Three Essays on Corporate Finance Regarding M&A, Investment Efficiency, and R&D

by

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Abstract

This dissertation is composed of three essays in the field of corporate finance. In the first one, we examine the role of country-level investor protections on the value of relationships between investment banks (IBs) and their corporate clients. Using an event-study approach and an international sample of consolidation activities in the investment banking industry, we document that clients of target IBs acquired by banks from stronger (weaker) investor protection countries realize lower (higher) returns upon merger announcement. This is consistent with a substitution effect between country-level investor protections and IB-level monitoring of client firms. Overall, our analysis highlights the economic role of country-level investor protection on the relationships between IBs and client firms in an international context.

In the second essay, we use a sample of international public companies to investigate whether there is a difference between family firms and non-family firms in terms of their investment efficiency. In doing so, we argue that there would be a shift in investment inefficiency resulting from regulatory quality differences amongst countries. Mainly, we find that compared to non-family firms, family firms invest inefficiently. We also discover that such investment inefficiency of family firms can be ameliorated when different regulatory environments are taken into consideration. In addition, we find that board diversity and family-owned stakes in family firms would steer investment efficiency.

In the third essay, we investigate whether there would be a significant difference of the market reaction reflecting on the stock return volatility on the strategic decision of R&D for both non-family and family firms on the U.S. market. In cognition literature, it is argued that investors would shift their attitude and behavior based upon whether the decision of a firm matches what investors' perception or expectation. We find evidence that the stock return of non-family firms would be more volatile compared to family ones as R&D investments increases. We also discover in inverted U-shape relationship between stock return volatility and R&D investments of family firms themselves, and such relationship between stock return volatility and deviation of R&D investment to industry-median for non-family firms.

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Chapter 1 General Introduction

This dissertation consists of three essays regarding a few aspects in the field of corporate finance such a merger and acquisition (M&A hereafter), investment efficiency, research and development (R&D hereafter), gender diversity and macro-level regulatory environment, which are all important elements or activities in business growth. We also discuss some perspectives relating the differentiation between family firm and non-family firm because family business is a significant component in modern financial and economic system.

In Chapter 2, we are interested in whether investor protections in the countries in which acquiring IBs are located relative to investor protections in countries where target IBs are located affect the relationship capital between the target IB and its clients. According to the Coase Theorem, when country-level monitoring is suboptimal, firms employ monitoring-enhancement strategies through either internal enhancement contracts or external monitoring efforts. we explore the role of investment banks as external monitors and examine whether IB reputation moderates the relationship between country-level differences in investor protections and the value of IB-client relationships.

In Chapter 3, we focus on investment efficiency of both family firm and non-family firm. Investment can be an essential activity for a company for it allocates available resources and is directly related to firm performance metrics such as increasing profits, controlling risks, business development, survival, and valuation (Mao et al., 2019). However, the system in which all the business operate is also important. La Porta et al. (1998) discover that the legal system can limit the scope within which the entrepreneurial firms adopt and comply the corporate governance and then operate. There are proliferate literature elucidating the difference between family firm and non-family ones using, for example, socioemotional wealth theory and agency theory. Thus, we attempt to uncover the joint effects of family control and the country-level regulatory quality on the investment efficiency of public firms.

In Chapter 4, we research R&D investments of both family firm and non-family firm. R&D activities are also important to innovation, long-term success, long-term viability (Cohen & Levinthal, 1990; Gu, 2016), to gain or maintain advantages in the market competition of a firm (Artz et al., 2010; Morbey, 1988; Kung and Schmid, 2015), and to improve firm performance and increase value of a firm (Abdoh & Liu, 2021; Hirschey, Skiba, Wintoki 2012). Families may be inclined to with the future value of a long-term project (Jensen & Meckling, 1976). Family owners, thus, could favor R&D investment (Lee & O'Neill, 2003). It was also found that family firms are long-term driven when making strategies in order to prolong family control (Gómez-Mejía et al., 2011; De Massis et al., 2015). Hence, they may avoid R&D investments.

In this study, we extend both standpoints of Lude & Prügl (2019) and Fang et al. (2019) to empirically study what the market reaction would be based upon whether the decision on R&D expense of a family firm matches the investors' perceived one. Namely, we investigate the joint effect of R&D investment and family involvement on the volatility of stock return.

Chapter 2 The Role of Investor Protections on the Value of Investment Banking Relationships: An International Evidence

2.1 Introduction

The value of business relationships between investment banks (IBs) and their client firms has been of significant interest to both academics and policy makers. Existing studies suggest that IBs perform a variety of services valuable to client firms, including monitoring manager effort in client firms (Hansen and Torregrosa,1992), allowing access to institutional investor networks (Benveniste and Spindt, 1989; Cornelli and Goldreich, 2001; Ritter and Welch, 2002; Ljungqvist, Jenkinson, and Wilhelm, 2003), and imparting underwriter reputation to certify offer prices (Beatty and Ritter,1986; Carter and Manaster, 1990). Whether client firms derive value from their investment-banking relationships has received considerable attention in the literature given the competitive and lucrative nature of the IB services market. Borisov and Gao (2019) shed light on the value firms derive from investment banks (IBs) using an event study approach. Using the same methodology, we examine this problem in an international context, with an emphasis on the role of country-level differences in investor protections on the value of IB-client relationships.

Given the endogenous nature of investment banking relationships and the decision to sustain them, it is difficult to accurately quantify the value of these relationships. To address this endogeneity issue, Fernando et al. (2012) and Kovner (2012) use the collapse of Lehman Brothers as an exogenous shock and find a significant negative market reaction for client firms. More recently, Borisov and Gao (2019) use the acquisition of an investment bank as an exogenous shock that interrupts the IB-client relationship to study the resulting value loss for client firms. The acquisition of an IB by another IB is an event independent of the relationship between the target IB and its clients. Thus, an acquisition event that interrupts the relationship between an IB and its clients serves as an exogenous shock which allows Borisov and Gao (2019) to study the direct impacts of relationship disruptions on real investment and employment at client firms, as well as how heterogeneity in investment bank

characteristics can affect value. We adopt the methodology from Borisov and Gao (2019) and extend these recent studies to the international context where disruptions to the IB-client relationship that occur as a result of IB acquisitions may be affected by the characteristics of the acquiring and target IBs' countries.[1] For example, when a foreign IB acquires a U.S. IB, the disruption in the relationship between the U.S. target IB and its clients may vary because of the difference in country-level characteristics of the foreign acquiring IB and the U.S. target IB. The recent wave of cross-border consolidations in the investment banking industry provides us with an unprecedented natural experiment that circumvents endogeneity issues and allows us to examine for the value of international investment banking relationships, and the role of country-level investor protections that moderate the value of these relationships.

In this study, we are interested in whether investor protections in the countries where acquiring IBs are located relative to investor protections in countries where target IBs are located affect the relationship capital between the target IB and its clients. According to the Coase Theorem, when country-level monitoring is suboptimal, firms employ monitoring-enhancement strategies through either internal enhancement contracts or external monitoring efforts. Bebchuk and Neeman (2010) demonstrate an equilibrium in which such supplementary protection is required. Empirically, Bergman and Nicolaievsky (2007) document that investor-protection-enhanced contracts are offered by private firms in Mexico as a firm-level, internal substitute to country-level investor protection. Motivated by their work, we examine the external monitoring mechanism that firms employ in absence of sufficient country-level monitoring. More specifically, we explore the role of investment banks as external

[1] It is possible that a self- selection issue would present if there is a difference between how investment banks choose their targets based on targets' relationships with clients that is dependent on the difference in investor protections between acquirer and target IBs. Literature on M&As between banks (including IBs) suggests that cross-border bank mergers are affected by cost of information, regulation (Buch and DeLong, 2004; Hagendorff et al., 2007), synergies from greater market power (Hankir et al., 2011), revenue generation (Hagendorff and Keasey, 2009), and potential agency-problems in U.S. domestic mergers (Anderson et al., 2004; Gupta and Misra, 2007; Rosen, 2011). While it is possible that acquiring IBs take into consideration the relationships of target IBs with clients, there is little evidence that acquiring IBs make their merger decision based on the equity performance of the target's clients, particularly in a way that differs based on the difference in investor protections between acquirer and target IBs.

monitors. Hansen and Torregrosa (1992) show that client firms demand stronger monitoring from their IBs when other monitoring mechanisms, such as investor protections, are not in place in the client's country. On the other hand, when country-level monitoring mechanisms are already in place, shareholders of client firms may not value or demand additional monitoring from IBs. Thus, there may exist a substitution effect between client country-level investor protections and IB-level monitoring of client firms whereby target IBs in countries with lower investor protections exert higher monitoring effort on clients. If a substitution effect exists, when this high-client-monitoring target IB is acquired by a low-client-monitoring IB from a country with higher investor protection, there will be a negative effect on client firm value because the target IB will now exert fewer monitoring resources in line with its low-client-monitoring acquirer upon acquisition.

