t because some patents are neither exploratory nor exploitative

in nature, for the firms without any patent records or that do not have exploratory (exploitative) patents in a specific year, we set their exploratory (exploitative) patents to zero in that year.

As a further robustness check, we also construct two other variables: $\%Explore_{i,t}$ and $\%Exploit_{i,t}$. These two variables are defined as $Explore_{i,t}$ and $Exploit_{i,t}$ scaled by a total number of patent counts, respectively.

2.2. Family ownership

We define family ownership following Masulis, Pham, and Zein (2011) checking whether the ultimate owner is a family (e.g., biologically linked families, individual entrepreneurs, known alliances of families/entrepreneurs) or a non-family entity (e.g., governments, widely held firms, collective investment funds, and widely held financial institutions).[8] In contrast to most prior studies that focus on the sample of large firms (e.g., Fortune 100 and 500), we identify the family ownership for all listed companies as follows. First, we merge two databases of Bureau Van Dijk: the Osiris and Amadeus (from 2000 to 2007) and Orbis (from 2007 onward) databases. These databases trace ownership hierarchies for each public firm and provide the initial family ownership information for the period from 2000 to 2011.[9] To improve the coverage and accuracy of our ownership data, we also manually verify and augment family ownership information by checking various information sources, including company annual reports, LexisNexis, and Factiva.

Using this database, we construct two proxies for family ownership. The first proxy for family ownership in our empirical analysis is a dummy variable, *Family Dummy*, which equals one if a firm's largest shareholder is a family and if the family effectively controls (directly or through the holdings of affiliates) at least 20% of the firm's voting rights, and zero otherwise. Such a threshold has been used in Charumilind, Kali, and Wiwattanakantang (2006) and Masulis,

[8] We first examine whether an ownership classification of "Employees/Managers," "Employees/Managers/Directors," "Individual(s) or family(ies)," or "One or more named individuals or families" involves families. Next, we determine whether other ownership categories (e.g., "State, Public authority," "Public authority, State, Government," "Bank," "Financial company," "Industrial company," "Insurance company," "Mutual & Pension Fund/Trust/Nominee," "Mutual & Pension Fund/Nominee/Trust/Trustee," "Private Equity firm," "Foundation," "Foundation/Research Institute," "Venture capital firm," "Hedge funds," and "Other unnamed shareholders, aggregated") include hidden family ownership. In an unreported analysis, we exclude individual entrepreneurs from our family definition and obtain consistent results.

[9] For indirect ownership of a firm, we accumulate the voting rights of the firm across a possible pyramid structure until we are able to determine its ultimate owner.

Pham, and Zein (2011) regarding family ownership, and has been used in La Porta, Lopez-de-Silanes, and Shleifer (1999) regarding controlling rights in general. Our results remain robust to alternative values of thresholds. To alleviate any remaining concerns on the use of *Family Dummy*, we construct a second proxy for family ownership as the fraction of the total voting rights ultimately owned by the controlling family of a firm (henceforth, *Family Ownership*), which ranges between 0 (if the firm does not have a controlling family) and 1 (if the controlling family retains all the voting rights).

Since family ownership is fairly sticky and the ownership data construction is substantial, we construct *Family Dummy* and *Family Ownership* for four particular years in the sample period: 2002, 2005, 2008, and 2011. We then expand these two measures in the four selected years to the rest of our sample period (1998-2010) by filling in the values of other years with that in the closest year. For example, we use the family identities (*Family Dummy* and *Family Ownership*) obtained in 2008 to determine the level of firm ownership in 2009. Our sample includes 788 unique firms that have been family owned. Of these firms, 16 experienced a transition in family ownership (i.e., they were non-family-owned at the beginning of our sample period or became non-family-owned by the end of the sample period).

Our main sample period is from 1998 to 2010. Including early years before 2000 allows for differences-in-differences tests that use three years both before and after the Bush administration-enacted EGTRRA (2001), though our results are robust when we exclude these early years or when we perform subsample tests for either the first or the second half of our sample period.

2.3. Control variables

We use NCUSIP and Ticker to match the identities of firms between the Bureau Van Dijk and CRSP/Compustat databases. This matching allows us to construct the following list of firm-level control variables from the CRSP/Compustat database: *Firm Age* is the number of years since the firm's first appearance in the Compustat database and reflects the life-cycle stage that determines innovation strategies; *M/B* is the ratio of market equity to book equity, which is commonly considered as a proxy of growth options that reflects the value of a firm's intangible assets and future potential; *Asset* is the logarithm of total book assets, which reflects a firm's size that

affects the scale of its innovation output; *R&D* is the logarithm of annual R&D expenditures plus one, which measures a firm's innovative investment; *CAPEX* is the logarithm of annual capital expenditures plus one, which measures a firm's investment in tangible assets; *Capital Intensity* is the logarithm of total assets divided by the number of employees, which may affect innovation choices (e.g., Hall and Ziedonis, 2001; Aghion, Van Reenen, and Zingales, 2013); *Leverage* is long-term debt and current debt scaled by total assets, as high leverage tends to constrain a firm's innovation investment (e.g., Aghion et al., 2004; Hsu, Tian, and Xu, 2014); and *Profit Margin* is annual operating income scaled by annual total sales, which reflects a firm's market positioning and competitive strategies. The detailed definitions of all these variables are provided in the Appendix.

In order to differentiate the effect of family ownership from that of institutional ownership or block ownership, we also control for maximum block ownership (*Max Blockown*), institutional ownership (*% Inst Own*), and institutional ownership concentration (*Own Concentration*).[10] *Max Blockown* is the maximum percentage of outstanding shares owned by one blockholder. *% Inst Own* is the percentage of shares owned by all institutional investors, as reported in the Thomson Reuters Institutional (13f) Holdings dataset. *Own Concentration* is measured by the Herfindahl index, and denotes the sum of all squared ownership percentages across individual institutional shareholders. By controlling for these two variables, we identify the influence of family ownership on innovation strategies beyond that of institutional ownership.

Last, we drop firms with annual sales lower than 100 million dollars or firm age younger than or equal to 5 years (since being included in the Compustat database) to avoid potential biases introduced by young firms with short histories or small firms with majority shares controlled by entrepreneurs. Our final sample consists of 17,253 firm-year observations (2,909 unique firms) in the sample period from 1998 to 2010.

2.4. Summary statistics

[10] Aghion, Van Reenen, and Zingales (2013) show that institutional ownership is positively associated with innovation. In addition, the concentration of institutional ownership may affect innovation investment and performance due to reduced monitoring power, higher agency costs, and more significant free-rider problems associated with diffused ownership (Baysinger, Kosnik, and Turk, 1991; Francis and Smith, 1995; Lee and O'Neill, 2003).

We now present the summary statistics of our main variables in Table 1. Panel A reports the mean, standard deviation, 25th percentile, median, and 75th percentile of our innovation strategy variables, family ownership dummies and percentages, and other control variables used in our regression analyses. *Explore* has a mean value of 0.09 (corresponding to an average of 0.1 exploratory patents per year) and a standard deviation of 0.32, and *Exploit* has a mean value of 0.17 (corresponding to an average of 0.19 exploratory patents per year) and a standard deviation of 0.67. The medians of these variables are zero, which is consistent with prior studies that consider patent data of *all* U.S. public firms. Overall, we see that both exploratory and exploitative innovation are widely adopted in the economy. There are, however, significant cross-firm variations in each type of innovation, which motivate us to further explore the incentives for any particular firm to adopt its innovation strategy.

In our sample, the sample mean and standard deviation of *Family Dummy* are 12% and 32%, respectively, suggesting that 12% of sample firms are family-owned (i.e., with 20% or more voting rights owned by a controlling family). This ratio is similar to that reported in La Porta, Lopez-de-Silanes, and Shleifer (1999), which covers mainly mid-size firms. In addition, the sample mean and standard deviation of *Family Ownership* are 5% and 15%, respectively, suggesting that 5% of the outstanding shares of all public firms are owned by families. Moreover, an average firm in our sample is 23 years old, owns 6.77 in log total assets, and has a market-to-book ratio of 2.42. Furthermore, the average firm has a capital intensity ratio of 5.49, a leverage ratio of 0.23, and a profit margin ratio of 0.09.

We recognize that the sample distribution of family firms may differ from that of non-family firms. For example, family firms may be smaller than non-family firms, due to controlling families' incentive to maintain their majority voting rights. Thus, in our regression analyses, we include a set of control variables that control for these characteristics. Moreover, in a later analysis, we also employ a propensity score matching (PSM) method to construct a matched sample so that family firms are statistically indistinguishable from non-family firms with respect to most characteristics.

3. Baseline Results

To empirically examine whether family ownership affects exploratory innovation and exploitative innovation, we estimate the following pooled ordinary least squares (OLS) regression:[11]

$$InnoStrategy_{i,t+1} = \alpha_0 + \beta_1 Family_{i,t} + \gamma Controls_{i,t} + \varepsilon_{i,t}, \quad (1)$$

where $InnoStrategy_{i,t+1}$ denotes our innovation strategy measures of firm *i* in industry *j* in year *t+1* (i.e., $Explore_{i,t+1}$, $Exploit_{i,t+1}$, $\%Explore_{i,t+1}$, and $\%Exploit_{i,t+1}$), $Family_{i,t}$ denotes the *Family Dummy* and *Family Ownership* of firm *i* in year *t*, and $Controls_{i,t}$ denotes a list of control variables discussed in Section 2.3. We adopt a one-year lead-lag regression, which is commonly used in the corporate finance literature, to examine if current family ownership affects innovation strategies in the following year.[12] In our main specifications, we control for industry fixed effects (defined by the two-digit SIC codes) and year fixed effects, and we also cluster the standard errors of the regression in two dimensions by firm and year. In a later robustness check, we obtain consistent results from many alternative specifications that examine alternative definitions of family ownership, distributional assumptions of our dependent variable, and econometric specifications of the models.

We tabulate the results of the baseline regression in Table 2. In Panel A, Models (1) to (4) are based on family ownership dummy, whereas Models (5) to (8) are based on fractional family ownership. We first observe that the family dummy is positively related to the development of exploratory patents and negatively related to that of exploitative ones. The coefficient estimates of *Family Dummy* are 5.8%, and -6.3% for $Explore_{i,t+1}$, and $Exploit_{i,t+1}$, respectively, in Models (1) and (2). These results suggest that, when compared with non-family firms, family firms produce 5.8% higher exploratory patents and 6.3% lower exploitative patents. Both effects are

[11] Note that we follow the literature on the real effects of family ownership (e.g., Anderson, Duru, and Reeb, 2009, 2012) and do not include firm fixed effects in Equation (1). Zhou (2001) suggests that firm fixed effects should not be included in investigating any real effect of ownership structure because ownership structure reveals substantial cross-firm variation but very little time-series variation within a firm. Given that innovation strategy is also highly firm-specific, the effect of family ownership on exploration and exploitation, if any, will be absorbed by firm fixed effects (e.g., Hall, Jaffe, and Trajtenberg, 2005a; Hall, Thoma, and Torrisi, 2007; Noel and Schankerman, 2013). Nevertheless, to address the issue of persistent dependent variables, we include lagged dependent variables as control variables in the regression, and in so doing, we obtain consistent results in the robustness check.

[12] Our premise is that, if family ownership has an impact on innovation strategy, such an impact mainly reveals itself in the next year. Such a premise is reasonable, given that prior empirical studies have shown that it takes less than one year for increased R&D investment to produce more patent applications (Hausman, Hall, and Griliches, 1984; Hall, Griliches, and Hausman, 1986; Lerner and Wulf, 2007).

statistically significant at the 1% level. Similar results are found in Models (3) and (4) for the ratios of exploratory innovation and exploitative innovation, respectively.

Similarly, a positive (negative) relationship can be found between *Family Ownership* and exploratory innovation (exploitative innovation). The coefficients of *Family Ownership* for exploratory innovation and exploitative innovation are 7.5% and -9.5% in Models (5) and (6), respectively, which are again highly statistically significant. In this case, a one-standard-deviation increase in family ownership is associated with 13.6% more exploratory patents and 8.5% fewer exploitative patents.[13] Similar results are found in Models (7) and (8) for the ratios of exploratory innovation and exploitative innovation, respectively. These observations not only further confirm the positive relation between family ownership and exploratory innovation, but also suggest that the results for *Family Dummy* are not driven by the selected threshold for family-owned firms (we will further consider alternative definitions of family ownership in later sections). Jointly, these results lend initial support to the *risk-diversification hypothesis*.

From these regressions, we can also see that block ownership (*Max BlockOwn*) and institutional ownership (*% Inst Own*) are largely unrelated to innovation strategies. More interestingly, the concentration of institutional ownership (*Own Concentration*) is negatively associated with exploratory innovation and positively associated with exploitative innovation, suggesting that ownership concentration of institutional investors yields the opposite influence on the choice of innovation direction than family owners. This difference is perhaps not surprising: institutional investors can easily achieve portfolio diversification. Hence, when they invest in a firm, they are more interested in the firm's key investment opportunity, which is more related to exploitative innovation. This finding also highlights the unique role of family ownership: concentrated family ownership is often associated with under-diversification of wealth and thus leads to different choices in innovative activities.

Similarly interesting is the observation that R&D intensity is significantly associated with less exploratory innovation but more exploitative innovation. One possible explanation is the increasing marginal costs in exploitation: it could be more challenging and more costly to create

[13] The economic significance for $y_{it} = \alpha + \beta \times x_{it} + \epsilon_{it}$ is calculated as $\beta \times \sigma_x / \bar{y}$, where y_{it} and x_{it} are innovation strategy measures and family ownership percentage, respectively, σ_x is the standard deviation of family ownership percentage, and $\bar{y}$ is the average value of innovation strategy measures in the sample. This calculation estimates the degree to which exploration or exploitation differs between a family firm and a non-family firm according to family ownership with respect to its average.

new technologies in fields that are already well-developed. A detailed examination of this issue goes beyond the scope of this paper. Nevertheless, such opposite relations indicate that our findings are not driven by the scale of R&D investment. Jointly, the observations on institutional ownership and R&D are not only novel on themselves to the literature but also heuristic in highlighting a unique role played by family ownership in innovation.

Panels B to D of Table 2 provides various robustness checks when we further control different types of fixed effects. For the interest of brevity, we no longer tabulate the regression coefficients of the control variables. Panel B incorporates industry-year joint fixed effects to capture the industry-specific time trends for exploratory innovation and exploitative innovation. Panel C further controls for the state of location-and-year joint fixed effects, which controls for any potential time-series variations in state-level policies that affect innovation strategies. Panel D controls for the state of incorporation-and-year joint fixed effects. For all these tests, our baseline results remain largely the same. Hence, our results are driven neither by omitted variables at the state or industry level nor by time trends of innovation that can occur at the state or industry level.

4. Endogeneity Tests

Although our previous tests lend initial support to the *risk-diversification hypothesis*, it is important to know whether the documented positive (negative) relationship between family ownership and exploratory (exploitative) innovation is causal. This section addresses the issue of endogeneity based on four different approaches: an instrumental variable specification, a neighboring state analysis, a differences-in-differences analysis based on an exogenous policy change, and a matched sample approach.

4.1. Instrumental regressions

We consider two instruments, state-level divorce laws and state-level divorce rates, and employ two-stage least square regressions to minimize the effect of omitted variables. State-level divorce laws differ in mandating the distribution of wealth acquired during the marriage. Some states, such as Connecticut and New Jersey, follow the equitable distribution standard that allows the division to be determined by a judge based on a range of factors, including the relative

contributions of the spouses to household assets. In other states, such as Arizona and California, the community property standard, which mandates an equal division of household assets, is adopted. The community property standard could negatively affect the incentives for entrepreneurs to use family ownership as a mechanism to create and maintain wealth, because an equal division is more favorable to the poorer spouse and thus influences the duration of marriage (Roussanov and Savor, 2014) and the behavior of married couples (Voena, 2015). Following these two studies, we design the variable *Laws* to take the value of one if a state adopts the community property standard and zero otherwise.[14]

Our second instrumental variable is state-level divorce rates, which reflect the prevalence of divorce in a region. From an entrepreneur's perspective, a higher state-level divorce rate implies a higher *ex ante* likelihood of disruptions in a family or family business (Stafford et al., 1999; Danes and Amarapurkar, 2001; Olson et al., 2003; Rutherford et al., 2006), which lowers the incentive for an entrepreneur to build up family firms. We thus argue that state-level divorce rates negatively influence family ownership. We collect annual state-level divorce rates (*Rates*) from the Center for Disease Control and Prevention (CDC). State-level divorce rates range from as low as 2.55% and 2.65% in Montana and Connecticut, respectively, to as high as 8.75% and 6.60% in Nevada and Wyoming, respectively.

The exclusion restriction of these two instrumental variables merits further discussion. First, these two variables are unlikely affected by individual firms. Second, we do not expect state-level divorces laws or divorce rates to influence firms' innovative activities directly through mechanisms unrelated to family ownership. As a result, we expect these two variables to be reasonable instruments that lead to exogenous variation in family ownership. These considerations allow us to estimate the following regression as the first stage regression:

$$Family_{i,t} = \alpha_0 + \eta \times Laws_{k,t} + \delta \times Rates_{k,t} + \gamma \times Controls_{i,t} + \varepsilon_{i,t}, \quad (2)$$

where $Laws_{k,t}$ and $Rates_{k,t}$ denote the state-level divorce laws and rates as defined earlier for firm i located in state k in year t, and $Family_{i,t}$ denotes the family ownership dummy or percentage ownership. We include the same set of control variables as in our main equation. In

[14] There are nine states that adopted the community property system: Arizona, California, Idaho, Louisiana, Nevada, New Mexico, Texas, Washington, and Wisconsin; the remaining states follow the equitable distribution standard.

the second stage, we then use instrumented family dummy or fractional family ownership to re-examine the family ownership-innovation strategy relation.

We tabulate the results in Table 3, with Models (1) to (5) for *Family Dummy* and (6) to (10) for *Family Ownership*. In Models (1) to (5), the first column reports the first-stage regression of Equation (2), while the remaining columns report the second-stage regression. Likewise, Model (6) and Models (7) to (10) report the results for the first-stage and second-stage regressions, respectively, for *Family Ownership*.

We find that both divorce laws and rates negatively affect family ownership. As shown in Models (1) and (5), the adoption of the community property standard is associated with 4.3% and 2.5% lower rates in the presence and fraction of family ownership, respectively. Similarly, a one-standard-deviation increase in the average state-level divorce rate is associated with 0.5% and 0.21% reductions in the presence and fraction of family ownership, respectively. In both columns, the *F*-test suggests that the two variables are not weak instruments.

When we link instrumented family dummy or fractional family ownership to innovation strategies in Models (2) to (5) and (7) to (10), we find that the coefficient estimates of instrumented family ownership still remain significantly positive (negative) on exploratory innovation (exploitative innovation). Moreover, the p-values of Hansen's J test reported at the bottom of Table 3 are insignificant, failing to reject the null. This dispels any concern of over-identification. Overall, these results imply a *causal* interpretation of our baseline results and lend further support to the *risk-diversification hypothesis*.

We further control for an array of state-level social demographic variables, including education level, population size, political affiliation measured by percentage of state population who voted for Democrat in the most recent presidential election, gender distribution, unemployment rate, and GDP growth rate in our instrumental variable regressions; we report the results in Table A1 of the Internet Appendix. Our instrumental regression results are robust to controlling for these state-level variables.

4.2. Neighboring states analysis

Although our instrumental variable regressions are robust to controls of an array of social demographic variables at the state level, a remaining concern is that divorce laws themselves

might be associated with some unobservable state characteristics that also affect innovation choices. To alleviate this concern, we conduct a second endogeneity test exploring neighboring states adopting different divorce laws.

We focus on firms that are located in the same states that adopt community property divorce laws (which dis-incentivizes family ownership). This allows us to easily control for hidden state characteristics. We then instrument family ownership using geographic proximity to adjacent states that adopt equitable distribution laws (hereafter, *favorable neighboring states*)—i.e., whether a firm's headquarter is located within driving distance to those favorable neighboring states. Our intuition is as follows. In the U.S., state divorce filing is usually dictated by place of residency (except for Alaska, Washington, and South Dakota). In this case, the negative influence of the community property divorce law on family ownership should be significantly reduced for a firm that is located close enough to favorable neighboring states, because entrepreneurs can choose to be residents in these neighboring states while commuting to work. Among all family firms located in the same state adopting community property divorce law, we expect that geographic proximity to more favorable divorce laws is positively associated with family ownership. Since the proximity affects only the influence of community property divorce laws on family ownership (inclusion restriction) but not the operations of the firms (exclusion restriction), it provides a reasonable instrument to identify the exogenous influence of divorce laws on family ownership. We implement the above intuition in the following regression for family ownership:

$$Family_{i,t} = \alpha_0 + \gamma_1 D(Adj\ to\ NonCom\ States)_{k,t} + \gamma Controls_{i,t} + \varepsilon_{i,t}, \qquad (3)$$

where $D(Adj\ to\ NonCom\ States)_{k,t}$ is the proxy of geographic proximity to favorable neighboring states, which takes a value of one if firm *i*'s headquarter is within 30 miles to an adjacent state where equitable distribution law is used, and $Family_{i,t}$ denotes the family ownership dummy (percentage) as before, for all firms that are located in states adopting community property divorce laws. We further control for state-fixed effect in addition to our normal specification (industry and year fixed effects). In the second stage, we then regress innovation strategies on geographic proximity-instrumented family ownership.

The results are reported in Table 4. As in Table 3, Model (1) and Model (6) report the results of the first-stage regression for *Family Dummy* and *Family Ownership*, respectively,

while Models (2) to (5) and Models (7) to (10) report the results of the second-stage regression for these two variables. From Model (1) and Model (6), we can see that geographic proximity to adjacent states with equitable distribution laws positively affects family ownership for all firms that are located in states adopting community property divorce laws. In terms of economic magnitude, being adjacent to states with more favorable divorce laws is associated with a 6.4% higher intensity of family dummy and about a 3.0% increase in family ownership. The influence is both statistically and economically significant.

From Models (2) to (5) and Models (7) to (10), we can see that geographic proximity-instrumented family ownership retains its power in forecasting exploratory (exploitative) innovation. Overall, these results lend further support to a causal interpretation of the relationship between family ownership and subsequent innovation strategies.

4.3. Differences-in-differences regressions

We next implement a differences-in-differences regression based on an exogenous policy change: the Economic Growth and Tax Relief Reconciliation Act (EGTRRA) that induced a substantial drop in the federal estate tax rate in 2002. In 2001, the Bush administration enacted EGTRRA, which reduced the federal estate tax rate from 55% in 2001 to 50% in 2002 with an additional reduction of 1% each year until 2007. As a result, the maximum estate tax rate reached 45% in 2007.[15] Moreover, the tax exemption amount significantly increased from $675,000 in 2001 to $1,000,000 in 2002, $1,500,000 in 2004, and $2,000,000 in 2006.

Since prior studies have suggested that estate taxes negatively influence the formation and growth of family firms,[16] we propose that the enactment of EGTRRA enhances the effect of family ownership on exploratory innovation because lower estate taxes increase families' incentives to diversify business risk. This helps us to address the omitted variable issue. Indeed, if an omitted variable did influence both family ownership and innovation spuriously generating

[15] The federal estate tax was first enacted in 1916. We do not consider the role of state-level estate tax as there is little cross-state variation in estate taxes, since the federal estate tax rate is higher than state estate taxes and also provides full credit toward state estate taxes (Francis, 2012).

[16] Using San Francisco County probate court records from 1979 to 1982, Brunetti (2006) finds that the sales of family businesses are significantly associated with the estate tax owed. In addition, Ellul, Pagano, and Panunzi (2010) use a large panel of firms in 38 countries in the 1990-2006 period to show that family firms' investment is significantly negatively associated with estate taxes.

our results, then we should not observe a significantly more pronounced effect of family ownership after 2001, unless this factor also coincidently strengthens in 2002.

Moreover, if family firms' incentives to explore innovation is to diversify risk (as we propose), such incentives should be strengthened after the enactment of ETGRRA because family firms accumulate more wealth due to lower taxes. However, if the pattern shown in our baseline results is spurious, then we should not be able to observe an even more significant effect of family ownership after the enactment of EGTRRA. We therefore adopt the following differences-in-differences specification:

$$InnoStrategy_{i,t+1} = \alpha_0 + \beta_0 Family_{i,t} \times PostEGTRRA_t + \beta_1 Family_{i,t} + \gamma Controls_{i,t} + Industry_j + Year_t + \varepsilon_{i,t}, \quad (4)$$

where $PostEGTRRA_t$ denotes a dummy that equals one for years greater than or equal to 2002 and zero otherwise, $Family_{i,t}$ denotes family ownership as before. We do not need to include a separate $PostEGTRRA_t$ dummy because its effect overlaps year fixed effects. To avoid the intervention of other macroeconomic factors, we estimate Equation (4) using a six-year event window by restricting our sample to firm-years between 1998 and 2000 (the pre-event period) and those between 2002 and 2004 (the post-event period). We drop the sample in 2001 in order to avoid wrongly defined cut-off timing. All control variables are the same as in Equation (1).

The results are reported in Table 5. We focus on the estimate of β_0 associated with $Family_{i,t} \times PostEGTRRA_t$, which captures the extra effect of family ownership on exploratory innovation after the enactment of EGTRRA. In Models (1) and (2), the coefficient estimates of this interaction term are 6.7 %, and -8.1 % for $Explore_{i,t+1}$, and $Exploit_{i,t+1}$, respectively; these estimates are both statistically significance at the 5% level. Models (5) and (6) show that, for percentage family ownership, the corresponding coefficient estimates are 8.2%, and -13.5% for $Explore_{i,t+1}$, and $Exploit_{i,t+1}$, respectively, and these estimates are also statistically significant at the 5% level. We obtain similar results when we use $\%Explore_{i,t+1}$, and $\%\ Exploit_{i,t+1}$ as dependent variables. These results further support a causal interpretation of the family ownership-innovation relation.

4.4. Matched sample analysis

Another concern is that family-owned firms might be different from non-family firms in terms of characteristics, such as firm size, which may be spuriously correlated with innovation strategies. To address this concern, we conduct a propensity score matching method to construct a balanced sample in which family firms and control non-family firms are not distinguishable in observable characteristics (Villalonga, 2004; Feldman, Amit, and Villalonga, 2016).

To compare a typical family firm to a typical non-family firm, we first conduct a univariate analysis to test the differences between the major characteristics of family firms with those of non-family firms. We find that, as reported in Panel A of Table 6, family firms are generally younger, smaller, and characterized by lower levels of market-to-book ratio and institutional ownership, by less capital expenditure, and by less R&D spending than non-family firms.

In order to control for such potential difference, we create a propensity score matched sample in which family firms and non-family control firms are similar in characteristics as follows. First, for each year, we estimate the propensity for all sample firms to be family-owned using a Probit model: $Prob(Family|X_t) = \alpha_j + \gamma' X_t + \varepsilon_t$, where α_j is the industry fixed effect at the 2-digit SIC level, and X is a vector of all control variables that we consider in the baseline regression. Second, for each family firm in every year, we assign the non-family firm with the closest propensity score to the family firm as the control firm. These control firms are thus treated as firms that should be family owned, but are not due to randomness. Third, as shown in Panel B, we compare the characteristics of family firms and control firms and find that they are indistinguishable for all control variables. However, family firms have a much higher value for *Explore* than non-family firms, while the latter have a higher value for *Exploit*. This finding supports our hypothesis that family firms pursue exploratory innovation to diversify their risk.

Finally, we estimate the regression model (1) by using family firms and control firms, and again we find a positive (negative) relation between family ownership and exploratory innovation (exploitative innovation). From Models (1) and (2) in Panel C of Table 6, the coefficient estimates for the family ownership dummy (*Family Dummy*) are 5.2% and -6.7% for $Explore_{i,t+1}$, and $Exploit_{i,t+1}$, respectively. From Models (5) and (6), the coefficient estimates for the fraction of family-owned voting rights (*Family Ownership*) are 5.1% and -10.8% for $Explore_{i,t+1}$, and $Exploit_{i,t+1}$, respectively. A one-standard-deviation increase in family ownership percentage is associated with 8.9% more exploratory patents filed, and 9.4% fewer exploitative

patents filed, respectively. The statistical and economic magnitude of family ownership based on these matched samples is close to our earlier findings in baseline tests reported in Table 2. We find similar results when we use % $Explore_{i,t+1}$ and % $Exploit_{i,t+1}$.

Overall, the evidence provided in Table 6 suggests that our baseline findings are not driven by sample selection issues that family firms may differ from non-family firms in observable characteristics in our sample.

5. Firm Incentives

We now turn our attention to this question: do undiversified family firms have more incentives to develop exploratory patents? The *risk-diversification hypothesis* implies that family firms should have more incentives to develop exploratory innovation when their portfolio ownership or their existing business is under-diversified. To test this prediction, we revisit our baseline regression and interact family ownership with an indicator that describes the degree of under-diversification. Proceeding from our previous section, we examine two dimensions of diversification—operational diversification and ownership diversification—in this section. With respect to operational diversification, we interact family dummy with a dummy variable, $D(NSeg = 1)_{i,t}$, which takes the value of one if the firm has one existing business line only and zero otherwise. Our *risk-diversification hypothesis* would suggest that the degree of under-diversification is most significantly related to exploratory innovation.

We report our results in Panel A of Table 7. Interestingly, from Models (1) and (2), we can see that under-diversified firms (i.e., when $D(NSeg = 1)_{i,t}$ takes the value of one) are actually associated with less (-2.0%) exploratory and more (5.1%) exploitative innovation. These statistics suggest that, in general, firms with focused business lines tend to deepen their existing expertise rather than explore unrelated new technology. Note that this pattern is exactly the opposite of what family firms should do according to the *risk-diversification hypothesis*. Hence, it is crucial to check how family firms behave in this case.

From the same two columns, we see that family ownership indeed exhibits an opposite pattern. The interaction between family ownership and $D(NSeg = 1)_{i,t}$ is associated with more (6.0%) exploratory and less (-5.5%) exploitative innovation. The fact that the absolute magnitude of this interaction term is greater than that of $D(NSeg = 1)_{i,t}$ alone indicates that undiversified

family firms indeed behave drastically differently from other undiversified firms. This difference not only further confirms the prediction of the *risk-diversification hypothesis*, but also suggests that the innovation incentives for family firms could indeed be related to the unique needs for the controlling family to diversify their business risk. Other results in the same panel are generally consistent with this conclusion.

Interestingly, we also see that the strongest incentive to use exploratory innovation as a channel to diversify business risk occurs when a family firm only has one business sector. In this regard, "a one-vs.-more than one" comparison suffices to capture the most significant incentives for undiversified family firms to innovate.

Next, we address ownership diversification. To do so, we interact family ownership with a dummy variable, $D(Own = 1)_{i,t}$, which takes the value of one if the ultimate owner of firm i owns only one firm and zero otherwise, and we report the results in Panel B of the same table. Again, we see that the relationship between family ownership and exploratory innovation/exploitative innovation concentrates in undiversified family firms.

Overall, our results in this section support that perhaps the most interesting feature of family ownership that affects innovation strategy lies in under-diversification, which shapes the direction of innovative activities and the exploration of new knowledge.