Using all M&As announced between 1980 and 2018 where both the target and acquirer are IBs, we find that when a target IB is acquired by an IB from a country with stronger investor protections, but presumably lower IB-level monitoring, clients of the target IB experience a decrease in firm value upon announcement of the acquisition, and vice versa. This result holds after controlling for firm characteristics, aggregate conditions, acquirer-country fixed effects, client-industry fixed effects, and year fixed effects. This indirect negative effect on client firm valuation results from the acquisition of the client's IB, rather than the client firm itself, and the fact that the stronger (weaker) investor protection in the acquiring IB's country cannot be transferred to the target IB's country via an acquisition. The substitution effect between country-level investor protections and IB-level monitoring has important implications for financial institutions operating internationally with clients beyond their home countries.

Given that IB reputation is important for a firm's decision to switch IBs or maintain the relationship (Krigman, Shaw, and Womack, 2001; Fernando, Gatchev, and Spindt, 2005), we examine whether IB reputation moderates the relationship between country-level differences in investor protections and the value of IB-client relationships. We find that when using legal origin as our proxy

for investor protections, when higher-reputation IB from a country with stronger (weaker) investor protections acquires a lower-reputation IB from a country with weaker (stronger) investor protections, reputation has a positive moderating effect on client CARs.

Our research contributes to three streams of literature. First, we contribute to the vast literature on investor protection and equity performance. Prior studies find a positive direct effect of stronger investor protection and corporate governance on various firm characteristics, both at the country and firm levels. For example, La Porta et al. (2002) find that firms in countries with stronger investment protections have higher valuations. In M&As, Hagendorff et al. (2008) argue that acquirers demand a premium when the target firm is located in a low investor protection country. Himmelberg et al. (2002) show that at the firm level, better investor protection improves capital allocation and reduces the cost of capital. However, none of these studies shed light on the impact of investor protections on the firm value lost due to a disruption in a firm's relationship with its primary IB. We fill this gap by documenting that clients of target IBs acquired by banks from stronger (weaker) investor protection countries realize lower (higher) returns upon the announcement of a merger.

Second, we contribute to the investment banking literature by providing evidence for the economic role of country-level investor protections on the value of the relationships between IBs and client firms. Fernando et al.(2012) and Kovner (2012) find a significant negative market reaction for client firms upon announcement that their IBs have been acquired. Akiyoshi (2019) reports a sharp decline in market value and higher SEO discounts by client firms in Japan when their connections with their IBs were interrupted. We build on the study by Bebchuk and Neeman (2010), which demonstrates the necessity of supplementary monitoring effort in an economy in equilibrium. This study also further the study by Hansen and Torregrosa (1992), which finds that client firms demand stronger monitoring from their IBs when other monitoring mechanisms such as investor protections are not in place, by showing that there exists heterogeneity in the value of client-IB relationships as a result of country-level differences in investor protections. Though Laeven and Levine (2009) show a relationship

between investor protection and commercial bank risk taking, to the best of our knowledge, this study is the first to study the role of investor protections on the value of client-IB relationships.

Lastly, our study also contributes to the literature on international investment bank M&As. While there are existing literatures that study both international M&As as well as bank M&As, with financial globalization, there is also a small but growing literature on international M&As in the banking industry. For example, Buch and DeLong (2004) provide evidence of the influence of regulation and information costs on cross-border M&A decisions between banks. Anderson et al. (2004), Hankir et al. (2011), and Rosen (2011) focus on the importance of managerial incentives in banking M&As. However, IBs are a unique subset of banks and have a functionality that differs dramatically from the traditional commercial bank. We do not know of any existing studies examining international IB M&As specifically. Our paper is thus one of the first to study international IB M&As and to provide evidence on the influence of institutional factor, investor protector, on this unique subset of banks.

2.2 Hypotheses Development

There is an extensive literature showing the effects of stronger legal protection of investors in a country on financial market development and firm valuation. For example, La Porta et al. (1997) show that countries with poorer investor protections have smaller, less developed equity and debt markets. La Porta et al. (2006) find that countries with extensive disclosure requirements and standards of liability facilitating investor recovery of losses have larger stock markets. Most relevant to our paper, La Porta et al. (2002) find that firms in countries with stronger protections for minority shareholders have higher valuations and Giannetti and Koskinen (2010) demonstrate the relationship between lower expected return and weak investor protection. From an investor's perspective, firms in countries with stronger investor protection are associated with improved firm-level liquidity (Brockman and Chung, 2003; Burkart et al., 2014; Huang et al., 2013), less earnings management (Leuz et al., 2003; Persakis and Iatridis, 2016), more efficient firm-level resource allocation (McLean et al., 2012), and more

dispersed ownership (Foley and Greenwood, 2010). Given that in most countries, large publicly traded firms tend to have controlling shareholders who are entrenched (La Porta et al., 1999), when laws protecting shareholders and creditors are weak, these controlling shareholders have the power to designate corporate managers who will aid in expropriating minority shareholders and creditors instead of building firm value. These external shareholder protections restrain managerial agency costs impeding value maximization by serving as a monitoring device for managers.

In this study, we examine how country-level investor protections interact with firm-level protections and jointly shape the IB-client relationship. Bebchuk and Neeman (2010) provide a theoretical framework in which country-level investor protection is suboptimal and supplementary protection is required. Fama and Jensen (1983) argue that external monitoring exerts pressure on managers to make decisions in the best interest of shareholders. Investment banks can provide monitoring services either directly by assigning analysts to track the company or indirectly through advising (Jain and Kini, 1999). As suggested by Hansen and Torregrosa (1992), lead bank monitoring has the potential to add value in a number of ways. For example, lead bank monitoring provides a credible avenue for the board of directors to assess managerial effort and firm value. It also reduces agency costs by motivating managers to exert more effort and decrease their perquisite consumption.

Hansen and Torregrosa (1992) find that investment bank monitoring serves as a substitute for firm-level corporate governance when other monitoring mechanisms are not in place. When working with clients, investment bankers review the performance and operations of their client firms, acting as a monitor for the collective interest of shareholders. This monitoring effectively improves corporate governance and reduces agency cost, and therefore creates value. However, the value created by monitoring varies across institutions. When strong country-level investor protections are already in place, shareholders of client firms may not value or demand additional monitoring from IBs. In countries with poor investor protections where agency problems are more severe, the monitoring provided by IBs is more important for the shareholders of client firms. Therefore, IB-monitoring and

client country-level investor protections are substitutes in terms of their effect on firms' market values. Similar substitution effects are also observed between firm-level governance and country-level governance in emerging markets (Francis et al., 2012), as well as between investment bank monitoring and capital market imperfections due to information asymmetry (García-Marco and Ocaña, 1999).

For example, IB A from a low investor-protection country has a higher capability of exerting a higher IB-level of monitoring when entering a new market or acquiring a new client, while IB B from a high investor-protection country has a lower capability of exerting a lower IB-level of monitoring. This monitoring capacity is not only comprised of how much each IB is willing to monitor, but also how much monitoring capability each IB has given their past monitoring experience. Thus, when high-monitoring-IB A is acquired by low-monitoring-IB B, the newly combined IB will provide monitoring initially comparable to that provided by low-monitoring-acquirer IB B prior to the acquisition. Hence clients of IB A, which continues to be in a country with fewer investor protections, will be subjected to less monitoring overall than they were prior to the acquisition. As a result of this reduction in monitoring, client firms of IB A will experience negative abnormal returns upon the merger announcement. This leads to the following hypothesis:

Hypothesis 1: Client firms with primary IBs acquired by IBs from stronger (weaker) investor protection countries will realize lower (higher) announcement returns.