6. The Market Response

In this section, we further explore the market response to innovation. If the *risk-diversification hypothesis* is correct that exploratory innovation is adopted simply to achieve business diversification for the controlling family, minority shareholders may feel unsatisfied because they can achieve business diversification more effectively with portfolio investments. By contrast, if innovation developed as the best fit for a firm's competitive conditions or simply reveals new growth opportunities without affecting the existing organizational structure, then investors should welcome such innovation. Hence, it is critical to further differentiate the risk diversification hypothesis from the aforementioned alternative explanation.

To achieve this goal, we follow Kogan, Papanikolaou, Seru, and Stoffman (2015) to calculate cumulative abnormal returns relative to market index over a three-day window (CAR3),

from patent announcement day (day 0) to two days after.[17] We estimate the pooled event study by putting all patent announcements together to conduct in the following regression:

$$CAR3_{k,\tau} = \alpha_0 + \beta_1 \times D\left(Family_{k,\tau}\right) + \beta_2 \times D\left(Explore_{k,\tau}\right) + \beta_3 \times D\left(Family_{k,\tau}\right) \times D\left(Explore_{k,\tau}\right) + \gamma Controls_{i,t} + \varepsilon_{i,t}, \qquad (5)$$

where $CAR3_{k,\tau}$ is the three-day cumulative abnormal returns for patent k to be announced around date τ, $D\left(Family_{k,\tau}\right)$ is a dummy variable that takes the value of one when the patent is announced by a family firm and zero otherwise, and $D\left(Explore_{k,\tau}\right)$ is a dummy variable that takes the value of one when the patent is exploratory and zero otherwise.

The results are reported in Table 8. Panel A provides a univariate analysis. We can see that investors react more positively to the grant of exploratory patents for non-family firms while the reverse pattern is observed for family firms.

Panel B provides a multivariate analysis. Consistent with our univariate analysis, Models (1) and (2) show that exploratory patents, on average, attract more positive investor reactions. The magnitude of the coefficient is 0.2%, suggesting that the market on average expects an exploratory patent to create a value of $3.5 Million (which is computed as the average market capitalization times the coefficient). But this effect is more pronounced for non-family firms than family firms because the interaction term of $D\left(Family_{k,\tau}\right) \times D\left(Explore_{k,\tau}\right)$ is negative. Indeed, when the exploratory patent is announced by a family firm (i.e., when $D\left(Family_{k,\tau}\right)$ takes the value of one), the negative interaction term dominates the positive announcement effect of exploratory patterns, leading to an overall negative announcement effect of a similar magnitude for family firms' exploratory innovation. This finding confirms the potential conflict between controlling families and minority shareholders.

As a Placebo test, we compare the role of family ownership with that of block institutional ownership by further interacting block institutional ownership with an exploratory dummy in Model (3). We can see that this interaction is insignificant, albeit with a negative coefficient.

[17] The USPTO announces granted patents in the *Official Gazette* that is published every Tuesday; hence, the market knows exactly which firm earns which patent(s) and related necessary details. Following Kogan, Papanikolaou, Seru, and Stoffman (2015), we measure the stock market reaction to patent grant news by accumulating the daily returns on Tuesday, Wednesday, and Thursday, and then adjust for aggregate market movement, idiosyncratic stock return volatility, firm-year fixed effect, and the day-of-week fixed effect.

More importantly, the patterns of the announcement effect of family firms' exploratory innovation remain largely the same.

To assess whether the short-term market response is simply an over-reaction, we examine the post-announcement drift based on the cumulative abnormal returns from day 4 to day 30 and to day 60 in Models (4) and (5), respectively. In general, after the initial price change, the patent announcement is no longer associated with any significant abnormal return, at least up to 60 trading days.[18] This insignificance confirms that the 3-day announcement return could capture the most important information as well as minority investors' preference over innovation in the market.

We further examine whether the announcement effect is indeed related to minority investors' concern that exploratory innovation signals a suboptimal move (from minority investors' perspective) for family firms to pursue business diversification. To do so, we further split family firms into two types: diversified or undiversified. In other words, we split the previous $D(Family_{k,\tau})$ dummy variables into two variables: $D(UndivFamily_{k,\tau})$, which takes the value of one when a patent is granted to an undiversified family firm and zero otherwise, and $D(DivFamily_{k,\tau})$, which takes the value of one when a patent is granted to a diversified family firm and zero otherwise. We then replace $D(Family_{k,\tau})$ by the two new dummy variables in Equation (5), and report the new regression results in Table 9. If the negative announcement effect is due to investors' concerns over family firms using exploratory innovation to diversify, then the negative effect should be more pronounced for undiversified family firms, because the marginal impact of innovation-based diversification should be smaller when the firm is already diversified.

In Model (1) and Model (2), we define diversified family firm as a family firm that has more than one business line (i.e., operational diversification) and a family firm whose owner owns more than one firm (i.e., ownership diversification), respectively. We can see that the negative announcement effect for family-exploratory innovation indeed concentrates in the cases for which the family firm is originally undiversified. This observation further confirms that the negative announcement effect is due to investors' concern over potential incentives for

[18] Our finding of the information content of patent announcements being reflected in stock prices within three days is consistent with the proposition of Kogan, Papanikolaou, Seru, and Stoffman (2015).

previously undiversified family firms to use innovation to diversify. In sum, this section lends further support to the *risk-diversification hypothesis* by providing evidence from minority investors' responses.

7. Robustness Checks

Finally, we consider a battery of robustness checks. We provide detailed tables in the Internet Appendix and discuss only the main findings in this section.

To mitigate concerns that our results are driven by entrepreneurial firms, we have already excluded firms that are more likely to be entrepreneurial firms (i.e., those with sales less than 100 million dollars and with firm age less than or equal to 5 years). To further address this issue, we then split our sample by sales growth and firm age. In so doing, we assume that firms that have below median sales growth or that have been listed for fewer than 15 years are more likely to be entrepreneurial firms. Results in Table A2 of the Internet Appendix show that we observe similar patterns in both groups of firms, which suggests that our results are not driven by entrepreneurial firms.

We then conduct robustness checks to demonstrate that our results are not affected by the definition of family ownership. As shown in Table A3 of the Internet Appendix, we redefine the dummies of family ownership by 30% and 40% voting rights thresholds, and we find that using these alternative definitions does not change our conclusions.

Next, we examine if our results are affected by the measures and distributions of exploratory innovation and exploitative innovation. In Table A4, we consider exploratory innovation and exploitative innovation measures in $t+1$ to $t+3$. These two panels collectively suggest that our results are less likely associated with reverse causality because future innovation strategy is unlikely to affect current family ownership, once the current R&D level and innovation strategy (shown in Table A8) has been controlled for. We also restrict our sample to the 1998-2007 period in order to mitigate the truncation bias due to the application-approval lag, as it might take two or three years for a patent application to be approved (and to enter into the patent data set we use). This approach (i.e., dropping the last three years of the sample) is common in the innovation literature. Again, we report consistent results in Table A5 of the Internet Appendix.

As fewer than 50% of public firms have patent records, the majority of firm-level patent-based variables are zeroes. In Table A6 of the Internet Appendix, we focus on firm-year observations with non-zero patents, and our conclusions are not affected. We use a logarithmic transformation of the dependent variables to account for skewness in distribution, and we also considered alternative distributional assumptions by running Poisson regressions that use raw counts of different type of patents. Table A7 shows that our results remain robust.

As discussed earlier, both family ownership and future innovation strategy may be determined by current innovation strategy, even though current R&D intensity has been controlled for. We thus include current strategy measures ($InnoStrategy_{i,t}$) in the main regression and find that family ownership retains its significant predictive ability with respect to future innovation strategy (Table A8).

We also recognize that our dependent variables may be affected by the firm size and that such a relation cannot be fully captured by a linear control of total assets in logarithm in Equation (1). To address such a size concern, we re-run Equation (1) with exploratory and exploitative patents scaled by total assets and obtain consistent results in Table A9 of the Internet Appendix. These results suggest that our main finding is not driven by the size of the sample firms.

To ensure that our baseline results are not affected by different expansion strategies between family and non-family firms, we exclude firm-year observations with asset sales or M&A activities (as acquirers) in a three-year even window (*t-1* to *t+1*). Tables A10 and A11 of the Internet Appendix show that our conclusions remain unaffected.

Lastly, to mitigate the concern that our results are driven by high-tech firms, we also interact family ownership variables with two dummies that identify whether the sample firm belongs to a "high-tech" or "low-tech" industry.[19] Table A12 of the Internet Appendix shows that we find consistent effects with family firms engaging in either a high- or low-tech industry (and the family ownership-innovation strategy relation is stronger among firms in a high-tech industry).

Overall, our various specifications point to a fairly robust positive (negative) effect of family ownership on exploratory innovation (exploitative innovation). Our robustness checks confirm

[19] Two-digit SIC codes of 28, 35, 36, 37, 38, and 73 are defined as "high-tech" industries (Lev and Sougiannis, 1996; Brown, Fazzari, and Petersen, 2009). Other industries are defined as "low-tech".

our baseline results as well as strengthen a causal interpretation of the family-innovation strategy relation along different dimensions.

Concluding Remarks

We examine the incentives for family firms to innovate as well as the associated implications. In general, both exploratory or exploitative innovation strategies allow firms to search for new knowledge, attempt new products, and expand new markets. Based on the inherited risk of concentrated wealth, however, the adoption of innovation strategies for family firms may differ from that of non-family firms.

We find that family ownership is in general associated with more exploratory innovation and less exploitative innovation. Tests based on instrumental variables (related to state-level divorce laws and divorce rates), differences in neighboring state divorce laws, regulatory shocks in inheritance taxes, and a matched-sample analysis lend support to a causal interpretation of such a relation. When we examine the market response to exploratory innovation, however, we find that the response is largely negative especially when the exploratory innovation is developed by initially undiversified family firms. Ironically, regardless of the negative market response, un-diversified family firms are more likely to adopt exploratory innovation. These results also strengthen a causal interpretation of our baseline results, as identifying a potential alternative factor that would generate patterns similar to our findings would be difficult.

Collectively, these empirical tests suggest that controlling families of family firms may have incentives to use exploratory innovation to diversify their concentrated business risk. This innovation approach, however, is likely to hurt minority shareholders. Innovation, in this regard, enhances—rather than mitigate—the conflicts between controlling and minority shareholders. Our findings therefore call for more attention to open up the black box of innovation and to understand its potential influences.

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Appendix Variable Definitions

Variables	Definition
Explore, t+1	Explore t+1 is defined as the logarithm of 1 plus the total number of exploratory patents. Following Benner and Tushman (2002), we categorize a patent as "exploratory" if 60% or more of its citations are based on new knowledge outside of a firm's existing knowledge base (i.e., not citing the firm's existing patents or the citations made by those patents over the past five years). We use the logarithm of the patent count plus 1 to mitigate skewness in the firm-level patent counts.
Exploit, t+1	Exploit t+1 is defined as the logarithm of 1 plus the total number of exploitative patents. Following Benner and Tushman (2002), we categorize a patent as "exploitative" if 60% or more of its citations are based on a firm's existing knowledge base (i.e., the firm's existing patents and the citations made by those patents over the past five years). We use the logarithm of the patent count plus 1 to mitigate skewness in the firm-level patent counts.
Patent, t+1	Patent, t+1 is defined as the logarithm of 1 plus the total number of successful patent applications ("patents" hereinafter) that are filed by firm i in year t+1 and that are approved by the USPTO from year t+1 to 2010. We use the logarithm of the patent count plus 1 to mitigate skewness in the firm-level patent counts. This measure reflects firm innovation performance from a quantitative perspective.
% Exploit, t+1	The number of exploratory patents over the total number of patent counts at t+1.
% Exploit, t+1	The number of exploitative patents over the total number of patent counts at t+1.
Family Dummy	A dummy variable that takes the value of one if a firm's ultimate owner is a family and if the family ownership is at least 20% of the total voting rights (and zero otherwise). This variable is computed for each firm in each given year.
Family Ownership	The fraction of voting rights of a firm that is attributable to its ultimate family ownership. This variable is computed for each firm in each given year.
Firm Age	Firm age is defined as the number of years being listed in three main stock exchanges (NYSE, AMEX, and NASDAQ).
M/B	M/B is defined as stock market capitalization divided by the book equity of firm i in year t. Stock market capitalization is defined as firm i's stock price multiplied by the number of shares outstanding at the year end of year t. Book equity is defined as firm i's common equity (CEQ) plus its deferred tax (TXDB).
Max Blockown	Maximum percentage of outstanding shares owned by one institutional investor. Ownership data are from the Thomson Reuters Institutional (13f) Holdings dataset.
% Own	The percentage of institutional ownership is the total institutional ownership from 13f filings divided by the total number of shares outstanding. Ownership data are from the Thomson Reuters Institutional (13f) Holdings dataset.
Own Concentration	Institutional ownership concentration is calculated based on the Herfindahl Index of the share distribution of individual institutional investors. It is defined as the sum of squared shares across all institutional investors; for institutional investor i, its share is defined as shares owned by institutional owner i divided by total institutional ownership in year t.
Assets	Assets is defined as the logarithm of firm i's total assets (AT) in millions at the year end of year t.

R&D	R&D is defined as the logarithm of firm i's R&D expenditures (XRD) in millions plus one at the year end of year t.
Capital Intensity	Capital intensity is defined as the logarithm of firm i's total assets (AT) in millions divided by its number of employees (EMP) in thousands at the year end of year t.
CAPEX	CAPEX is defined as the logarithm of firm i's capital expenditures (CAPX) in millions plus one at the year end of year t.
Leverage	Leverage is defined as firm i's long-term debt (DLTT) plus current debt (DLC), divided by its total assets (AT) at the year end of year t.
Profit Margin	Profit margin is defined as firm i's operating income (OIADP) divided by its total sales (SALE) at the year end of year t.
D(DivFamily)	A dummy variable that takes the value of one when a patent is issued by a diversified family firm and zero otherwise.
D(UndivFamily)	A dummy variable that takes the value of one when a patent is issued by an undiversified family firm and zero otherwise.
D(NSeg=1)	A dummy variable that takes the value of one if a firm has one business segment.
D(Own=1)	A dummy variable that takes the value of one if a firm's ultimate owner owns one firm.
Divorce Rate	The state-year level divorce rate from the Center for Disease Control and Prevention (CDC).
Divorce Law	A dummy equal to one if a state adopts a community property system, which mandates an equal split of assets acquired during marriage. These states are Arizona, California, Idaho, Louisiana, Nevada, New Mexico, Texas, Washington, and Wisconsin.
Adj to Non-Com Law	A dummy equal to one if firm i's headquarter is within 30 miles of the adjacent state where equitable distribution law is used.
Education	Percentage of state population with at least a bachelor's degree.
Population Size	Log of state population
Vote Democrat	Percentage of state population that voted Democrat in the most recent presidential election
Gender Distribution	Percentage of female population
Unemployment Rate	State unemployment rate
GDP Growth	State GDP growth rate
CAR[0,2]	Cumulative abnormal return of a stock on Tuesday, Wednesday, and Thursday when it has patent grant announcements on Tuesday, following Kogan et al. (2015).
CAR[3,30]	Cumulative abnormal return of a stock from Friday (day 3) to the 30th trading day from a patent grant announcement, following Kogan et al. (2015).
CAR[3,60]	Cumulative abnormal return of a stock from Friday (day 3) to the 60th trading day from a patent grant announcement, following Kogan et al. (2015).

Table 1 Summary Statistics

The sample period ranges from 1998 to 2010. We exclude firms with sales < 100 million and a firm age less than or equal to 5 years. All continuous variables are winsorized at 1%. All other variables are defined in the Appendix.

Summary Statistics						
	N	Mean	Median	Std	P25	P75
Explore,t+1	17253	0.09	0.00	0.32	0.00	0.00
Exploit, t+1	17253	0.17	0.00	0.67	0.00	0.00
% Explore,t+1	17253	0.06	0.00	0.22	0.00	0.00
% Exploit, t+1	17253	0.07	0.00	0.25	0.00	0.00
Family Dummy	17253	0.12	0.00	0.32	0.00	0.00
Family Ownership	17253	0.05	0.00	0.15	0.00	0.00
Firm Age	17253	23.02	17.00	16.70	10.00	32.00
M/B	17253	2.42	1.71	2.48	1.07	2.83
Max Blockown	17253	0.55	0.62	0.31	0.32	0.80
% Inst Own	17253	0.52	0.62	0.40	0.00	0.92
Own Concentration	17253	0.05	0.03	0.08	0.00	0.06
Asset	17253	6.77	6.59	1.55	5.60	7.75
R&D	17253	1.13	0.00	1.81	0.00	2.21
Capital Intensity	17253	5.49	5.42	1.20	4.68	6.23
CAPEX	17253	3.50	3.37	1.85	2.17	4.75
Leverage	17253	0.23	0.22	0.18	0.06	0.35
Profit Margin	17253	0.09	0.08	0.10	0.04	0.14

Table 2 Main Results

The sample period ranges from 1998 to 2010. We estimate the following regression model: $InnoStrategy_{t+1} = \alpha_j + \alpha_t + \beta_1 Family + \gamma' X_t + \varepsilon_t$, where α_j is the industry fixed effect at the 2-digit SIC level; □□ is the year fixed effect; *X* is a vector of control variables measured at *t*; and *InnoStrategy* is *Explore*, *Exploit*, *%Explore*, and *%Exploit* measured at *t+1*. Columns 1-4 report results using the family ownership dummy, and columns 5-8 use the family ownership percentage. Panel A presents the results of our baseline regressions, Panel B incorporates industry-year joint fixed effects, Panel C further controls for the state of location-and-year joint fixed effects, and Panel D controls for the state of incorporation-and-year joint fixed effects. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are clustered at firm and year level.

Panel A Main Results

	Family = Family Dummy				Family = Percentage Family Ownership			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Family	0.058***	-0.063***	0.030***	-0.036***	0.075***	-0.095**	0.046***	-0.059***
	(0.020)	(0.022)	(0.009)	(0.009)	(0.027)	(0.042)	(0.015)	(0.017)
Firm Age	0.000*	-0.001	0.000**	-0.000*	0.000*	-0.001	0.000**	-0.000*
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
M/B	-0.000	0.004	-0.001	0.001	-0.000	0.003	-0.001	0.001
	(0.002)	(0.003)	(0.001)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)
Max Blockown	0.011	-0.066**	0.006	-0.005	0.008	-0.064**	0.005	-0.004
	(0.009)	(0.028)	(0.007)	(0.007)	(0.009)	(0.027)	(0.007)	(0.007)
% Inst Own	-0.010	0.001	-0.008	0.007	-0.012	0.003	-0.009	0.008
	(0.007)	(0.022)	(0.006)	(0.006)	(0.008)	(0.022)	(0.006)	(0.007)
Own Concentration	-0.067***	0.277***	-0.058***	0.069***	-0.048**	0.260***	-0.051***	0.061***
	(0.021)	(0.086)	(0.018)	(0.022)	(0.019)	(0.082)	(0.017)	(0.021)
Asset	0.002	0.032***	-0.002	0.004	0.002	0.032***	-0.002	0.004
	(0.005)	(0.012)	(0.003)	(0.003)	(0.005)	(0.012)	(0.003)	(0.003)
R&D	-0.020***	0.087***	-0.023***	0.024***	-0.021***	0.088***	-0.023***	0.024***
	(0.006)	(0.025)	(0.006)	(0.006)	(0.006)	(0.025)	(0.006)	(0.006)
Capital Intensity	-0.004	0.014	-0.007***	0.007***	-0.004	0.014	-0.007***	0.007***
	(0.003)	(0.009)	(0.002)	(0.002)	(0.003)	(0.009)	(0.002)	(0.002)
CAPEX	-0.005	0.018**	-0.004	0.004	-0.005	0.018**	-0.004	0.004
	(0.003)	(0.009)	(0.003)	(0.003)	(0.003)	(0.009)	(0.003)	(0.003)
Leverage	-0.010	-0.100**	0.011	-0.013	-0.013	-0.097**	0.010	-0.011
	(0.017)	(0.042)	(0.009)	(0.010)	(0.017)	(0.041)	(0.009)	(0.010)
Profit Margin	0.015	0.158*	0.009	0.008	0.018	0.156*	0.010	0.007
	(0.033)	(0.093)	(0.021)	(0.023)	(0.033)	(0.093)	(0.022)	(0.023)
Observations	17,253	17,253	17,253	17,253	17,253	17,253	17,253	17,253
R-squared	0.4477	0.4661	0.4783	0.5641	0.4458	0.4657	0.4776	0.5635
SIC2 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2 Main Results, Continued

Panel B Industry-Year Joint Fixed Effects								
	Family = Family Dummy				Family = Percentage Family Ownership			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Family	0.060**	-0.068***	0.031**	-0.037***	0.075**	-0.106**	0.046*	-0.062***
	(0.025)	(0.023)	(0.013)	(0.009)	(0.038)	(0.045)	(0.024)	(0.018)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,253	17,253	17,253	17,253	17,253	17,253	17,253	17,253
R-squared	0.1396	0.3148	0.1252	0.3073	0.1377	0.3144	0.1244	0.3066
SIC2-Year joint FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel C Location-Year Joint Fixed Effects								
	Family = Family Dummy				Family = Percentage Family Ownership			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Family	0.067***	-0.050**	0.034**	-0.027***	0.084**	-0.072*	0.048**	-0.045***
	(0.026)	(0.023)	(0.013)	(0.009)	(0.038)	(0.041)	(0.024)	(0.016)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,024	17,024	17,024	17,024	17,024	17,024	17,024	17,024
R-squared	0.1055	0.3078	0.0879	0.3024	0.1031	0.3075	0.0868	0.3020
State-Year joint FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel D Incorporation-Year Joint Fixed Effects								
	Family = Family Dummy				Family = Percentage Family Ownership			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Family	0.070***	-0.059**	0.038***	-0.031***	0.088**	-0.091**	0.056**	-0.051***
	(0.025)	(0.024)	(0.013)	(0.009)	(0.037)	(0.044)	(0.024)	(0.016)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,194	17,194	17,194	17,194	17,194	17,194	17,194	17,194
R-squared	0.0930	0.2628	0.0798	0.2562	0.0904	0.2625	0.0785	0.2557
Incorp-Year joint FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 3 Instrumental Variable Regression

The sample period ranges from 1998 to 2010. We estimate the following instrumental variable regression model: $InnoStrategy_{t+1} = \alpha_j + \alpha_t + \beta_1 Family + \gamma' X_t + \varepsilon_t$, where the family firm dummy (family ownership percentage) is instrumented by the state-level divorce rate (*Rates*) and divorce law (*Laws*) in the first stage. Columns 1-5 report results using the family ownership dummy, and columns 6-10 use the family ownership percentage. Columns 1 and 6 report the first-stage regressions, and Columns 2-5 and 7-10 report the second-stage regressions. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are clustered at firm and year level.

	Family = Family Dummy					Family = Percentage Family Ownership				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Family	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Family	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Laws	-0.043***					-0.025***				
	(0.016)					(0.007)				
Rates	-0.016**					-0.007*				
	(0.007)					(0.003)				
Family		0.282*	-0.238**	0.284**	-0.075*		0.510*	-0.475*	0.528**	-0.148*
		(0.161)	(0.108)	(0.141)	(0.040)		(0.308)	(0.280)	(0.262)	(0.078)
Firm Age	-0.001*	0.000	-0.000	0.000	-0.000	-0.001***	0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
M/B	-0.003	-0.000	-0.000	-0.001	0.000	-0.002**	-0.000	-0.001	-0.000	0.000
	(0.002)	(0.002)	(0.001)	(0.001)	(0.000)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Max Blockown	-0.084***	0.036*	-0.009	0.026	0.005	-0.035***	0.030*	-0.006	0.021	0.006
	(0.025)	(0.018)	(0.014)	(0.016)	(0.006)	(0.013)	(0.016)	(0.014)	(0.014)	(0.005)
% Inst Own	-0.040**	0.004	-0.015	0.007	-0.008**	-0.012	-0.002	-0.012	0.002	-0.007*
	(0.018)	(0.012)	(0.010)	(0.010)	(0.004)	(0.009)	(0.011)	(0.015)	(0.009)	(0.004)
Own Concentration	0.706***	-0.204*	0.151*	-0.214**	0.063*	0.276***	-0.146	0.114	-0.159*	0.052*
	(0.109)	(0.124)	(0.085)	(0.106)	(0.033)	(0.046)	(0.101)	(0.084)	(0.084)	(0.028)
Asset	-0.011	-0.009	0.002	-0.008*	-0.001	-0.007	-0.008	0.001	-0.007*	-0.001
	(0.010)	(0.006)	(0.005)	(0.004)	(0.002)	(0.005)	(0.006)	(0.006)	(0.004)	(0.002)
R&D	-0.012**	0.013**	0.013***	0.007*	0.005***	-0.003	0.011**	0.014**	0.005	0.005***
	(0.005)	(0.006)	(0.003)	(0.004)	(0.001)	(0.003)	(0.005)	(0.006)	(0.003)	(0.001)
Capital Intensity	-0.001	0.006	0.009**	0.002	0.003**	-0.000	0.006	0.009*	0.002	0.004***
	(0.010)	(0.005)	(0.004)	(0.004)	(0.001)	(0.005)	(0.004)	(0.005)	(0.004)	(0.001)
CAPEX	0.001	0.015***	0.002	0.011***	0.002	0.002	0.014***	0.003	0.010***	0.002
	(0.007)	(0.004)	(0.004)	(0.003)	(0.001)	(0.004)	(0.004)	(0.004)	(0.003)	(0.001)
Leverage	-0.075*	-0.076***	-0.067***	-0.032*	-0.024***	-0.017	-0.088***	-0.057***	-0.045**	-0.020***
	(0.043)	(0.027)	(0.020)	(0.019)	(0.007)	(0.023)	(0.026)	(0.017)	(0.019)	(0.007)
Profit Margin	0.070	-0.090**	-0.020	-0.059**	-0.011	0.028	-0.084**	-0.024	-0.054**	-0.013
	(0.061)	(0.036)	(0.033)	(0.028)	(0.013)	(0.027)	(0.034)	(0.045)	(0.026)	(0.013)
Observations	13,529	13,529	13,529	13,529	13,529	13,529	13,529	13,529	13,529	13,529
SIC2 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hansen J (p-value)		0.325	0.721	0.446	0.686		0.221	0.973	0.2864	0.8658
Wald F statistic	41.285					45.422				

Table 4 Neighboring States Analysis

The sample period ranges from 1998 to 2010. We keep all firms located in states with community property laws. We estimate the following instrumental variable regression model: $InnoStrategy_{t+1} = \alpha_j + \alpha_t + \beta_1 Family + \gamma' X_t + \varepsilon_t$, where the family firm dummy (family ownership percentage) is instrumented by the geographic proximity to neighboring states with equitable distribution divorce law in the first stage. *Adj to NonCom Law* is an indicator equal to one if firm i's headquarter is within 30 miles of the adjacent state where equitable distribution law is used. Columns 1-5 report results using the family ownership dummy, and columns 6-10 use the family ownership percentage. Columns 1 and 6 report the first-stage regressions, and Columns 2-5 and 7-10 report the second-stage regressions. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are clustered at firm and year level.

	Family = Family Dummy					Family = Percentage Family Ownership				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Family	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Family	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Adj to Non-Com Law	0.064***					0.030***				
	(0.019)					(0.009)				
Family		0.868**	-0.705**	0.799*	-0.359**		1.836**	-1.492**	1.691*	-0.759**
		(0.423)	(0.312)	(0.416)	(0.153)		(0.894)	(0.661)	(0.880)	(0.323)
Firm Age	-0.001***	0.001	-0.001	0.001**	-0.001**	-0.001***	0.001	-0.001	0.001**	-0.001**
	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)
M/B	-0.003	0.003	-0.002	0.001	-0.000	-0.002***	0.004	-0.003	0.003	-0.001
	(0.002)	(0.004)	(0.004)	(0.003)	(0.002)	(0.001)	(0.004)	(0.004)	(0.003)	(0.002)
Max Blockown	-0.084***	0.063*	-0.053	0.061*	-0.024**	-0.032***	0.049*	-0.041	0.048*	-0.018*
	(0.015)	(0.035)	(0.033)	(0.032)	(0.011)	(0.007)	(0.029)	(0.029)	(0.026)	(0.010)
% Inst Own	-0.064***	0.045	-0.024	0.044	-0.008	-0.025***	0.036	-0.016	0.035	-0.004
	(0.012)	(0.032)	(0.021)	(0.031)	(0.012)	(0.005)	(0.029)	(0.019)	(0.026)	(0.011)
Own Concentration	0.748***	-0.625**	0.684***	-0.647**	0.337***	0.290***	-0.509**	0.589***	-0.540**	0.289***
	(0.059)	(0.304)	(0.243)	(0.309)	(0.117)	(0.027)	(0.248)	(0.203)	(0.254)	(0.097)
Asset	0.024***	-0.019	0.019*	-0.025**	0.009**	0.007***	-0.011	0.014	-0.019*	0.006
	(0.006)	(0.014)	(0.011)	(0.012)	(0.004)	(0.003)	(0.012)	(0.009)	(0.010)	(0.004)
R&D	-0.020***	0.042***	0.030**	0.028**	0.011**	-0.009***	0.042***	0.031**	0.027**	0.011**
	(0.003)	(0.014)	(0.012)	(0.011)	(0.005)	(0.001)	(0.014)	(0.012)	(0.011)	(0.005)
Capital Intensity	-0.006	0.026***	-0.004	0.018***	-0.001	-0.001	0.022***	-0.002	0.015***	-0.000
	(0.005)	(0.008)	(0.006)	(0.006)	(0.002)	(0.002)	(0.007)	(0.006)	(0.006)	(0.002)
CAPEX	-0.012**	0.015	0.001	0.013	-0.001	-0.003	0.011	0.005	0.009	0.001
	(0.005)	(0.012)	(0.009)	(0.009)	(0.004)	(0.002)	(0.011)	(0.008)	(0.008)	(0.004)
Leverage	-0.038	-0.076*	-0.009	-0.028	0.012	0.005	-0.119**	0.026	-0.067**	0.030*
	(0.026)	(0.039)	(0.029)	(0.025)	(0.018)	(0.012)	(0.048)	(0.035)	(0.028)	(0.017)
Profit Margin	0.119***	-0.165*	0.203***	-0.159**	0.060*	0.078***	-0.204*	0.235***	-0.195**	0.077**
	(0.036)	(0.094)	(0.073)	(0.066)	(0.031)	(0.016)	(0.108)	(0.083)	(0.082)	(0.036)
Observations	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100
R-squared	0.2009	0.1508	0.4297	0.1378	0.4864	0.2241	0.1508	0.4297	0.1378	0.4864
SIC2 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 5 Differences-in-Differences Analysis

The sample period ranges from 1998 to 2004, excluding year 2001. Post-EGTRRA is a dummy that is equal to one if the year > 2001 and zero otherwise. Columns 1-4 report results using the family ownership dummy, and columns 5-8 use the family ownership percentage. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are clustered at firm and year level.