Krigman et al. (2001) find that cumulative abnormal returns following an SEO announcement are less negative when firms switch to a higher-ranked underwriter. Jain and Kini (1999) argue that underwriter reputation is a proxy for quality monitoring since more prestigious IBs have a stronger incentive to monitor more effectively in order to protect their reputation and reduce the probability of being associated with a lemon. Fang (2005) found that firms receive higher net proceeds when underwritten by reputable investment banks. IPOs underwritten by more prestigious IBs are associated

with better long-run performance (Carter, Dark, and Singh, 1998). Underwriter reputation also significantly impacts IPO performance both in developed markets (Michaely and Shaw, 1994; Carter, Dark, and Singh, 1998; Loughran and Ritter, 2004) and in developing countries (Su and Bangassa, 2011; Chen and Wang, 2016).

As a result, we expect the underwriting reputation of an IB to moderate the relationship between the relative strength of acquirer-IB and target-IB country-level investor protections and announcement returns. If the acquiring IB has a higher underwriting reputation rank than the target IB, the market rewards the client firm for obtaining a higher quality IB (i.e., stronger monitoring effort and capability), therefore positively moderating the negative relationship between the relative strength of acquirer-IB and target-IB country investor protections and the client firms' announcement returns. Thus, we expect an acquisition by an IB with a higher underwriting reputation to mitigate any value lost by client firms as they change to a stronger investor protection regime. This leads to the following hypothesis:

Hypothesis 2: An acquirer with a higher underwriting reputation ranking than the target IB will positively moderate the relationship between the relative strength of acquirer-IB and target-IB country-level investor protections and announcement returns.

For robustness, we use two additional proxies for country-level investor protections: legal origin and insider trading. La Porta et al. (1998) provide evidence that legal origin, and thus the legal rules protecting investors, as well as the quality of rule enforcement differs across countries. In particular, these rules vary systematically by legal origin. Common-law countries have the most shareholders and creditors protection whereas French civil law countries have the least amount of investor protection. In countries with poor country-level governance, the agency problem is severer, and investors cannot rely on the institutional environment to monitor manager behavior. As a result,

additional external monitoring services provided by the IB are more valuable to investors in these countries. On the contrary, in countries with strong country-level governance, agency problems are mitigated by the institutional environment and the demand for external monitoring is limited.

Second, Beny (2005) finds that common-law countries have tougher insider trading laws and allocate greater enforcement power, which is consistent with findings in La Porta et al. (1997, 1998) that show common-law countries provide better investor protection than civil-law countries. DeFond et al. (2007) show that market reactions to earning announcement are stronger in countries with stronger enforcement of insider trading laws. Thus, we use insider trading as our second proxy for country-level investor protection.

2.3 Data and Methodology

2.3.1 Data

We construct our sample using four categories of data: data on the target and acquirer IBs; data on services received by client firms of these IBs; data on client firms' performance around the merger announcement dates; and data on country-level characteristics. First, we include in our sample all mergers and acquisitions announced between 1980 and 2018 where both the bidder and target are financial institutions present in the Securities Data Corporation Mergers and Acquisitions (SDC M&A) Database. We do not explicitly require both the bidder and target to be IBs in order to generate the largest possible initial sample, and to include deals involving institutions that provide investment-banking services but do not identify themselves as IBs based on SIC codes.[2] The resulting dataset contains 74,287 transactions over a period of 39 years.

Next to identify the client firms of IBs involved in mergers, we use the SDC M&A Database to obtain records of IB advisory services and the SDC Global New Issuance Database to obtain records

[2] We use the term "investment bank" loosely to refer to financial institutions that provide either underwriting or advisory services.

of IB underwriting services received by client firms prior to the merger announcement. We consider a firm an active client of an IB if the IB has been listed as either the M&A advisor or lead manager of an equity or debt offering by the client firm within the five years prior to the merger announcement. If an IB is involved in multiple mergers within the five-year window, only the impact of the first merger following the client's transaction with its IB is considered. The resulting dataset consists of 2,225 client-IB firm pairs.

Using this dataset containing client-IB relationships, we quantify how reliant client firms are on their IBs using the number and value of equity and bond offerings, as well as M&A advising services provided by IBs. More specifically, Issuance Count is the number of offerings completed by the client firms with their IBs in the five years prior to the merger announcement. Issuance Value is the corresponding average dollar value of these offerings. M&A Count is the number of M&A advisory services received by the client firms from their IBs in the five years prior to merger announcement. M&A Value is the average dollar amount of these deals.

Client firms' stock prices and returns information are obtained from the Center for Research in Security Prices (CRSP). The value-weighted market-adjusted cumulative abnormal returns (CAR) for the three-day window centered at the IB merger announcement date are obtained from EVENTUS. Client firm characteristics such as size, book-to-market ratio, and leverage are obtained from COMPUSTAT. All dollar amounts are in U.S. dollars.

To measure country-level investor protections, we use an index of investor protections provided by La Porta et al. (2006). This Investor Protection variable is constructed as the principal component of the indices for anti-director rights, disclosure requirements, and liability standards, and ranges from 0 to 10, with a higher value indicating better investor protection. For robustness, we use two additional proxies for country-level investor protections. First, we use Common Law Legal Origin, which identifies a country's legal origin using data provided by La Porta et al. (2008). It is a dummy variable that equals one if the country's legal origin is common law, and zero otherwise. The second

proxy, Insider Trading, measures the prevalence of insider trading and is provided by the World Economic Forum's Global Competitiveness Report. It ranges from 1 to 7, with a lower value indicating a lower level of insider trading and thus, better investor protection.

To capture differences in country-level investor protections when a client firm's IB is acquired by a foreign IB, we take the difference between the acquiring IB's country-level investor protection and the target IB's country-level investor protection. More specifically, Diff in Investor Protection is the difference in investor protections between the acquiring IB's and target IB's respective countries. Similarly, Diff in Common Law Legal Origin, is the difference in Common Law Legal Origin between the acquiring IB's and target IB's respective countries. Diff in Insider Trading is the difference in insider trading prevalence between the acquiring IB's country and the target IB's country.

To measure the underwriting reputation of IBs, we use rankings of IB underwriting reputation on a scale from 0 to 9, with 9 being the highest (Loughran and Ritter, 2004). To test hypothesis 2, we construct a dummy variable, Reputation (A>T), which equals 1 if the acquirer has a higher underwriting reputation ranking than the target in the year of the merger announcement, and 0 otherwise. The GDP growth of the acquirer, target, and client firm countries is obtained from the World Bank national accounts data and OECD National Accounts data files. We also control for the nine dimensions of macro-level institutional distance introduced by Berry et al. (2010), which consist of economic distance, financial distance, political distance, administrative distance, cultural distance, demographic distance, knowledge distance, global connectedness distance, and geographic distance. We use the average of each of these nine variables over time to prevent a reduction in sample size by a third due to the limited availability of these variables. Detailed variable descriptions are presented in Appendix A.