	Family = Family Dummy				Family = Percentage Family Ownership			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Family	0.042***	-0.022	0.025**	-0.031***	0.058**	-0.043	0.034*	-0.049**
	(0.014)	(0.042)	(0.010)	(0.011)	(0.026)	(0.071)	(0.018)	(0.021)
Family*Post-EGTRRA	0.067**	-0.081**	0.020*	-0.020*	0.082**	-0.135*	0.039*	-0.046**
	(0.026)	(0.041)	(0.011)	(0.012)	(0.036)	(0.073)	(0.020)	(0.023)
Firm Age	0.001***	-0.001	0.000***	-0.000**	0.001***	-0.001	0.000***	-0.000**
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
M/B	0.001	-0.000	-0.000	0.000	0.001	0.001	-0.000	0.000
	(0.002)	(0.005)	(0.001)	(0.001)	(0.002)	(0.004)	(0.001)	(0.001)
Max Blockown	0.023*	-0.096**	0.014	-0.009	0.020	-0.090***	0.013	-0.008
	(0.014)	(0.042)	(0.009)	(0.011)	(0.015)	(0.033)	(0.009)	(0.010)
% Inst Own	-0.013	0.043	-0.016**	0.013	-0.015	0.021	-0.016**	0.014
	(0.011)	(0.039)	(0.008)	(0.009)	(0.011)	(0.031)	(0.008)	(0.009)
Own Concentration	-0.074***	0.200*	-0.045**	0.057*	-0.047*	0.243**	-0.035*	0.047*
	(0.028)	(0.102)	(0.021)	(0.029)	(0.025)	(0.102)	(0.021)	(0.028)
Asset	-0.003	0.033	-0.006	0.008	-0.003	0.053***	-0.006	0.008
	(0.008)	(0.020)	(0.004)	(0.005)	(0.008)	(0.016)	(0.004)	(0.005)
R&D	-0.034***	0.219***	-0.036***	0.038***	-0.035***	0.148***	-0.037***	0.039***
	(0.006)	(0.022)	(0.004)	(0.005)	(0.006)	(0.021)	(0.004)	(0.005)
Capital Intensity	-0.003	0.043***	-0.009***	0.008***	-0.003	0.018	-0.009***	0.008***
	(0.004)	(0.015)	(0.003)	(0.003)	(0.004)	(0.013)	(0.003)	(0.003)
CAPEX	-0.004	0.033**	-0.002	0.001	-0.004	0.008	-0.002	0.001
	(0.006)	(0.016)	(0.004)	(0.004)	(0.006)	(0.014)	(0.004)	(0.004)
Leverage	-0.004	-0.261***	0.016	-0.019*	-0.008	-0.102**	0.015	-0.017
	(0.025)	(0.061)	(0.012)	(0.011)	(0.025)	(0.048)	(0.011)	(0.011)
Profit Margin	-0.020	0.209	-0.024	0.037	-0.019	0.284*	-0.023	0.036
	(0.057)	(0.174)	(0.029)	(0.040)	(0.057)	(0.151)	(0.029)	(0.040)
Observations	8,092	8,092	8,092	8,092	8,092	8,092	8,092	8,092
R-squared	0.4749	0.3323	0.5242	0.5422	0.4714	0.4716	0.5233	0.5414
SIC2 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 6 Propensity Score Matching

The sample period ranges from 1998 to 2010. We create a propensity score matched sample using the following steps: 1) For each year, we estimate the propensity to be a family firm given various firm characteristics by using a Probit model: $Prob(Family|X_t) = \alpha_j + \gamma' X_t + \varepsilon_t$, where α_j is the industry fixed effect at the 2-digit SIC level, and *X* is a vector of control variables measured at *t*. 2) We rank the estimated propensity score obtained in step 1 in ascending order and match each family firm to a non-family firm with the closest propensity score. 3) We repeat steps 1 and 2 for all years in our sample. We then estimate the following regression model by using family firms and matched non-family firms: $InnoStrategy_{i,t+1} = \alpha_j + \alpha_t + \beta \times Family_{i,t} + \gamma \times X_{i,t} + \varepsilon_{i,t}$, where α_j is the industry fixed effect at the 2-digit SIC level; □□ is the year fixed effect; *X* is a vector of control variables measured at *t*; and *InnoStrategy* is *Explore*, *Exploit*, *%Explore*, and *%Exploit* measured at *t+1*. Panels A and B report a univariate comparison between family and non-family firms using all samples and propensity score matched samples, respectively. Panel C reports a multivariate regression results. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are clustered at firm and year level.

Panel A Univariate-All Sample			
	Non-family	Family	p-value
Firm Age	23.51	19.27	0.00
M/B	2.47	2.09	0.00
Max Blockown	0.56	0.43	0.00
% Inst Own	0.54	0.44	0.00
Own Concentration	0.05	0.09	0.00
Asset	6.85	6.12	0.00
R&D	1.21	0.57	0.00
Capital Intensity	5.53	5.17	0.00
CAPEX	3.60	2.79	0.00
Leverage	0.23	0.21	0.00
Profit Margin	0.09	0.08	0.00
Panel B Univariate-Propensity Score Matched Sample			
	Non-family	Family	p-value
Propensity Score	0.247	0.248	0.799
Explore,t+1	0.071	0.127	0.000
Exploit, t+1	0.085	0.021	0.000
% Explore,t+1	0.054	0.086	0.000
% Exploit, t+1	0.043	0.012	0.000
Firm Age	18.65	19.24	0.15
M/B	2.13	2.08	0.49
Max Blockown	0.42	0.43	0.60
% Inst Own	0.45	0.44	0.23
Own Concentration	0.09	0.09	0.26
Asset	6.12	6.12	0.98
R&D	0.57	0.57	0.97
Capital Intensity	5.15	5.17	0.42
CAPEX	2.81	2.79	0.64
Leverage	0.21	0.21	0.99
Profit Margin	0.08	0.08	0.83

Table 6 Propensity Score Matching, Continued

Panel C Multivariate Regression								
	Family = Family Dummy				Family = Percentage Family Ownership			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Family	0.052***	-0.067***	0.029***	-0.033***	0.051***	-0.108***	0.046***	-0.056***
	(0.015)	(0.016)	(0.006)	(0.006)	(0.016)	(0.028)	(0.010)	(0.011)
Firm Age	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
M/B	0.006**	0.002	0.001	0.000	0.006**	0.001	0.001	0.000
	(0.003)	(0.002)	(0.001)	(0.001)	(0.003)	(0.002)	(0.001)	(0.001)
Max Blockown	-0.020	-0.045*	0.007	-0.002	-0.018	-0.046*	0.007	-0.002
	(0.020)	(0.026)	(0.015)	(0.010)	(0.020)	(0.026)	(0.016)	(0.010)
% Inst Own	-0.023	0.042***	-0.014	0.009	-0.025	0.044***	-0.015	0.010
	(0.027)	(0.015)	(0.011)	(0.008)	(0.028)	(0.016)	(0.011)	(0.008)
Own Concentration	0.055	0.010	-0.003	0.022	0.059	0.005	-0.001	0.020
	(0.043)	(0.034)	(0.018)	(0.017)	(0.044)	(0.033)	(0.018)	(0.017)
Asset	0.033**	0.007	0.007	-0.000	0.033**	0.006	0.007	-0.001
	(0.015)	(0.012)	(0.006)	(0.005)	(0.015)	(0.012)	(0.006)	(0.005)
R&D	0.011	0.022**	-0.009**	0.008*	0.010	0.022**	-0.009**	0.008**
	(0.014)	(0.010)	(0.004)	(0.004)	(0.014)	(0.011)	(0.004)	(0.004)
Capital Intensity	0.004	0.014*	-0.002	0.004	0.004	0.014*	-0.002	0.003
	(0.006)	(0.008)	(0.004)	(0.004)	(0.006)	(0.008)	(0.004)	(0.004)
CAPEX	-0.005	0.003	-0.004	0.002	-0.005	0.004	-0.005	0.002
	(0.007)	(0.009)	(0.004)	(0.004)	(0.008)	(0.009)	(0.004)	(0.004)
Leverage	-0.073*	-0.011	-0.014	0.001	-0.076*	-0.005	-0.017	0.004
	(0.038)	(0.030)	(0.015)	(0.012)	(0.039)	(0.030)	(0.015)	(0.012)
Profit Margin	-0.020	-0.049	0.007	-0.022	-0.021	-0.048	0.007	-0.022
	(0.120)	(0.119)	(0.044)	(0.047)	(0.121)	(0.119)	(0.044)	(0.047)
Observations	3,978	3,978	3,978	3,978	3,978	3,978	3,978	3,978
R-squared	0.5728	0.2593	0.6783	0.3084	0.5694	0.2558	0.6770	0.3052
SIC2 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 7 Operational and Ownership Diversification

The sample period ranges from 1998 to 2010. We estimate the following regression model: $InnoStrategy_{t+1} = \alpha_j + \alpha_t + \beta_1 Family + \gamma' X_t + \varepsilon_t$, where α_j is the industry fixed effect at the 2-digit SIC level; α_t is the year fixed effect; *X* is a vector of control variables measured at *t*; and *InnoStrategy* is *Explore*, *Exploit*, *%Explore*, and *%Exploit* measured at *t+1*. Panel A is for operational diversification, and Panel B is for ownership diversification. Columns 1-4 report results using the family ownership dummy, and columns 5-8 use the family ownership percentage. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are clustered at firm and year level.

Panel A: Innovation vs. Number of Business Sectors

	Family = Family Dummy				Family = Percentage Family Ownership			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Family	0.022	-0.028	0.007	-0.004	0.026	-0.033	0.016	-0.036**
	(0.015)	(0.024)	(0.016)	(0.012)	(0.027)	(0.047)	(0.018)	(0.018)
Family*D(NSeg=1)	0.060**	-0.055*	0.037*	-0.032***	0.081*	-0.101*	0.049**	-0.037*
	(0.029)	(0.031)	(0.021)	(0.012)	(0.042)	(0.055)	(0.022)	(0.022)
D(NSeg=1)	-0.020***	0.051**	-0.009*	0.024***	-0.014**	0.037**	-0.015***	0.013***
	(0.006)	(0.020)	(0.005)	(0.008)	(0.005)	(0.018)	(0.004)	(0.005)
Firm Age	0.000	-0.001	0.000	-0.000	0.000	-0.001	0.000*	-0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
M/B	0.000	0.003	-0.000	0.002	0.000	0.003	-0.001	0.001
	(0.002)	(0.003)	(0.001)	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)
Max Blockown	0.012	-0.068**	0.009	-0.004	0.009	-0.066**	0.006	-0.005
	(0.009)	(0.028)	(0.008)	(0.012)	(0.009)	(0.028)	(0.007)	(0.007)
% Inst Own	-0.010	0.000	-0.001	0.013	-0.012	0.003	-0.009	0.008
	(0.007)	(0.022)	(0.008)	(0.010)	(0.008)	(0.022)	(0.006)	(0.007)
Own Concentration	-0.063***	0.275***	-0.065*	0.061**	-0.047**	0.260***	-0.050***	0.061***
	(0.020)	(0.085)	(0.034)	(0.030)	(0.019)	(0.082)	(0.017)	(0.021)
Asset	0.001	0.037***	-0.011***	-0.003	0.002	0.033***	-0.002	0.004
	(0.005)	(0.012)	(0.004)	(0.004)	(0.005)	(0.012)	(0.003)	(0.003)
R&D	-0.020***	0.086***	0.007**	0.052***	-0.021***	0.088***	-0.023***	0.024***
	(0.006)	(0.025)	(0.003)	(0.010)	(0.006)	(0.025)	(0.006)	(0.006)
Capital Intensity	-0.003	0.010	0.006**	0.018***	-0.004	0.013	-0.007***	0.006***
	(0.003)	(0.009)	(0.003)	(0.004)	(0.003)	(0.009)	(0.002)	(0.002)
CAPEX	-0.004	0.018**	0.008***	0.015***	-0.005	0.018**	-0.004	0.003
	(0.003)	(0.009)	(0.003)	(0.004)	(0.003)	(0.009)	(0.003)	(0.003)
Leverage	-0.012	-0.094**	-0.060***	-0.079***	-0.014	-0.095**	0.009	-0.011
	(0.017)	(0.041)	(0.013)	(0.017)	(0.017)	(0.042)	(0.009)	(0.010)
Profit Margin	0.019	0.147	-0.045**	-0.050	0.020	0.152	0.012	0.006
	(0.032)	(0.091)	(0.023)	(0.036)	(0.033)	(0.092)	(0.021)	(0.023)
Observations	17,253	17,253	17,253	17,253	17,253	17,253	17,253	17,253
R-squared	0.4489	0.4675	0.0918	0.2693	0.4464	0.4663	0.4785	0.5640
SIC2 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 7 Operational and Ownership Diversification, Continued

Panel B: Innovation vs. Number of Firms Owned								
	Family = Family Dummy				Family = Percentage Family Ownership			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Family	0.018	-0.035	0.010	-0.018	0.006	-0.024	0.007	-0.018
	(0.013)	(0.032)	(0.010)	(0.011)	(0.019)	(0.051)	(0.015)	(0.018)
Family*D(Own=1)	0.052*	-0.072*	0.030**	-0.028**	0.055*	-0.129	0.041*	-0.051**
	(0.028)	(0.042)	(0.012)	(0.014)	(0.031)	(0.080)	(0.021)	(0.025)
D(Own=1)	-0.013*	0.023	-0.019***	0.017***	-0.023**	0.040**	-0.023***	0.023***
	(0.008)	(0.021)	(0.004)	(0.005)	(0.011)	(0.019)	(0.006)	(0.006)
Firm Age	0.000**	-0.001	0.000**	-0.000*	0.000**	-0.001	0.000**	-0.000*
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
M/B	-0.000	0.004	-0.001	0.001	-0.000	0.004	-0.001	0.001
	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)
Max Blockown	0.011	-0.066**	0.006	-0.006	0.011	-0.064**	0.006	-0.005
	(0.009)	(0.028)	(0.007)	(0.007)	(0.009)	(0.028)	(0.007)	(0.007)
% Inst Own	-0.008	0.000	-0.008	0.007	-0.009	0.003	-0.008	0.008
	(0.006)	(0.022)	(0.006)	(0.006)	(0.007)	(0.023)	(0.006)	(0.007)
Own Concentration	-0.066***	0.291***	-0.061***	0.071***	-0.051***	0.279***	-0.054***	0.066***
	(0.019)	(0.082)	(0.017)	(0.021)	(0.018)	(0.079)	(0.017)	(0.021)
Asset	-0.001	0.032***	-0.002	0.003	-0.001	0.032***	-0.002	0.003
	(0.004)	(0.012)	(0.003)	(0.003)	(0.004)	(0.012)	(0.003)	(0.003)
R&D	-0.020***	0.088***	-0.023***	0.024***	-0.020***	0.088***	-0.023***	0.024***
	(0.006)	(0.025)	(0.006)	(0.006)	(0.006)	(0.025)	(0.006)	(0.006)
Capital Intensity	-0.004	0.014	-0.007***	0.007***	-0.004	0.014	-0.007***	0.007***
	(0.003)	(0.009)	(0.002)	(0.002)	(0.003)	(0.009)	(0.002)	(0.002)
CAPEX	-0.004	0.019**	-0.004	0.004	-0.004	0.018**	-0.004	0.004
	(0.003)	(0.009)	(0.003)	(0.003)	(0.003)	(0.009)	(0.003)	(0.003)
Leverage	-0.001	-0.100**	0.011	-0.013	-0.001	-0.100**	0.011	-0.012
	(0.013)	(0.042)	(0.009)	(0.010)	(0.013)	(0.042)	(0.009)	(0.010)
Profit Margin	0.010	0.155*	0.010	0.008	0.012	0.153	0.010	0.008
	(0.029)	(0.094)	(0.022)	(0.023)	(0.029)	(0.093)	(0.022)	(0.023)
Observations	17,253	17,253	17,253	17,253	17,253	17,253	17,253	17,253
R-squared	0.4721	0.4669	0.4788	0.5655	0.4709	0.4664	0.4782	0.5649
SIC2 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 8 Announcement Returns

The sample period ranges from 1998 to 2010. This table reports 3-day announcement returns when a patent is announced. Panel A reports a univariate comparison of CAR[0,2] by family firms and patent type (exploratory vs. exploitative). Panel B reports a multivariate regression analysis in which dependent variables include CAR[0,2], CAR[3,30], and CAR[3,60]. $D(\text{Family})$ is a dummy variable that takes the value of one when the patent is announced by a family firm and zero otherwise. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are clustered at firm and year level.

Panel A Univariate Analysis

	Non-Explore	Explore	p-value
Non-Family	0.092%	0.256%	0.000
Family	0.254%	0.008%	0.015

Panel B Regression Analysis

	(1) CAR[0,2]	(2) CAR[0,2]	(3) CAR[0,2]	(4) CAR[3,30]	(5) CAR[3,60]
D(Family)	0.001	0.001	0.001	0.002	0.006
	(0.001)	(0.001)	(0.001)	(0.004)	(0.007)
D(Explore)	0.002***	0.001***	0.002***	-0.000	-0.001
	(0.000)	(0.000)	(0.001)	(0.001)	(0.002)
D(Family)*D(Explore)	-0.004***	-0.004***	-0.004***	0.002	-0.002
	(0.002)	(0.002)	(0.002)	(0.006)	(0.008)
Max Blockown*D(Explore)			-0.000		
			(0.001)		
Firm Age		0.000	0.000	-0.000	-0.000
		(0.000)	(0.000)	(0.000)	(0.000)
M/B		-0.000**	-0.000**	-0.000	-0.001*
		(0.000)	(0.000)	(0.000)	(0.001)
Max Blockown		0.000	0.001	0.007	0.009
		(0.001)	(0.001)	(0.006)	(0.012)
% Inst Own		-0.001*	-0.001*	-0.009***	-0.017**
		(0.001)	(0.001)	(0.003)	(0.007)
Own Concentration		0.004	0.004	0.042	0.072
		(0.008)	(0.008)	(0.039)	(0.082)
Asset		-0.001**	-0.001**	-0.004**	-0.008**
		(0.000)	(0.000)	(0.002)	(0.004)
R&D		0.000**	0.000**	-0.001	-0.001
		(0.000)	(0.000)	(0.001)	(0.001)
Capital Intensity		0.000	0.000	0.001	0.003
		(0.000)	(0.000)	(0.002)	(0.005)
CAPEX		-0.000	0.000	0.002	0.005**
		(0.000)	(0.000)	(0.001)	(0.003)
Leverage		0.002**	0.002**	0.020**	0.039**
		(0.001)	(0.001)	(0.010)	(0.019)
Profit Margin		-0.003**	-0.003**	0.006	0.011
		(0.001)	(0.001)	(0.006)	(0.012)
Observations	161,259	161,259	161,259	161,259	161,259
R-squared	0.0012	0.0022	0.0022	0.0044	0.0080
SIC2 FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Table 9 Announcement Returns By Diversification

The sample period ranges from 1998 to 2010. This table reports 3-day announcement returns when a patent is announced. Columns 1-2 report results using the family ownership dummy, and columns 3-4 use the family ownership percentage. D(Diversify) controls for operational or ownership diversification and is equal to D(Nseg=1) in Column 1 and to D(Own=1) in Column 2, respectively. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are clustered at firm and year level.

	Family = Family Dummy		Family = Percentage Family Ownership	
	Operational Diversification	Ownership Diversification	Operational Diversification	Ownership Diversification
	(1)	(2)	(1)	(2)
	CAR[0,2]	CAR[0,2]	CAR[0,2]	CAR[0,2]
D(DivFamily)	0.001	0.001	0.003	0.001
	(0.001)	(0.001)	(0.003)	(0.003)
D(UndivFamily)	-0.001	0.004*	-0.003	0.016**
	(0.003)	(0.003)	(0.006)	(0.006)
D(DivFamily)*D(Explore)	-0.003	-0.004**	-0.005	-0.009**
	(0.002)	(0.002)	(0.005)	(0.004)
D(UndivFamily)*D(Explore)	-0.004**	-0.007*	-0.010**	-0.016*
	(0.002)	(0.004)	(0.004)	(0.009)
D(Explore)	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
D(Diversify)	-0.000	-0.001	-0.000	-0.000
	(0.000)	(0.001)	(0.000)	(0.001)
Firm Age	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
M/B	-0.000***	-0.000**	-0.000***	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Max Blockown	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
% Inst Own	-0.001*	-0.001*	-0.001*	-0.001*
	(0.001)	(0.001)	(0.001)	(0.001)
Own Concentration	0.004	0.004	0.004	0.004
	(0.008)	(0.008)	(0.008)	(0.008)
Asset	-0.001**	-0.001**	-0.001**	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)
R&D	0.000***	0.000**	0.000***	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
CAPEX	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Leverage	0.002**	0.002**	0.002*	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Profit Margin	-0.003**	-0.003**	-0.003**	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	161,259	161,259	161,259	161,259
R-squared	0.0022	0.0022	0.0021	0.0022
SIC2 FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Internet Appendix

Table A1 IV Regression with State Controls

The sample period ranges from 1998 to 2010. We estimate the following instrumental variable regression model: $InnoStrategy_{t+1} = \alpha_j + \alpha_t + \beta_1 Family + \gamma' X_t + \varepsilon_t$, where the family firm dummy (family ownership percentage) is instrumented by the state-level divorce rates (*Rates*) and divorce laws (*Laws*) in the first stage. Columns 1-5 report results using the family ownership dummy, and columns 6-10 use the family ownership percentage. Columns 1 and 6 report the first-stage regressions, and Columns 2-5 and 7-10 report the second-stage regressions. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are two-way clustered at firm and year level.

	Family = Family Dummy					Family = Percentage Family Ownership				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Family	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Family	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Laws	-0.052***					-0.028***				
	(0.009)					(0.004)				
Rates	-0.008**					-0.004**				
	(0.004)					(0.002)				
Family		0.645**	-0.274*	0.540**	-0.136**		1.210**	-0.544	1.015**	-0.254**
		(0.311)	(0.165)	(0.245)	(0.064)		(0.531)	(0.345)	(0.411)	(0.120)
Education	0.002	0.001	0.000	-0.000	0.001	0.000	0.002	0.000	0.001	0.000
	(0.001)	(0.002)	(0.001)	(0.002)	(0.000)	(0.001)	(0.002)	(0.001)	(0.001)	(0.000)
Population Size	-0.009	-0.013	-0.006	-0.007	-0.003	-0.003	-0.015	-0.005	-0.009	-0.003
	(0.005)	(0.012)	(0.006)	(0.009)	(0.002)	(0.006)	(0.011)	(0.007)	(0.008)	(0.002)
Vote Democrat	0.100	-0.116	0.064	-0.064	0.051	0.101	-0.176	0.094	-0.114	0.060*
	(0.075)	(0.151)	(0.079)	(0.119)	(0.033)	(0.079)	(0.146)	(0.087)	(0.113)	(0.035)
Gender Distribution	0.471	-0.800	-0.230	-0.518	-0.063	0.044	-0.498	-0.345	-0.266	-0.108
	(0.548)	(0.944)	(0.547)	(0.755)	(0.226)	(0.657)	(0.890)	(0.541)	(0.729)	(0.217)
Unemploy Rate	0.124	0.222	0.524*	-0.123	0.167	-0.002	0.298	0.486	-0.058	0.166
	(0.281)	(0.379)	(0.276)	(0.313)	(0.114)	(0.242)	(0.363)	(0.298)	(0.297)	(0.113)
GDP Growth	-0.121	0.129	-0.022	0.086	-0.008	-0.100	0.173	-0.043	0.122	-0.020
	(0.077)	(0.171)	(0.078)	(0.131)	(0.032)	(0.082)	(0.171)	(0.110)	(0.129)	(0.034)
Firm Age	-0.001***	0.001	-0.000	0.000	-0.000	-0.001***	0.001	-0.000	0.001	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
M/B	-0.001	-0.001	0.000	-0.001	0.000	-0.002	0.001	-0.000	-0.000	0.000
	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Max Blockown	-0.077***	0.069**	-0.018	0.050**	-0.004	-0.034**	0.062**	-0.015	0.044**	-0.002
	(0.011)	(0.028)	(0.017)	(0.023)	(0.007)	(0.014)	(0.024)	(0.017)	(0.020)	(0.007)
% Inst Own	-0.050***	0.022	-0.017	0.021	-0.011**	-0.015	0.008	-0.011	0.009	-0.008*
	(0.009)	(0.021)	(0.012)	(0.017)	(0.005)	(0.010)	(0.017)	(0.015)	(0.013)	(0.004)
Own Concentration	0.696***	-0.463*	0.169	-0.393**	0.106**	0.259***	-0.328**	0.119	-0.281**	0.078**
	(0.042)	(0.239)	(0.122)	(0.188)	(0.051)	(0.047)	(0.159)	(0.100)	(0.122)	(0.039)
Asset	-0.010**	-0.001	-0.001	-0.002	-0.002	-0.007	0.001	-0.002	-0.000	-0.002
	(0.005)	(0.008)	(0.005)	(0.006)	(0.002)	(0.005)	(0.008)	(0.007)	(0.006)	(0.002)
R&D	-0.016***	0.021**	0.013***	0.013**	0.004**	-0.005*	0.017**	0.014**	0.010**	0.005***
	(0.003)	(0.008)	(0.004)	(0.006)	(0.002)	(0.003)	(0.007)	(0.007)	(0.005)	(0.001)
Capital Intensity	-0.002	0.005	0.009**	0.001	0.002	-0.001	0.005	0.009*	0.001	0.003*
	(0.004)	(0.007)	(0.004)	(0.006)	(0.002)	(0.005)	(0.007)	(0.005)	(0.006)	(0.002)
CAPEX	0.001	0.013**	0.003	0.009**	0.002	0.003	0.009*	0.005	0.006	0.002*
	(0.004)	(0.006)	(0.004)	(0.004)	(0.001)	(0.004)	(0.005)	(0.005)	(0.004)	(0.001)

Table A1 IV Regression with State Controls, Continued

Leverage	-0.073***	-0.059	-0.063***	-0.020	-0.022***	-0.013	-0.091**	-0.050**	-0.046	-0.015**
	(0.019)	(0.040)	(0.023)	(0.033)	(0.008)	(0.024)	(0.037)	(0.021)	(0.030)	(0.007)
Profit Margin	0.069**	-0.097**	-0.008	-0.067*	0.000	0.031	-0.091**	-0.010	-0.062*	-0.004
	(0.034)	(0.050)	(0.036)	(0.039)	(0.015)	(0.029)	(0.046)	(0.044)	(0.036)	(0.014)
Observations	12,190	12,190	12,190	12,190	12,190	12,190	12,190	12,190	12,190	12,190
SIC2 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hansen J (p-value)		0.576	0.510	0.293	0.987		0.216	0.662	0.2427	0.8776
Wald F statistic	44.02					20.36				

Table A2: Entrepreneurial Firms

The sample period ranges from 1998 to 2010. We estimate the following regression model: $InnoStrategy_{i,t+1} = \alpha_j + \alpha_t + \beta \times Family_{i,t} + \gamma \times X_{i,t} + \varepsilon_{i,t}$, where α_j is the industry fixed effect at the 2-digit SIC level; α_t is the year fixed effect; X is a vector of control variables measured at *t*; and the *InnoStrategy* is *Explore*, *Exploit*, *%Explore*, and *%Exploit* measured at *t+1*. Panel A is based on firm age, and Panel B is based on firm growth. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are clustered at firm and year level.

Panel A Split by Firm Age

	Family = Family Dummy				Family = Percentage Family Ownership			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Family*D(Firm age<15)	0.047**	-0.051**	0.030***	-0.035***	0.063**	-0.080*	0.050***	-0.060***
	(0.019)	(0.022)	(0.008)	(0.008)	(0.029)	(0.043)	(0.015)	(0.017)
Family*D(Firm age>=15)	0.070**	-0.073**	0.030**	-0.036***	0.087**	-0.106*	0.042*	-0.057**
	(0.031)	(0.035)	(0.014)	(0.013)	(0.043)	(0.062)	(0.025)	(0.024)
D(Firm age>=15)	-0.002	0.047**	-0.004	0.009	-0.001	0.046**	-0.004	0.009
	(0.007)	(0.023)	(0.005)	(0.006)	(0.007)	(0.023)	(0.005)	(0.006)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,253	17,253	17,253	17,253	17,253	17,253	17,253	17,253
R-squared	0.4478	0.4666	0.4784	0.5643	0.4459	0.4663	0.4777	0.5636
SIC2 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B Split by Firm Growth

	Family = Family Dummy				Family = Percentage Family Ownership			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Family*Low Growth	0.046**	-0.042**	0.021***	-0.025***	0.062**	-0.051	0.030**	-0.039**
	(0.018)	(0.019)	(0.008)	(0.007)	(0.028)	(0.038)	(0.015)	(0.015)
Family*High Growth	0.072***	-0.086***	0.040***	-0.047***	0.089***	-0.143***	0.064***	-0.081***
	(0.025)	(0.031)	(0.011)	(0.012)	(0.030)	(0.049)	(0.017)	(0.020)
High Growth	-0.001	-0.018	-0.002	0.003	0.001	-0.018	-0.002	0.002
	(0.005)	(0.014)	(0.004)	(0.004)	(0.004)	(0.013)	(0.004)	(0.004)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,253	17,253	17,253	17,253	17,253	17,253	17,253	17,253
R-squared	0.4479	0.4664	0.4785	0.5643	0.4459	0.4661	0.4778	0.5636
SIC2 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A3 Alternative Definitions of Family Firm Dummy

The sample period ranges from 1998 to 2010. We estimate the following regression model: $InnoStrategy_{i,t+1} = \alpha_j + \alpha_t + \beta \times Family_{i,t} + \gamma \times X_{i,t} + \varepsilon_{i,t}$, where α_j is the industry fixed effect at the 2-digit SIC level; α_t is the year fixed effect; *X* is a vector of control variables measured at *t*; and the *InnoStrategy* is *Explore*, *Exploit*, *%Explore*, and *%Exploit* measured at *t+1*. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are clustered at firm and year level.