2.3.2 Empirical Models

To test our first hypothesis, we use the following ordinary least squares (OLS) regression model:

$$CAR_{i,j,k,l,m,t} = a + \beta_1 ln\left(1 + Issuance\ Count\ _{i,j,t}\right) + \beta_2\ ln\left(1 + M\&A\ Count_{i,j,t}\right) + \beta_3 Diff\ in\ Investor\ Protection_{i,j,k,t}\ +\ gX_{i,j,k,t} + \delta_m + \tau_l + \theta_t + e_{i,j,k,t} \quad (1)$$

where $CAR_{i,j,k,l,m,t}$ is client firm i's three-day cumulative abnormal returns around the announcement day when client i's IB j is acquired by IB k in year t. In the main analysis, we test the CAR within a three-day window (-1, +1). Although there is no "correct" way to choose event window, including days prior to the event, the event day and days after seems to be a common practice (MacKinlay, 1997; Marmora, 2022). Thus, we conduct analysis using symmetric window in order to have a better comparison. In the robustness test, we also test 7-day and 11-day windows, and the results are consistent. Issuance Count and M&A Count measure the client's reliance on IB j for equity and bond issuance underwriting and M&A advisory services, respectively. We also estimate similar regressions using Issuance Value in lieu of Issuance Count and M&A Value in lieu of M&A Count. Diff in Investor Protection, our main variable of interest, measures the difference between acquirer-IB and target-IB country-level investor protections. $X_{i,j,k,t}$ is a matrix of client firm i's characteristics and country-level controls, including book-to-market ratio, leverage, and size, as well as country-level GDP growth for client i, target IB j, and acquirer IB k in year t. δ_m, τ_l, and θ_t are client industry, acquirer country, and year fixed effects, respectively. Client industry fixed effects control for unobservable client-industry level differences on client firm announcement returns using two-digit SIC codes for client firms. Acquirer country fixed effects control for time-invariant, unobservable country-level differences for acquiring IBs. Year fixed effects control for macroeconomic trends affecting announcement returns such as stock market conditions. All standard errors are clustered by deal to

account for potential correlation of error terms across different clients for each target that is acquired (Petersen, 2009). To test our second hypothesis, we use the following model:

$$CAR_{i,j,k,l,t} = a + \beta_1 ln(1 + Issuance\ Count_{i,j,t}) + \beta_2\ ln(1 + M\&A\ Count_{i,j,t}) + \beta_3 Diff\ in\ Investor\ Protection_{i,j,k,t} + \beta_4 Reputation\ (A > T) + \beta_5[Diff\ in\ InvProt \times Reputation\ (A > T)] + gX_{i,j,k,t} + \delta_m + \tau_l + \theta_t + e_{i,j,k,t} \quad (2)$$

This model is similar to model (1) but includes two additional terms: Reputation (A>T) and [Diff in Investor Protection × Reputation (A>T)]. β_5 is our coefficient of interest when testing hypothesis 2; it measures the moderating effect of acquiring IB k having a higher reputation ranking that target-IB j on the relationship between the relative strength of acquirer-IB and target-IB country investor protections and announcement returns. We cluster standard errors by the merger deal when estimating both models (1) and (2).

2.4 Empirical Results

2.4.1 Summary Statistics

Summary statistics for our sample are presented in Table 2.1. The sample consists of 2,225 client-IB pairs with 117 IBs involved in M&A events during our sample period. M&A Count, the average number of advisory services a client firm received from their primary IB in the 5-year period prior to the merger is 0.409. The average dollar amount of these deals, M&A Value, is $313.855 million U.S. dollars in our sample. The average Issuance Count, including both equity and bond issuances, is 1.006. The average dollar value of these issuances, Issuance Value, is $125.607 million US dollars. Since these variables are highly skewed, we take the natural logarithm after adding 1 to preserve observations without either underwriting or M&A advisory (Borisov and Gao, 2019). The

average three-day CARs of client firms around the announcement of their primary IB's acquisition is -0.1%, with a median of -0.4%.

The average levels of Investor Protection for the acquirer and target are 0.893 and 0.896, respectively. The average difference in investor protection (acquirer minus target) is -0.003, indicating that acquirers are from countries with slightly lower investor protection relative to targets. On average, 81.7% of acquirers and 84.9% of target are from common law countries, which have stronger investor protections. The average difference in Common Law Legal Origin is -0.032, indicating that acquirers are slightly less likely to be headquartered in a common law country. The average levels of Insider Trading for the acquirer and target are 5.368 and 5.410, respectively. The average difference in Insider Trading is -0.042, indicating that acquirers are on average from countries with lower levels of insider trading relative to targets.

Table 2.2 contains the number of observations as well as key summary statistics at the country level. The United States has the highest levels of investor protection, followed by Canada and the United Kingdom. The investor protection is generally higher for countries with common law legal origin than those without. India has the lowest level of insider trading, followed by Mexico and Brazil. While more than half of the acquirers, targets, and client firms are located in the U.S., Spanish and Japanese IBs are also active international acquirers in the IB industry. After U.S. IB targets, British IBs are the second largest target group by country. The client CARs grouped by country are generally negative, with the exceptions of the Netherlands and the Marshall Islands. The correlations between key variables are presented in Table 3.

Table 2. 1 Summary Statistics

The sample consists of 2,225 client-IB pairs with 117 IBs involved in M&A event during from 1980 to 2018. The IB-Client Transaction section reports characteristics of the pair-wise relationship between IB and client firm. The CAR variables are market-adjusted cumulative abnormal returns for the client firms over three-day windows centered at the merger announcement date. Size is the natural logarithm of the client firm's total assets. Total Assets is COMPUSTAT annual item 6. Book-to-Market Ratio is the natural log of the ratio of the book value of equity to the market value of equity. Leverage is the ratio of total debt to total asset. GDP Growth variables are the measure of GDP Growth of the countries where the acquirer, target, and client are located, respectively. Diff in Investor Protection is the difference of principal component of: (1) anti-director rights; (2) disclosure requirements; and (3) liability standards, between acquirers and targets. Diff in Insider Trading is the difference between acquirer and target in the measure of insider trading, ranging from one (low level of insider trading) to seven (high level of insider trading). Detailed definitions and construction of the variables are provided in Appendix A.

	Mean	Std. Dev	P25	Median	P75	N
Panel A: IB-Client Firm Transactions						
M&A Count	0.409	0.670	0	0	1	2337
ln (1+ M&A Count)	0.232	0.547	0	0	0.693	2337
M&A Value	313.855	1478.447	0	0	39.205	2245
ln (1+ M&A Value)	1.664	2.684	0	0	3.694	2245
Issuance Count	1.006	0.820	1	1	1	2337
ln (1+ Issuance Count)	0.618	0.400	0.693	0.693	0.693	2337
Issuance Value	125.607	254.087	10	45	128.132	2308
ln (1+ Issuance Value)	3.374	2.106	2.398	3.829	4.861	2308
Panel B: Client Firm Characteristics						
CAR (-1, +1)	-0.001	0.065	-0.029	-0.004	0.024	2337
Size	5.684	1.849	4.246	5.415	6.973	2337
Book-to-Market Ratio	0.558	1.194	0.229	0.461	0.774	2337
Leverage	0.215	0.256	0.008	0.161	0.335	2337
Panel C: Country-Level Characteristics						
Acquirer Investor Protection	0.893	0.211	1	1	1	2337
Target Investor Protection	0.896	0.206	1	1	1	2337
Diff in Investor Protection	-0.003	0.175	0	0	0	2337
Acquirer Common-Law Legal	0.817	0.387	1	1	1	2337
Target Common-Law Legal	0.849	0.359	1	1	1	2337
Diff in Common Law Legal	-0.032	0.232	0	0	0	2337
Acquirer Insider Trading	5.368	0.438	5.50	5.50	5.50	2337
Target Insider Trading	5.410	0.427	5.50	5.50	5.50	2337
Diff in Insider Trading	-0.042	0.279	0	0	0	2337
Acquirer-Country GDP Growth	2.472	2.409	0.374	2.862	4.45	2337
Target-Country GDP Growth	2.427	2.505	0	3.345	4.45	2337
Client-Country GDP Growth	2.624	2.113	1.601	2.667	4.45	2337

Table 2. 2 Country-Level Summary Statistics

The table lists a distribution of investor protection, counts of firms, and cumulative abnormal returns across all the countries in our sample. Column (1) and column (2) shows the measure of investor protection in each country where an acquirer, or target firm is located, Column (3) and column (4) shows the frequency of common law origin country where an acquirer, or target firm is located. Column (5) and column (6) shows the frequency of insider trading in each country where an acquirer, or target firm is located. Column (7) to column (8) shows the frequency of acquirer firms, or target firms in each country. Column (9) to (11) show the cumulative abnormal return of client firm, acquiring firm, or target firm one day before and after the merger date of the IB firm distributed in each country in our sample.

Country	Acquirer Investor Protection	Target Investor Protection	Acquirer Legal Origin	Target Legal Origin	Acquirer Insider Trading	Target Insider Trading	Acquirer	Target	Client CAR (-1, +1)	Acquirer CAR (-1, +1)	Target CAR (-1, +1)
Australia		0.78		1		5.7		80			0.000
Belgium									-0.038		
Bermuda									-0.011		
Brazil	0.44	0.44	0	0	4	4	9	9		-0.017	-0.017
Canada	0.96		1		5.2		54		-0.016	-0.007	
France	0.47	0.47	0	0	5.1	5.1	53	51		-0.016	-0.016
Germany	0	0	0	0	4.9	4.9	17	25		-0.016	-0.007
Hong Kong									-0.008		
India	0.77	0.77	1	1	3.5	3.5	22	23	-0.013	0.006	0.005
Ireland									-0.043		
Italy	0.20	0.20	0	0	4.2	4.2	1	3		-0.015	-0.018
Japan	0.42	0.42	0	0	5.1	5.1	120	116		-0.006	-0.007
Marshall Islands									0.003		
Mexico	0.10		0		3.8		1			-0.037	
Netherlands	0.54	0.54	0	0	5.8	5.8	63	31	0.010	-0.009	-0.029
Singapore	0.77	0.77	1	1	5.5	5.5	1	1		0.018	0.018
Spain	0.55	0.55	0	0	4.1	4.1	153	118		-0.006	0.000
Sweden	0.39	0.39	0	0	5	5	1	1		-0.062	-0.062
Switzerland	0.30		0		5.3		10			-0.040	
United Kingdom	0.78	0.78	1	1	6.2	6.2	65	109	-0.001	0.012	-0.001
United States	1	1	1	1	5.5	5.5	1767	1770	-0.001	-0.000	-0.000

Table 2. 3 Correlations

This table contains the correlations between key variables in our sample. Details on variable construction are available in Appendix A.

	CAR (-1, +1)	Issuance Count	Issuance Value	M&A Count	M&A Value	Reputation (A>T)	Diff in Investor Protection	Diff in Common Law Origin	Diff in Insider Trading
CAR (-1, +1)	1								
Issuance Count	-.02	1							
Issuance Value	-.03	.43[a]	1						
M&A Count	-.01	-.38[a]	-.09[a]	1					
M&A Value	.00	-.16[a]	.03	.39[a]	1				
Reputation (A>T)	.06[a]	.01	-.15[a]	.01	.01	1			
Diff in Investor Protection	.02	-.06[a]	.02[b]	.01	.01	-.18[a]	1		
Diff in Common Law	.03	-.06[a]	.00	-.01	-.00	-.20[a]	.88[a]	1	
Diff in Insider Trading	.05[a]	-.08[a]	-.05[b]	.07[a]	.04[c]	.16[a]	.09[a]	.15[a]	1
Size	-.01	-.01	.45[a]	.27[a]	.32[a]	-.20[a]	.13[a]	.04[b]	-.01
Leverage	-.06[a]	-.06[b]	.09[a]	.13[a]	.10[c]	-.07[a]	.01	-.02	.06[a]
Book-To-Market	-.11[a]	-.11	-.02	.04[c]	.01	.00	.04[c]	.01	.01
Administrative Distance	-.03	-.01	.03	.08[a]	.02	-.09[a]	-.05[b]	-.33[c]	-.19[a]
Culture Distance	-.01	-.06[b]	-.04	.11[a]	.02	.06[b]	-.21[a]	-.34[a]	.17[a]
Demographic Distance	-.02	-.07[a]	.00	.09[a]	.01	-.12[a]	.29[a]	.10[a]	-.09[a]
Economic Distance	-.05[a]	-.03	-.04[a]	.07[a]	.01	.10[a]	-.26[a]	-.50[a]	-.07[a]
Financial Distance	-.02	.00	.06[c]	.03	.03	-.19[a]	.13[a]	.00	-.30[a]
Geographic Distance	-.02	.01	.09[a]	.08[a]	.04[b]	-.11[a]	.08[a]	-.23[a]	-.13[a]
Connectedness Distance	-.03	.02	.09[a]	.04[c]	.00	-.22[a]	.23[a]	-.03	-.45[a]
Knowledge Distance	-.02	.01	.09[a]	.07[a]	.03	-.10[a]	.04[b]	-.28[a]	-.19[a]
Political Distance	-.02	-.05[b]	.01	.08[a]	.00	-.08[a]	.17[a]	-.02	-.14[a]

a, b, and c indicate statistical significance at 1%, 5%, and 10% levels, respectively.

Table 2. 3 Correlations (continued)

This table contains the correlations between key variables in our sample. Details on variable construction are available in Appendix A.

	1	2	3	4	5	6	7	8	9	10	11	12
Size	1											
Leverage	.30[a]	1										
Book-To-	.06[a]	-.14[a]	1									
Administrative	.07[a]	.05[b]	.07[a]	1								
Culture	.01	.09[a]	-.03	.75[a]	1							
Demographic	.06[a]	.05[b]	.10[a]	.69[a]	.58[a]	1						
Economic	-.01	.04[b]	.09[a]	.71[a]	.67[a]	.51[a]	1					
Financial	.08[a]	-.02	.03	.72[a]	.29[a]	.28[a]	.35[a]	1				
Geographic	.11[a]	.05[b]	.06[a]	.88[a]	.52[a]	.55[a]	.47[a]	.64[a]	1			
Connectedness	.10[a]	.03	.10[a]	.76[a]	.38[a]	.56[a]	.31[a]	.57[a]	.86[a]	1		
Knowledge	.12[a]	.04[c]	.08[a]	.88[a]	.48[a]	.48[a]	.53[a]	.75[a]	.95[a]	.81[a]	1	
Political	.08[a]	.05[b]	.05[b]	.70[a]	.64[a]	.65[a]	.56[a]	.26[a]	.52[a]	.49[a]	.54[a]	1

a, b, and c indicate statistical significance at 1%, 5%, and 10% levels, respectively.

2.4.2 The Role of Investor Protection on the Value of Investment Banking Relationships

As described in Section 3.2, we estimate ordinary least squares (OLS) regressions using the three-day CAR as the dependent variable. In all models, we control for the size, leverage, and book-to-market value of client firms and nine dimensions of institutional distance introduced by Berry et al. (2010). In addition, we control for aggregate economic and market conditions using client, target, and acquirer country GDP growth, as well as acquirer country, client industry, and year fixed effects. All standard errors are clustered by deal.

In column (1) of Table 2.4, the coefficient on ln(1+Issuance Count) is negative and statistically significant at the 5% level, while the coefficient on ln(1+M&A Count) is negative and insignificant. The negative coefficients indicate that client firms with a stronger reliance on IBs for issuance service that are acquired suffer a larger decrease in firm value upon announcement of the acquisition. There is a 0.81% decrease in the three-day CARs of client firms for each one unit increase in log issuance count. In column (2), we replace the count measures of client reliance on target IB with their value-based counterparts; the results are similar in both economic and statistical significance. These results are consistent with the empirical findings in Krigman, Shaw, and Womack (2001), Fernando, May, and Megginson (2012), and Borisov and Gao (2019). For our key variable of interest, Difference in Investor Protection (e.g., the difference of investor protection scores between the acquirer-IB country and the target-IB country), a one standard deviation increase in the difference is associated with a statistically significant 1.66% (0.0948*0.175) and 2.66% (0.1519*0.175) decrease in client CARs in the three days surrounding the merger announcement in columns (1) and (2), respectively. This result is consistent with the implication of Bebchuk and Neeman (2010), or our hypothesis 1, in which we posit a negative relationship between the relative strength of acquirer-IB and target-IB country-level investor protections and client firm announcement returns. On average, when a client firm's primary IB is acquired by an IB from a stronger investor protection country, client firms realize lower announcement returns.

In columns (3) and (4), we augment the baseline specifications in columns (1) and (2) to allow an interaction between the difference in investor protection variable and a dummy variable, Reputation (A>T), that equals one if the acquirer has a higher reputation rank than the target, and zero otherwise. The coefficients on the interaction term in columns (3) and (4) indicate that the three-day client firm CARs increase by 5.17% and decrease by 1.54%, respectively. This finding does not support hypothesis 2, which posits that IB underwriting reputation positively moderates the relationship between the relative strength of acquirer-IB and target-IB country-level investor protections and announcement returns.

Table 2. 4 The Effect of Investor Protection on the Value Effects of Investment Banking Relationships

This table presents OLS estimation results of analysis of the determinants of three-day CAR of client firms around the IB merger announcement date. The sample consists of all active clients of IBs involved in business combinations, i.e., mergers and acquisitions. A client firm is considered an active client if the firm used the IB's services within 5 years prior to the merger and did not switch to another IB for the same type (e.g., underwriting) of service prior to merger. Diff in Investor Protection is the difference of principal component of: (1) anti-director rights; (2) disclosure requirements; and (3) liability standards, between acquirers and targets. Reputation (A>T) is a dummy variable that equals one when the acquirer IB has a higher reputation ranking than the target IB one year prior to IB merger announcement date. The table reports coefficient estimates followed in parentheses by standard errors clustered at the merger deal. Detailed definitions and construction of the variables are provided in Appendix A. ***, **, and * indicate statistical significance at 1 %, 5%, and 10% levels, respectively.

	CAR (-1, +1)			
	（1）	（2）	（3）	（4）
ln (1+Issuance Value)		-0.0030***		-0.0030***
		(0.006)		(0.007)
ln (1+Issuance Count)	-0.0081**		-0.0081**	
	(0.040)		(0.040)	
ln (1+M&A Value)		-0.0019**		-0.0019**
		(0.037)		(0.037)
ln (1+M&A Count)	-0.0036		-0.0036	
	(0.244)		(0.239)	
Reputation (A>T)			-0.0013	-0.0014
			(0.874)	(0.873)
Diff in Investor Protection	-0.0948***	-0.1519***	-0.1093***	-0.1503***
	(<.001)	(<.001)	(<.001)	(<.001)
Diff in Investor Protection × Reputation			0.0517	-0.0154
			(0.233)	(0.820)
Book-to-Market	-0.0074***	-0.0078***	-0.0075***	-0.0078***
	(0.002)	(0.001)	(0.002)	(0.001)
Leverage	-0.0223**	-0.0227**	-0.0224**	-0.0228**
	(0.043)	(0.046)	(0.042)	(0.045)
Size	0.0025**	0.0038***	0.0025**	0.0038***
	(0.018)	(0.006)	(0.016)	(0.007)
Acquirer-Country GDP Growth	0.0051	0.0014	0.0059	0.0012
	(0.352)	(0.792)	(0.282)	(0.830)
Client-Country GDP Growth	0.0019	0.0010	0.0019	0.0010
	(0.446)	(0.698)	(0.433)	(0.699)
Target-Country GDP Growth	0.0072**	0.0017	0.0073*	0.0021
	(0.036)	(0.531)	(0.068)	(0.598)
Administrative Distance	-0.0018**	-0.0008	-0.0003	-0.0013
	(0.022)	(0.439)	(0.818)	(0.578)
Culture Distance	-0.0049	-0.0031*	-0.0069	-0.0030*
	(0.319)	(0.063)	(0.268)	(0.090)
Demographic Distance	0.0439	0.0821***	0.0400	0.0864***
	(0.162)	(<.001)	(0.261)	(<.001)
Economic Distance	-0.0026	0.0062	-0.0124	0.0064
	(0.740)	(0.585)	(0.275)	(0.647)
Financial Distance	-0.0159*	0.0483***	-0.0100	0.0449*
	(0.068)	(<.001)	(0.298)	(0.057)
Geographic Distance	0.000*	-0.000***	0.000	0.000
	(0.075)	(<.001)	(0.778)	(0.201)
Connectedness Distance	0.0188***	0.512***	0.0216**	0.0486***
	(0.008)	(<.001)	(0.011)	(0.006)
Knowledge Distance	-0.0012		-0.0002	
	(0.748)		(0.962)	
Political Distance	0.0171**		0.0224**	
	(0.024)		(0.021)	
Constant	0.0089	0.0036	0.0214	0.0034
	(0.824)	(0.878)	(0.551)	(0.888)
Acquirer-Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adj.R^2	.075	.080	.075	.080
Observations	2337	2245	2337	2245

2.4.3 Robustness Tests

For robustness, we repeat our baseline regressions with two alternative proxies for country-level investor protections: legal origin and the level of insider trading. All variables are measured as the difference between the country-level measures for the acquiring IB and the target IB.

In Table 2.5, we present the baseline result using Diff in Common Law Legal Origin, the difference in common law legal origin between the acquiring IB's and target IB's respective countries, as a proxy for investor protection. In column (2), there is a significantly negative effect on the client firm's three-day CAR if the acquiring IB is from a common law country and the target IB is not. Consistent with hypothesis 1 and the results using our main investor protection measure, there is a negative relationship between the relative strength of acquirer-IB and target-IB country investor protections and client firm announcement returns. After controlling for both the difference in common law legal origin and reputation rank between the acquiring IB and the target IB, the three-day announcement returns of client firms increase significantly by 4.24% in column (3) and does not change significantly in column (4). This finding is consistent with hypothesis 2, suggesting that underwriting reputation of IBs positively moderates the relationship between the relative strength of acquirer-IB and target-IB country-level investor protections and announcement returns. An acquisition by an IB with a higher underwriting reputation assuages any value lost by client firms as they switch to a stronger investor protection regime. In addition, we also conduct analysis using 7-day (-3, +3) and 11-day (-5, +5) event window and the results are consistent.

Table 2. 5 The Effect of Legal Origin on the Value Effects of Investment Banking Relationships

This table presents OLS estimation results of analysis of the determinants of three-day CAR of client firms around the IB merger announcement date. The sample consists of all active clients of IBs involved in business combinations, i.e., mergers and acquisitions. A client firm is considered an active client if the firm used the IB's services within 5 years prior to the merger and did not switch to another IB for the same type (e.g., underwriting) of service prior to merger. Reputation (A>T) is a dummy variable that equals one when the acquirer IB has a higher reputation ranking than the target IB one year prior to IB merger announcement date. Diff in Common Law Legal Origin is the difference in legal origin between acquiring IB country and target IB country. Country-level controls include the GDP Growth for the acquirer, target, and client firm countries. The table reports coefficient estimates followed in parentheses by standard errors clustered at the merger deal. Detailed definitions and construction of the variables are provided in Appendix A. ***, **, and * indicate statistical significance at 1 %, 5%, and 10% levels, respectively.

	CAR (-1, +1)			
	（1）	（2）	（3）	（4）
ln (1+Issuance Value)		-0.003***		-0.003***
		(0.007)		(0.007)
ln (1+Issuance Count)	-0.0081**		-0.0080**	
	(0.038)		(0.041)	
ln (1+M&A Value)		-0.0019**		-0.0019**
		(0.047)		(0.047)
ln (1+M&A Count)	-0.0037		-0.0035	
	(0.234)		(0.254)	
Reputation (A>T)			-0.0012	-0.0008
			(0.886)	(0.927)
Diff in Common Law Legal Origin	-0.0215	-0.1652	-0.0609***	-0.0270**
	(0.111)	(0.267)	(0.009)	(0.028)
Diff in Common Law Legal Origin			0.0424**	-0.0292
× Reputation (A>T)			(0.039)	(0.351)
Book-to-Market	-0.0074***	-0.0078***	-0.0075***	-0.0078***
	(0.002)	(0.001)	(0.002)	(0.001)
Leverage	-0.0219**	-0.0225**	-0.0222**	-0.0226**
	(0.046)	(0.047)	(0.044)	(0.046)
Size	0.0022**	0.0035**	0.0023**	0.0035**
	(0.031)	(0.012)	(0.027)	(0.012)
Acquirer-Country GDP Growth	0.0036	0.0026	0.0054	0.0025
	(0.564)	(0.706)	(0.433)	(0.716)
Client-Country GDP Growth	0.0019	0.0010	0.0020	0.0010
	(0.442)	(0.679)	(0.418)	(0.680)
Target-Country GDP Growth	0.0121**	0.0121*	0.0133**	0.0124*
	(0.034)	(0.052)	(0.042)	(0.073)
Administrative Distance	-0.0001	0.0052	0.0020	0.0003
	(0.954)	(0.380)	(0.169)	(0.806)
Culture Distance	-0.0012	0.0021	0.0001	-0.0019
	(0.808)	(0.473)	(0.986)	(0.376)
Demographic Distance	0.0008	0.0140	-0.0268	0.0114
	(0.974)	(0.370)	(0.367)	(0.487)
Economic Distance	0.0018	0.0016	-0.0121	0.0105
	(0.835)	(0.884)	(0.246)	(0.581)
Financial Distance	-0.0093	0.1264	0.0106	-0.001
	(0.388)	(0.345)	(0.418)	(0.870)
Geographic Distance	0.0000	-0.0001	-0.0000	
	(0.486)	(0.350)	(0.646)	
Connectedness Distance	0.0108		0.0059	
	(0.274)		(0.574)	
Knowledge Distance	-0.0015		-0.0038	
	(0.672)		(0.343)	
Political Distance	0.0032		0.0118	
	(0.645)		(0.152)	
Constant	0.0046	-0.0240	0.0177	-0.0244
	(0.912)	(0.430)	(0.597)	(0.433)
Acquirer-Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adj.R^2	.074	.078	.075	.078
Observations	2337	2245	2337	2245