	Family = Family Dummy (Family Ownership >30%)				Family = Family Dummy (Family Ownership >40%)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Family	0.035**	-0.045**	0.022***	-0.030***	0.075***	-0.095**	0.046***	-0.059***
	(0.014)	(0.022)	(0.008)	(0.009)	(0.027)	(0.042)	(0.015)	(0.017)
Firm Age	0.000*	-0.001	0.000**	-0.000*	0.000*	-0.001	0.000**	-0.000*
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
M/B	-0.000	0.004	-0.001	0.001	-0.000	0.003	-0.001	0.001
	(0.002)	(0.003)	(0.001)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)
Max Blockown	0.008	-0.064**	0.005	-0.004	0.008	-0.064**	0.005	-0.004
	(0.010)	(0.027)	(0.007)	(0.007)	(0.009)	(0.027)	(0.007)	(0.007)
% Inst Own	-0.011	0.003	-0.009	0.007	-0.012	0.003	-0.009	0.008
	(0.008)	(0.022)	(0.006)	(0.007)	(0.008)	(0.022)	(0.006)	(0.007)
Own Concentration	-0.046**	0.258***	-0.049***	0.060***	-0.048**	0.260***	-0.051***	0.061***
	(0.021)	(0.082)	(0.017)	(0.021)	(0.019)	(0.082)	(0.017)	(0.021)
Asset	0.002	0.032***	-0.002	0.004	0.002	0.032***	-0.002	0.004
	(0.005)	(0.012)	(0.003)	(0.003)	(0.005)	(0.012)	(0.003)	(0.003)
R&D	-0.021***	0.088***	-0.023***	0.024***	-0.021***	0.088***	-0.023***	0.024***
	(0.006)	(0.025)	(0.006)	(0.006)	(0.006)	(0.025)	(0.006)	(0.006)
Capital Intensity	-0.004	0.014	-0.007***	0.007***	-0.004	0.014	-0.007***	0.007***
	(0.003)	(0.009)	(0.002)	(0.002)	(0.003)	(0.009)	(0.002)	(0.002)
CAPEX	-0.005	0.018**	-0.004	0.004	-0.005	0.018**	-0.004	0.004
	(0.003)	(0.009)	(0.003)	(0.003)	(0.003)	(0.009)	(0.003)	(0.003)
Leverage	-0.013	-0.097**	0.010	-0.011	-0.013	-0.097**	0.010	-0.011
	(0.017)	(0.041)	(0.009)	(0.009)	(0.017)	(0.041)	(0.009)	(0.010)
Profit Margin	0.019	0.155*	0.011	0.007	0.018	0.156*	0.010	0.007
	(0.033)	(0.093)	(0.022)	(0.023)	(0.033)	(0.093)	(0.022)	(0.023)
Observations	17,253	17,253	17,253	17,253	17,253	17,253	17,253	17,253
R-squared	0.4455	0.4656	0.4774	0.5633	0.4458	0.4657	0.4776	0.5635
SIC2 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A4 Long-term Effect of Family Ownership on Innovation

The sample period ranges from 1998 to 2010. We estimate the following regression model: $InnoStrategy_{i,t+1\ to\ t+3} = \alpha_j + \alpha_t + \beta \times Family_{i,t} + \gamma \times X_{i,t} + \varepsilon_{i,t}$, where α_j is the industry fixed effect at the 2-digit SIC level; α_t is the year fixed effect; *X* is a vector of control variables measured at *t*; and the *InnoStrategy* is *Explore*, *Exploit*, *%Explore*, and *%Exploit* measured from *t+1* to *t+3*. Columns 1-4 report results using the family ownership dummy, and columns 5-8 use the family ownership percentage. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are clustered at firm and year level.

	Family = Family Dummy				Family = Percentage Family Ownership			
	(1) Explore,t+1 to t+3	(2) Exploit, t+1 to t+3	(3) % Explore,t+1 to t+3	(4) % Exploit, t+1 to t+3	(5) Explore,t+1 to t+3	(6) Exploit, t+1 to t+3	(7) % Explore,t+1 to t+3	(8) % Exploit, t+1 to t+3
Family	0.042**	0.001	0.029*	-0.033***	0.065**	0.000	0.050*	-0.054**
	(0.019)	(0.019)	(0.016)	(0.013)	(0.032)	(0.044)	(0.029)	(0.027)
Firm Age	-0.000	-0.001	0.001***	-0.000	-0.000	-0.001	0.001***	-0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
M/B	0.008**	0.009***	0.000	0.004***	0.008**	0.009***	0.000	0.004**
	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.004)	(0.002)	(0.002)
Max Blockown	-0.067**	-0.068**	-0.001	-0.007	-0.068**	-0.068**	-0.002	-0.006
	(0.027)	(0.033)	(0.014)	(0.016)	(0.027)	(0.033)	(0.014)	(0.016)
% Inst Own	0.056**	0.020	0.047***	0.027*	0.055**	0.020	0.046***	0.027*
	(0.025)	(0.028)	(0.016)	(0.014)	(0.025)	(0.028)	(0.016)	(0.014)
Own Concentration	0.178**	0.241**	-0.043	0.084**	0.188***	0.241**	-0.037	0.076*
	(0.070)	(0.095)	(0.045)	(0.040)	(0.073)	(0.095)	(0.045)	(0.040)
Asset	0.028**	0.029**	0.002	-0.001	0.028**	0.029**	0.002	-0.001
	(0.013)	(0.014)	(0.006)	(0.007)	(0.013)	(0.014)	(0.006)	(0.007)
R&D	0.071**	0.104***	-0.012***	0.044***	0.070**	0.104***	-0.012***	0.044***
	(0.028)	(0.031)	(0.004)	(0.012)	(0.027)	(0.031)	(0.004)	(0.012)
Capital Intensity	0.007	0.021**	-0.009*	0.013**	0.007	0.021**	-0.009*	0.013**
	(0.009)	(0.011)	(0.005)	(0.006)	(0.009)	(0.011)	(0.005)	(0.006)
CAPEX	0.027***	0.029***	0.006	0.012**	0.027***	0.029***	0.006	0.012**
	(0.010)	(0.011)	(0.005)	(0.006)	(0.010)	(0.011)	(0.005)	(0.006)
Leverage	-0.176***	-0.173***	-0.027	-0.062***	-0.178***	-0.173***	-0.028	-0.060***
	(0.040)	(0.051)	(0.027)	(0.021)	(0.040)	(0.051)	(0.027)	(0.021)
Profit Margin	0.138	0.161	-0.001	0.034	0.140	0.161	-0.000	0.033
	(0.106)	(0.110)	(0.043)	(0.044)	(0.106)	(0.110)	(0.042)	(0.044)
Observations	17,253	17,253	17,253	17,253	17,253	17,253	17,253	17,253
R-squared	0.6114	0.5497	0.5476	0.5684	0.6113	0.5497	0.5475	0.5682
SIC2 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A5 Restricted to Patents Filed Before 2008

The sample period ranges from 1998 to 2007. We estimate the following regression model: $InnoStrategy_{i,t+1} = \alpha_j + \alpha_t + \beta \times Family_{i,t} + \gamma \times X_{i,t} + \varepsilon_{i,t}$, where α_j is the industry fixed effect at the 2-digit SIC level; α_t is the year fixed effect; *X* is a vector of control variables measured at *t*; and the *InnoStrategy* is *Explore*, *Exploit*, *%Explore*, and *%Exploit* measured at *t+1*. Columns 1-4 report results using the family ownership dummy, and columns 5-8 use the family ownership percentage. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are clustered at firm and year level.

	Family = Family Dummy				Family = Percentage Family Ownership			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Family	0.070***	-0.074***	0.035***	-0.042***	0.092***	-0.116**	0.056***	-0.071***
	(0.022)	(0.024)	(0.009)	(0.009)	(0.029)	(0.046)	(0.016)	(0.018)
Firm Age	0.000*	-0.001	0.000**	-0.000*	0.000*	-0.001	0.000**	-0.000*
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
M/B	0.001	0.002	-0.001	0.001	0.001	0.002	-0.001	0.001
	(0.002)	(0.003)	(0.001)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)
Max Blockown	0.012	-0.078***	0.008	-0.007	0.010	-0.076**	0.007	-0.006
	(0.011)	(0.030)	(0.008)	(0.008)	(0.011)	(0.030)	(0.008)	(0.008)
% Inst Own	-0.011	0.001	-0.009	0.008	-0.012	0.002	-0.010	0.008
	(0.009)	(0.026)	(0.007)	(0.008)	(0.009)	(0.026)	(0.007)	(0.008)
Own Concentration	-0.078***	0.301***	-0.059***	0.071***	-0.054**	0.282***	-0.050***	0.061***
	(0.023)	(0.093)	(0.020)	(0.024)	(0.022)	(0.089)	(0.019)	(0.023)
Asset	0.004	0.039***	-0.002	0.004	0.004	0.039***	-0.002	0.004
	(0.006)	(0.014)	(0.004)	(0.004)	(0.006)	(0.014)	(0.004)	(0.004)
R&D	-0.028***	0.123***	-0.032***	0.033***	-0.029***	0.124***	-0.032***	0.033***
	(0.006)	(0.022)	(0.004)	(0.005)	(0.006)	(0.022)	(0.004)	(0.005)
Capital Intensity	-0.005	0.013	-0.008***	0.007***	-0.005	0.013	-0.008***	0.007***
	(0.004)	(0.011)	(0.003)	(0.003)	(0.004)	(0.011)	(0.003)	(0.003)
CAPEX	-0.007*	0.021*	-0.005*	0.004	-0.007*	0.021*	-0.005*	0.005
	(0.004)	(0.011)	(0.003)	(0.003)	(0.004)	(0.011)	(0.003)	(0.003)
Leverage	-0.010	-0.098**	0.011	-0.014	-0.014	-0.095**	0.010	-0.012
	(0.020)	(0.048)	(0.011)	(0.011)	(0.021)	(0.047)	(0.011)	(0.011)
Profit Margin	0.010	0.239**	0.004	0.020	0.012	0.238**	0.005	0.019
	(0.045)	(0.111)	(0.028)	(0.029)	(0.045)	(0.110)	(0.028)	(0.029)
Observations	14,097	14,097	14,097	14,097	14,097	14,097	14,097	14,097
R-squared	0.4495	0.4817	0.4888	0.5641	0.4473	0.4813	0.4880	0.5633
SIC2 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A6: Non-zero Innovation Measures

The sample period ranges from 1998 to 2010. We drop all observations with zero innovation measures. We estimate the following regression model: $InnoStrategy_{i,t+1} = \alpha_j + \alpha_t + \beta \times Family_{i,t} + \gamma \times X_{i,t} + \varepsilon_{i,t}$, where α_j is the industry fixed effect at the 2-digit SIC level; α_t is the year fixed effect; *X* is a vector of control variables measured at *t*; and the *InnoStrategy* is *Explore*, *Exploit*, *%Explore*, and *%Exploit* measured at *t+1*. Columns 1-4 report results using the family ownership dummy, and columns 5-8 use the family ownership percentage. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are clustered at firm and year level.

	Family = Family Dummy				Family = Percentage Family Ownership			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Family	0.430***	-0.475***	0.224***	-0.218***	0.592***	-0.922***	0.351***	-0.472***
	(0.117)	(0.115)	(0.047)	(0.040)	(0.156)	(0.187)	(0.075)	(0.067)
Firm Age	0.001	-0.005**	0.001	-0.002***	0.002*	-0.004	0.001***	-0.001**
	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
M/B	0.005	0.017	-0.001	0.008**	0.001	0.011	-0.004	0.004
	(0.008)	(0.010)	(0.003)	(0.003)	(0.007)	(0.010)	(0.003)	(0.003)
Max Blockown	0.069	-0.137	0.016	0.006	0.039	-0.132	0.002	0.005
	(0.046)	(0.138)	(0.027)	(0.048)	(0.047)	(0.117)	(0.029)	(0.036)
% Inst Own	-0.013	0.060	-0.017	0.035	-0.042	0.059	-0.032	0.032
	(0.036)	(0.096)	(0.022)	(0.033)	(0.032)	(0.083)	(0.023)	(0.026)
Own Concentration	0.035	0.656	0.039	0.127	0.053	0.395	0.028	0.005
	(0.265)	(0.478)	(0.174)	(0.177)	(0.184)	(0.421)	(0.119)	(0.153)
Asset	0.003	0.117**	-0.023	0.004	0.022	0.144***	-0.009	0.017
	(0.032)	(0.049)	(0.021)	(0.015)	(0.029)	(0.051)	(0.016)	(0.015)
R&D	-0.018	0.206***	-0.018**	0.064***	-0.052***	0.160***	-0.040***	0.041***
	(0.014)	(0.031)	(0.008)	(0.009)	(0.014)	(0.030)	(0.008)	(0.009)
Capital Intensity	-0.002	0.177***	-0.024**	0.066***	-0.030	0.137***	-0.043***	0.046***
	(0.020)	(0.055)	(0.011)	(0.014)	(0.018)	(0.052)	(0.011)	(0.012)
CAPEX	0.001	0.135***	0.004	0.038***	-0.031	0.091**	-0.017	0.016
	(0.019)	(0.043)	(0.013)	(0.014)	(0.020)	(0.041)	(0.013)	(0.012)
Leverage	-0.194*	-0.799***	-0.074	-0.184***	-0.047	-0.525***	0.031	-0.050
	(0.108)	(0.206)	(0.048)	(0.052)	(0.091)	(0.183)	(0.038)	(0.037)
Profit Margin	-0.073	0.110	-0.007	-0.078	0.034	0.175	0.056	-0.041
	(0.132)	(0.288)	(0.061)	(0.091)	(0.129)	(0.263)	(0.062)	(0.072)
Observations	3,258	3,258	3,258	3,258	3,258	3,258	3,258	3,258
R-squared	0.1277	0.4089	0.1463	0.3233	0.2952	0.4930	0.3552	0.5084
SIC2 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A7 Poisson Regression

The sample period ranges from 1998 to 2007. We estimate the following poisson regression model: $InnoStrategy_{i,t+1} = \alpha_j + \alpha_t + \beta \times Family_{i,t} + \gamma \times X_{i,t} + \varepsilon_{i,t}$, where α_j is the industry fixed effect at the 2-digit SIC level; α_t is the year fixed effect; *X* is a vector of control variables measured at *t*; and the *InnoStrategy* is *Explore* and *Exploit* measured at *t+1*. Columns 1-2 report results using the family ownership dummy, and columns 3-4 use the family ownership percentage. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are clustered at firm level.

	Family = Family Dummy		Family = Percentage Family Ownership	
	(1)	(2)	(3)	(4)
	Explore,t+1	Exploit, t+1	Explore,t+1	Exploit, t+1
Family	1.350***	-1.103**	1.862***	-2.117*
	(0.275)	(0.492)	(0.431)	(1.240)
Firm Age	-0.003	0.010	-0.002	0.009
	(0.005)	(0.006)	(0.005)	(0.006)
M/B	0.026	-0.006	0.027	-0.007
	(0.018)	(0.028)	(0.019)	(0.028)
Max Blockown	0.028	0.087	-0.039	0.096
	(0.201)	(0.256)	(0.211)	(0.257)
% Inst Own	0.012	0.002	-0.064	0.026
	(0.195)	(0.235)	(0.204)	(0.230)
Own Concentration	-1.712**	1.655	-1.006	1.511
	(0.738)	(1.690)	(0.714)	(1.713)
Asset	0.122	0.120	0.139	0.123
	(0.147)	(0.120)	(0.162)	(0.121)
R&D	0.157*	0.571***	0.127	0.576***
	(0.093)	(0.079)	(0.102)	(0.079)
Capital Intensity	0.098	0.338**	0.084	0.335**
	(0.093)	(0.159)	(0.102)	(0.159)
CAPEX	0.036	0.244**	0.030	0.241**
	(0.095)	(0.100)	(0.103)	(0.101)
Leverage	-1.700***	-1.727***	-1.941***	-1.717***
	(0.508)	(0.509)	(0.583)	(0.507)
Profit Margin	-0.375	0.279	-0.151	0.266
	(0.957)	(0.463)	(1.063)	(0.461)
Observations	17,253	17,253	17,253	17,253
SIC2 FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Table A8 Lagged Innovation Included

The sample period ranges from 1998 to 2010. We estimate the following regression model: $InnoStrategy_{i,t+1} = \beta_0 InnoStrategy_{i,t} + \alpha_j + \alpha_t + \beta \times Family_{i,t} + \gamma \times X_{i,t} + \varepsilon_{i,t}$, where α_j is the industry fixed effect at the 2-digit SIC level; α_t is the year fixed effect; *X* is a vector of control variables measured at *t*; and the *InnoStrategy* is *Explore* and *Exploit* measured at *t+1*. Columns 1-2 report results using the family ownership dummy, and columns 3-4 use the family ownership percentage. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are clustered at firm and year level.