In Table 2.6, we use country-level insider trading as a proxy for investor protections. Consistent with hypothesis 1 and the previous results, we find that client CARs around merger announcements are significantly and positively associated with a difference in the level of insider trading between acquirer and target IBs, which indicates that client firms with primary IBs acquired by IBs from countries with stronger (weaker) investor protection, and thus lower (higher) levels of insider trading, realize lower (higher) announcement returns. Like the result using our main investor protection variable, the coefficients on the interaction term in columns (3) and (4) are positive and insignificant.

Table 2. 6 The Effect of Insider Trading on the Value Effects of Investment Banking Relationships

This table presents OLS estimation results of analysis of the determinants of three-day CAR of client firms around the IB merger announcement date. The sample consists of all active clients of IBs involved in business combinations, i.e., mergers and acquisitions. A client firm is considered an active client if the firm used the IB's services within 5 years prior to the merger and did not switch to another IB for the same type (e.g., underwriting) of service prior to merger. Diff in Insider Trading is difference of the trading of stocks based on non-public information between acquirers and targets. Reputation (A>T) is a dummy variable that equals one when the acquirer IB has a higher reputation ranking than the target IB one year prior to IB merger announcement date. Client firm-level controls include size, leverage, and book-to-market. Country-level controls include the GDP Growth for the acquirer, target, and client firm countries. The table reports coefficient estimates followed in parentheses by standard errors clustered at the merger deal. Detailed definitions and construction of the variables are provided in Appendix A. ***, **, and * indicate statistical significance at 1 %, 5%, and 10% levels, respectively.

	CAR (-1, +1)			
	（1）	（2）	（3）	（4）
ln (1+Issuance Value)		-0.003***		-0.003**
		(0.006)		(0.007)
ln (1+Issuance Count)	-0.0081**		-0.0080**	
	(0.039)		(0.045)	
ln (1+M&A Value)		-0.0019**		-0.0019**
		(0.037)		(0.037)
ln (1+M&A Count)	-0.0038		-0.0037	
	(0.219)		(0.237)	
Reputation (A>T)			-0.0018	-0.0014
			(0.825)	(0.873)
Diff in Insider Trading	0.0417***	0.0486***	0.0421***	0.0481***
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Diff in Insider Trading × Reputation			0.0060	0.0049
			(0.543)	(0.820)
Book-to-Market	-0.0074***	-0.0078***	-0.0074***	-0.0078***
	(0.002)	(0.001)	(0.002)	(0.001)
Leverage	-0.0221**	-0.0227**	-0.0222**	-0.0228**
	(0.044)	(0.046)	(0.043)	(0.045)
Size	0.0024**	0.0038***	0.0025**	0.0038***
	(0.018)	(0.006)	(0.018)	(0.007)
Acquirer-Country GDP Growth	0.0025	0.0014	0.0027	0.0012
	(0.615)	(0.792)	(0.599)	(0.830)
Client-Country GDP Growth	0.0017	0.0010	0.0018	0.0010
	(0.479)	(0.698)	(0.470)	(0.699)
Target-Country GDP Growth	0.0039	0.0017	0.0042	0.0021
	(0.164)	(0.531)	(0.226)	(0.598)
Administrative Distance	0.0006	0.0023*	0.0014	0.0028
	(0.394)	(0.058)	(0.349)	(0.273)
Culture Distance	-0.0047	-0.0028*	-0.0045	-0.0028
	(0.336)	(0.092)	(0.402)	(0.104)
Demographic Distance	0.0038	-0.0378***	-0.0063	-0.0412**
	(0.885)	(0.003)	(0.814)	(0.027)
Economic Distance	0.0010	0.0127	-0.0040	0.0073
	(0.875)	(0.277)	(0.732)	(0.774)
Financial Distance	-0.0206**	-0.025***	-0.0172*	-0.0205
	(0.019)	(0.001)	(0.067)	(0.358)
Geographic Distance	-0.0000	0.0000	-0.0000	-0.0000
	(0.843)	(0.685)	(0.678)	(0.916)
Connectedness Distance	0.0339***	0.0309***	0.0370***	0.0355*
	(<0.001)	(<0.001)	(<0.001)	(0.094)
Knowledge Distance	0.0033		0.0030	
	(0.403)		(0.496)	
Political Distance	0.0013		0.0020	
	(0.798)		(0.766)	
Constant	0.0240	0.0036	0.0253	0.0034
	(0.542)	(0.878)	(0.521)	(0.888)
Acquirer-Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adj.R^2	.075	.080	.076	.080
Observations	2337	2245	2337	2245

We further categorize IBs based on their investor protection score into two groups, above median (high) investor protection and below median (low) investor protection. We then create two indicator variables High Acquirer IP & Low Target IP and Low Acquirer IP & High Target IP. High Acquirer IP & Low Target IP is a dummy variable that equals one if the acquirer is from a country with above median investor protection and the target is from a country with below median investor protection, and zero otherwise. Low Acquirer IP & High Target IP is a dummy variable that equals one if the acquirer is from a country with below median investor protection and the target is from a country with above median investor protection, and zero otherwise. Table 2.7 presents the results of these alternate categorizations of country-level investor protections. The coefficient estimate on High Acquirer IP & Low Target IP is significant and negative in all four columns; this is consistent with hypothesis 1, which suggests that when an acquirer IB is based in a country with stronger investor protections than the target IB, client firms realize lower announcement returns upon announcement of the acquisition. The interaction term between High Acquirer IP & Low Target IP and Reputation (A>T) is significant and positive in both column (3) and (4), indicating that if the acquirer-IB has a stronger reputation ranking relative to the target-IB, this reputation effect mitigates the effect of differences in investor protection and insider trading on three-day client CARs. Results presented in Table 8 show that the coefficient estimates on Low Acquirer IP & High Target IP are positive and significant in all four columns. This is consistent with Table 7, which suggests that when an acquirer IB is based in a country with low investor protections than the target IB, client firms realize higher announcement returns upon announcement of the acquisition.

Table 2. 7 The Effect of Investor Protection on the Value Effects of Investment Banking Relationships

This table presents OLS estimation results of analysis of the determinants of three-day CAR of client firms around the IB merger announcement date. The sample consists of all active clients of IBs involved in business combinations, i.e., mergers and acquisitions. A client firm is considered an active client if the firm used the IB's services within 5 years prior to the merger and did not switch to another IB for the same type (e.g., underwriting) of service prior to merger. Reputation (A>T) is a dummy variable that equals one when the acquirer IB has a higher reputation ranking than the target IB one year prior to IB merger announcement date. High Acquirer IP & Low Target IP is a dummy that equals one if the acquirer is from an above median investor protection country and the target is from a below median investor protection country, and zero otherwise. The table reports coefficient estimates followed in parentheses by standard errors clustered at the merger deal. Detailed definitions and construction of the variables are provided in Appendix A. ***, **, and * indicate statistical significance at 1 %, 5%, and 10% levels, respectively.

	CAR (-1, +1)			
	（1）	（2）	（3）	（4）
ln (1+Issuance Value)		-0.002**		-0.002**
		(0.013)		(0.013)
ln (1+Issuance Count)	-0.008**		-0.008**	
	(0.039)		(0.035)	
ln (1+M&A Value)		-0.001*		-0.002*
		(0.075)		(0.072)
ln (1+M&A Count)	-0.0037		-0.0043	
	(0.229)		(0.173)	
Reputation (A>T)			-0.0020	-0.0020
			(0.810)	(0.811)
High Acquirer IP & Low Target IP	-0.0555***	-0.0598***	-0.0597***	-0.0635***
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
High Acquirer IP & Low Target IP × Reputation			0.0696***	0.0570***
			(0.002)	(0.001)
Book-to-Market	-0.0074***	-0.0075***	-0.0074***	-0.0075***
	(0.002)	(0.002)	(0.002)	(0.002)
Leverage	-0.0222**	-0.0221**	-0.0224**	-0.0223**
	(0.044)	(0.043)	(0.043)	(0.042)
Size	0.0025**	0.0033***	0.0026**	0.0034***
	(0.017)	(0.006)	(0.014)	(0.005)
Acquirer-Country GDP Growth	0.0036	0.0026	0.0037	0.0027
	(0.473)	(0.592)	(0.463)	(0.588)
Client-Country GDP Growth	0.0018	0.0017	0.0018	0.0017
	(0.467)	(0.480)	(0.473)	(0.484)
Target-Country GDP Growth	0.0048*	0.0039	0.0046	0.0038
	(0.094)	(0.144)	(0.175)	(0.246)
Administrative Distance	-0.0002	-0.0000	-0.0003	-0.0001
	(0.747)	(0.962)	(0.634)	(0.869)
Culture Distance	-0.0003	0.0003	-0.0009	-0.0001
	(0.947)	(0.946)	(0.857)	(0.990)
Demographic Distance	0.0022	-0.0036	0.0032	-0.0036
	(0.932)	(0.898)	(0.917)	(0.912)
Economic Distance	0.0045	0.0036	0.0006	0.0004
	(0.446)	(0.537)	(0.924)	(0.947)
Financial Distance	-0.0090	-0.0069	-0.0124	-0.0098
	(0.302)	(0.449)	(0.157)	(0.291)
Geographic Distance	0.0000	0.0000	0.0000	0.0000
	(0.231)	(0.270)	(0.174)	(0.217)
Connectedness Distance	0.0176***	0.0184***	0.0149**	0.0163**
	(0.009)	(0.009)	(0.027)	(0.019)
Knowledge Distance	-0.0012	-0.0017	-0.0010	-0.0017
	(0.735)	(0.650)	(0.814)	(0.708)
Political Distance	0.0020	0.0020	0.0049	0.0043
	(0.705)	(0.715)	(0.391)	(0.469)
Constant	-0.0375	-0.0106	-0.0377	-0.0088
	(0.427)	(0.800)	(0.429)	(0.835)
Acquirer-Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adj.R^2	.075	.077	.076	.077
Observations	2337	2337	2337	2337

Table 2. 8 The Effect of Investor Protection on the Value Effects of Investment Banking Relationships

This table presents OLS estimation results of analysis of the determinants of three-day CAR of client firms around the IB merger announcement date. The sample consists of all active clients of IBs involved in business combinations, i.e., mergers and acquisitions. A client firm is considered an active client if the firm used the IB's services within 5 years prior to the merger and did not switch to another IB for the same type (e.g., underwriting) of service prior to merger. Reputation (A>T) is a dummy variable that equals one when the acquirer IB has a higher reputation ranking than the target IB one year prior to IB merger announcement date. Low Acquirer IP & High Target IP is a dummy that equals one if the acquirer is from a below median investor protection country and the target is from an above median investor protection country, and zero otherwise. The table reports coefficient estimates followed in parentheses by standard errors clustered at the merger deal. Detailed definitions and construction of the variables are provided in Appendix A. ***, **, and * indicate statistical significance at 1 %, 5%, and 10% levels, respectively.

	CAR (-1, +1)			
	（1）	（2）	（3）	（4）
ln (1+Issuance Value)		-0.0024**		-0.0024**
		(0.013)		(0.013)
ln (1+Issuance Count)	-0.0081**		-0.0081**	
	(0.039)		(0.039)	
ln (1+M&A Value)		-0.0014*		-0.0014*
		(0.075)		(0.076)
ln (1+M&A Count)	-0.0038		-0.0038	
	(0.224)		(0.225)	
Reputation (A>T)			-0.0018	-0.0018
			(0.831)	(0.829)
Low Acquirer IP & High Target IP	0.0543***	0.0585***	0.0602***	0.0641***
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Low Acquirer IP & High Target IP × Reputation			-0.0087	-0.0082
			(0.573)	(0.589)
Book-to-Market	-0.0074***	-0.0075***	-0.0074***	-0.0075***
	(0.002)	(0.002)	(0.002)	(0.002)
Leverage	-0.0222**	-0.0221**	-0.0223**	-0.0222**
	(0.044)	(0.043)	(0.043)	(0.042)
Size	0.0025**	0.0033***	0.0025**	0.0034***
	(0.017)	(0.006)	(0.017)	(0.006)
Acquirer-Country GDP Growth	0.0032	0.0022	0.0033	0.0023
	(0.527)	(0.659)	(0.511)	(0.648)
Client-Country GDP Growth	0.0018	0.0017	0.0018	0.0017
	(0.474)	(0.487)	(0.473)	(0.485)
Target-Country GDP Growth	0.0050*	0.0041	0.0052	0.0043
	(0.092)	(0.140)	(0.146)	(0.209)
Administrative Distance	-0.0011*	-0.0010	-0.0011*	-0.0010
	(0.077)	(0.117)	(0.074)	(0.117)
Culture Distance	0.0009	0.0016	0.0013	0.0020
	(0.847)	(0.747)	(0.800)	(0.714)
Demographic Distance	-0.0032	-0.0094	-0.0066	-0.0128
	(0.903)	(0.740)	(0.828)	(0.692)
Economic Distance	0.0113*	0.0108*	0.0118**	0.0113*
	(0.059)	(0.065)	(0.049)	(0.059)
Financial Distance	-0.0115	-0.0095	-0.0109	-0.0090
	(0.195)	(0.304)	(0.209)	(0.323)
Geographic Distance	0.0000	0.0000	0.0000	0.0000
	(0.102)	(0.122)	(0.134)	(0.161)
Connectedness Distance	0.0229***	0.0241***	0.0227***	0.0239***
	(0.001)	(0.001)	(<0.001)	(<0.001)
Knowledge Distance	-0.0034	-0.0041	-0.0038	-0.0045
	(0.342)	(0.292)	(0.370)	(0.325)
Political Distance	-0.0027	-0.0030	-0.0030	-0.0034
	(0.601)	(0.575)	(0.598)	(0.572)
Constant	-0.0363	-0.0091	-0.0313	-0.0043
	(0.441)	(0.828)	(0.493)	(0.916)
Acquirer-Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adj.R^2	.075	.077	.076	.077
Observations	2337	2337	2337	2337

2.5 Conclusions

In this paper, we examine the role of country-level investor protection on the value of relationships between IBs and client firms by using cross-country acquisitions between IBs as external shocks to these relationships. Using an event-study approach, we document evidence consistent with implications of Bebchuk and Neeman (2010) that the clients of target IBs acquired by IBs from stronger (weaker) investor protection countries realize lower (higher) announcement returns. This is primarily due to the substitutive relationship between country-level investor protections and IB-level monitoring. The results are robust using two additional proxies for investor protection, including common law legal origin and insider trading. In addition, we find that the underwriting reputation of the IB banks positively moderates the relationship between the relative strength of acquirer-IB and target-IB country investor protections and announcement return when using legal origin as the proxy for investor protections. Overall, our analysis highlights the economic role of country-level investor protections on the value of relationships between IBs and client firms. Practically, the study can provide more historical information to both institutional and non-institutional investors who may have more interest to track M&A activities of investment banks as well as stay active on stock market. It can also introduce investment bankers and/or managers the possible and imminent stock reaction upon a cross-border merger and acquisition. However, our study is subject to limitations. One is that due to the availability of database, our data is not up to date. Another is that the data is not strongly balanced. Last not least, we cannot eliminate any potential information flow prior to the announcement of M&A.

This chapter also provide a few avenues for future research. First, one can consider family firms as subject of such study, because the unique governance and goal of family business may interact with local laws and regulations. Another approach is to include more international event such as joint venture announcement which is similar to merger and acquisitions and also involves local regulations.