	Family = Family Dummy		Family = Percentage Family Ownership	
	(1)	(2)	(3)	(4)
	Explore,t+1	Exploit, t+1	Explore,t+1	Exploit, t+1
Family	0.061***	-0.091***	0.078***	-0.137***
	(0.020)	(0.028)	(0.027)	(0.046)
Strategy	-0.086***	0.684***	-0.086***	0.684***
	(0.016)	(0.043)	(0.016)	(0.043)
Firm Age	0.000*	-0.000	0.000*	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
M/B	0.000	0.001	0.000	0.001
	(0.001)	(0.002)	(0.002)	(0.002)
Max Blockown	0.003	-0.014	0.000	-0.011
	(0.008)	(0.009)	(0.008)	(0.010)
% Inst Own	-0.010	0.012	-0.012	0.014
	(0.007)	(0.011)	(0.007)	(0.011)
Own Concentration	-0.050***	0.081*	-0.030*	0.058
	(0.019)	(0.048)	(0.017)	(0.042)
Asset	0.007	0.004	0.007	0.004
	(0.004)	(0.005)	(0.004)	(0.005)
R&D	-0.009**	0.001	-0.010**	0.001
	(0.004)	(0.008)	(0.004)	(0.008)
Capital Intensity	-0.005	0.009***	-0.005	0.009***
	(0.003)	(0.003)	(0.003)	(0.003)
CAPEX	-0.003	0.002	-0.003	0.002
	(0.003)	(0.003)	(0.003)	(0.004)
Leverage	-0.019	-0.026	-0.022	-0.022
	(0.016)	(0.018)	(0.017)	(0.018)
Profit Margin	0.024	0.044	0.027	0.041
	(0.032)	(0.033)	(0.032)	(0.033)
Observations	17,253	17,253	17,253	17,253
R-squared	0.4662	0.7297	0.4642	0.7290
SIC2 FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Table A9 Innovation Measures Scaled by Firm Size

The sample period ranges from 1998 to 2010. We estimate the following regression model: $InnoStrategy_{i,t+1} = \alpha_j + \alpha_t + \beta \times Family_{i,t} + \gamma \times X_{i,t} + \varepsilon_{i,t}$, where α_j is the industry fixed effect at 2-digit SIC level; α_t is the year fixed effect; *X* is a vector of control variables measured at *t*; and the *InnoStrategy* is the logarithmic value of one plus *Explore* and *Exploit* scaled by total assets measured at *t+1*. Columns 1-2 report results using the family ownership dummy, and columns 3-4 use the family ownership percentage. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are clustered at firm and year level.

	Family = Family Dummy		Family = Percentage Family Ownership	
	(1)	(2)	(3)	(4)
	Explore,t+1/Asset,t	Exploit,t+1/Asset,t	Explore, t+1/Asset, t	Exploit, t+1/Asset,t
Family	0.058***	-0.063***	0.075***	-0.095**
	(0.020)	(0.022)	(0.027)	(0.042)
Firm Age	0.000*	-0.001	0.000*	-0.001
	(0.000)	(0.001)	(0.000)	(0.001)
M/B	-0.000	0.004	-0.000	0.003
	(0.002)	(0.003)	(0.002)	(0.003)
Max Blockown	0.011	-0.066**	0.008	-0.064**
	(0.009)	(0.028)	(0.009)	(0.027)
% Inst Own	-0.010	0.001	-0.012	0.003
	(0.007)	(0.022)	(0.008)	(0.022)
Own Concentration	-0.067***	0.277***	-0.048**	0.260***
	(0.021)	(0.086)	(0.019)	(0.082)
Asset	-0.998***	-0.968***	-0.998***	-0.968***
	(0.005)	(0.012)	(0.005)	(0.012)
R&D	-0.020***	0.087***	-0.021***	0.088***
	(0.006)	(0.025)	(0.006)	(0.025)
Capital Intensity	-0.004	0.014	-0.004	0.014
	(0.003)	(0.009)	(0.003)	(0.009)
CAPEX	-0.005	0.018**	-0.005	0.018**
	(0.003)	(0.009)	(0.003)	(0.009)
Leverage	-0.010	-0.100**	-0.013	-0.097**
	(0.017)	(0.042)	(0.017)	(0.041)
Profit Margin	0.015	0.158*	0.018	0.156*
	(0.033)	(0.093)	(0.033)	(0.093)
Observations	17,253	17,253	17,253	17,253
R-squared	0.9774	0.9065	0.9773	0.9064
SIC2 FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Table A10 Exclude Firm-year with Asset Sales during t−1 to t+1

The sample period ranges from 1998 to 2010. We include firm-year observations where there are no asset sales (Compustat item 107) during *t−1* to *t+1*. We estimate the following regression model: $InnoStrategy_{i,t+1} = \alpha_j + \alpha_t + \beta \times Family_{i,t} + \gamma \times X_{i,t} + \varepsilon_{i,t}$, where α_j is the industry fixed effect at the 2-digit SIC level; α_t is the year fixed effect; *X* is a vector of control variables measured at *t*; and *InnoStrategy* is *Explore*, *Exploit*, *%Explore*, and *%Exploit* measured at *t+1*. Columns 1-4 report results using the family ownership dummy, and columns 5-8 use the family ownership percentage. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are clustered at firm and year level.

	Family = Family Dummy				Family = Percentage Family Ownership			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Family	0.061**	-0.037	0.021*	-0.027**	0.079**	-0.049	0.038*	-0.046**
	(0.027)	(0.030)	(0.012)	(0.011)	(0.033)	(0.052)	(0.020)	(0.020)
Firm Age	0.000	-0.000	0.000	-0.000	0.000	-0.000	0.000	-0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
M/B	0.001	0.001	-0.001	0.001	0.001	0.001	-0.001	0.001
	(0.003)	(0.005)	(0.002)	(0.002)	(0.003)	(0.005)	(0.002)	(0.002)
Max Blockown	0.027*	-0.121***	0.012	-0.012	0.023	-0.118***	0.012	-0.011
	(0.015)	(0.045)	(0.011)	(0.011)	(0.015)	(0.044)	(0.011)	(0.011)
% Inst Own	-0.030*	0.023	-0.020**	0.015*	-0.032*	0.023	-0.020**	0.016*
	(0.016)	(0.039)	(0.008)	(0.009)	(0.016)	(0.039)	(0.008)	(0.009)
Own Concentration	-0.136**	0.375**	-0.043	0.068*	-0.111**	0.360**	-0.038	0.060
	(0.056)	(0.166)	(0.043)	(0.041)	(0.054)	(0.164)	(0.042)	(0.040)
Asset	-0.006	0.027	-0.001	-0.000	-0.005	0.026	-0.001	-0.000
	(0.007)	(0.021)	(0.005)	(0.005)	(0.007)	(0.021)	(0.005)	(0.005)
R&D	-0.023***	0.121***	-0.027***	0.030***	-0.024***	0.121***	-0.027***	0.030***
	(0.009)	(0.035)	(0.007)	(0.008)	(0.009)	(0.035)	(0.007)	(0.008)
Capital Intensity	-0.004	0.019	-0.008**	0.007**	-0.004	0.019	-0.008**	0.007**
	(0.005)	(0.015)	(0.003)	(0.003)	(0.005)	(0.015)	(0.003)	(0.003)
CAPEX	0.001	0.030*	-0.004	0.004	0.001	0.031*	-0.004	0.005
	(0.006)	(0.017)	(0.004)	(0.005)	(0.006)	(0.017)	(0.004)	(0.005)
Leverage	-0.002	-0.127*	0.020	-0.013	-0.004	-0.126*	0.019	-0.012
	(0.031)	(0.075)	(0.018)	(0.018)	(0.031)	(0.075)	(0.018)	(0.018)
Profit Margin	-0.021	0.482**	-0.028	0.083	-0.016	0.479**	-0.027	0.081
	(0.075)	(0.202)	(0.060)	(0.053)	(0.076)	(0.202)	(0.060)	(0.053)
Observations	5,541	5,541	5,541	5,541	5,541	5,541	5,541	5,541
R-squared	0.4225	0.5194	0.4569	0.6223	0.4206	0.5193	0.4567	0.6219
SIC2 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A11 Exclude Firm-years with M&A during t−1 to t+1

The sample period ranges from 1998 to 2010. We exclude firm-year observations where firms engage in M&A activities (as acquirer) during *t−1* to *t+1*. M&A information is from SDC. We estimate the following regression model: $InnoStrategy_{i,t+1} = \alpha_j + \alpha_t + \beta \times Family_{i,t} + \gamma \times X_{i,t} + \varepsilon_{i,t}$, where α_j is the industry fixed effect at the 2-digit SIC level; α_t is the year fixed effect; *X* is a vector of control variables measured at *t*; and *InnoStrategy* is *Explore, Exploit, %Explore*, and *%Exploit* measured at *t+1*. Columns 1-4 report results using the family ownership dummy, and columns 5-8 use the family ownership percentage. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are corrected for heteroskedasticity and are clustered at firm and year level.

	Family = Family Dummy				Family = Percentage Family Ownership			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Family	0.045***	-0.060***	0.028***	-0.032***	0.054**	-0.092**	0.043***	-0.053***
	(0.015)	(0.019)	(0.008)	(0.008)	(0.022)	(0.037)	(0.015)	(0.016)
Firm Age	0.000	-0.001*	0.000	-0.000	0.000	-0.001**	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
M/B	-0.000	0.003	-0.001	0.001	-0.000	0.003	-0.001	0.001
	(0.002)	(0.004)	(0.001)	(0.001)	(0.002)	(0.004)	(0.001)	(0.001)
Max Blockown	-0.001	-0.007	-0.004	0.007	-0.002	-0.006	-0.005	0.008
	(0.010)	(0.026)	(0.007)	(0.007)	(0.010)	(0.026)	(0.007)	(0.007)
% Inst Own	-0.001	-0.015	-0.000	-0.003	-0.002	-0.013	-0.001	-0.002
	(0.009)	(0.022)	(0.007)	(0.007)	(0.009)	(0.022)	(0.007)	(0.007)
Own Concentration	-0.057***	0.178***	-0.057***	0.066***	-0.041***	0.162***	-0.050***	0.058***
	(0.016)	(0.051)	(0.012)	(0.016)	(0.015)	(0.048)	(0.011)	(0.015)
Asset	0.000	0.028**	-0.003	0.005	0.000	0.028**	-0.003	0.005
	(0.004)	(0.012)	(0.003)	(0.003)	(0.005)	(0.012)	(0.003)	(0.003)
R&D	-0.018***	0.070***	-0.023***	0.023***	-0.019***	0.071***	-0.023***	0.023***
	(0.006)	(0.020)	(0.006)	(0.006)	(0.006)	(0.020)	(0.006)	(0.006)
Capital Intensity	-0.002	0.017**	-0.006***	0.005**	-0.002	0.017**	-0.006***	0.005**
	(0.003)	(0.008)	(0.002)	(0.002)	(0.003)	(0.008)	(0.002)	(0.002)
CAPEX	-0.001	-0.001	-0.001	0.001	-0.001	-0.000	-0.001	0.001
	(0.004)	(0.008)	(0.003)	(0.003)	(0.004)	(0.008)	(0.003)	(0.003)
Leverage	-0.012	-0.098***	0.016*	-0.017	-0.015	-0.095***	0.015	-0.016
	(0.011)	(0.036)	(0.010)	(0.011)	(0.012)	(0.035)	(0.010)	(0.011)
Profit Margin	-0.024	0.185**	-0.026	0.044*	-0.021	0.182**	-0.025	0.042*
	(0.033)	(0.084)	(0.020)	(0.023)	(0.033)	(0.084)	(0.020)	(0.023)
Observations	11,165	11,165	11,165	11,165	11,165	11,165	11,165	11,165
R-squared	0.4920	0.4356	0.5214	0.5251	0.4905	0.4351	0.5206	0.5243
SIC2 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A12 High-tech Vs Low-tech Industries

The sample period ranges from 1998 to 2010. We estimate the following regression model: $InnoStrategy_{i,t+1} = \alpha_j + \alpha_t + \beta 1 \times Family_{i,t} \times Low\ Tech_{j,t} + \beta 2 \times Family_{i,t} \times High\ Tech_{j,t} + \gamma \times X_{i,t} + \varepsilon_{i,t}$, where α_j is the industry fixed effect at the 2-digit SIC level; α_t is the year fixed effect; X is a vector of control variables measured at *t*; and *InnoStrategy* is *Explore*, *Exploit*, *%Explore*, and *%Exploit* measured at *t+1*. Columns 1-4 report results using the family ownership dummy, and columns 5-8 use the family ownership percentage. All other variables are defined in the Appendix. Constants are included but not reported in the regression. Standard errors are presented beneath the coefficients within parentheses. *, **, and *** denote significance levels at 10%, 5%, and 1%, respectively. Standard errors are clustered at the firm and year level.

	Family = Family Dummy				Family = Percentage Family Ownership			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1	Explore,t+1	Exploit, t+1	% Explore,t+1	% Exploit, t+1
Family*Low Tech	0.025**	-0.020*	0.012**	-0.017***	0.038*	-0.023	0.019	-0.028**
	(0.012)	(0.011)	(0.006)	(0.006)	(0.021)	(0.032)	(0.012)	(0.012)
Family*High Tech	0.146***	-0.176***	0.077***	-0.083***	0.198***	-0.334***	0.139***	-0.163***
	(0.054)	(0.060)	(0.022)	(0.024)	(0.074)	(0.125)	(0.042)	(0.052)
Firm Age	0.000	-0.001	0.000**	-0.000*	0.000*	-0.001	0.000**	-0.000*
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
M/B	-0.000	0.004	-0.001	0.001	-0.000	0.003	-0.001	0.001
	(0.002)	(0.003)	(0.001)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)
Max Blockown	0.012	-0.069**	0.007	-0.006	0.009	-0.067**	0.006	-0.005
	(0.009)	(0.028)	(0.007)	(0.007)	(0.009)	(0.028)	(0.007)	(0.007)
% Inst Own	-0.010	0.001	-0.008	0.007	-0.011	0.002	-0.008	0.007
	(0.007)	(0.022)	(0.006)	(0.006)	(0.008)	(0.022)	(0.006)	(0.007)
Own Concentration	-0.064***	0.273***	-0.057***	0.067***	-0.048**	0.260***	-0.050***	0.061***
	(0.021)	(0.083)	(0.017)	(0.021)	(0.020)	(0.080)	(0.016)	(0.020)
Asset	0.002	0.033***	-0.002	0.004	0.002	0.032***	-0.002	0.004
	(0.005)	(0.012)	(0.003)	(0.003)	(0.005)	(0.012)	(0.003)	(0.003)
R&D	-0.019***	0.085***	-0.022***	0.023***	-0.020***	0.086***	-0.022***	0.023***
	(0.006)	(0.025)	(0.006)	(0.006)	(0.006)	(0.025)	(0.006)	(0.006)
Capital Intensity	-0.003	0.012	-0.007***	0.006**	-0.004	0.012	-0.007***	0.006***
	(0.003)	(0.009)	(0.002)	(0.002)	(0.003)	(0.009)	(0.002)	(0.002)
CAPEX	-0.005	0.019**	-0.004	0.004	-0.005	0.019**	-0.004	0.004
	(0.004)	(0.009)	(0.003)	(0.003)	(0.004)	(0.009)	(0.003)	(0.003)
Leverage	-0.008	-0.102**	0.012	-0.014	-0.012	-0.099**	0.011	-0.012
	(0.016)	(0.042)	(0.009)	(0.010)	(0.017)	(0.042)	(0.009)	(0.010)
Profit Margin	0.016	0.158*	0.010	0.008	0.020	0.153	0.011	0.006
	(0.033)	(0.094)	(0.021)	(0.023)	(0.033)	(0.093)	(0.021)	(0.023)
Observations	17,253	17,253	17,253	17,253	17,253	17,253	17,253	17,253
R-squared	0.4504	0.4671	0.4799	0.5655	0.4468	0.4665	0.4787	0.5646
SIC2 FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes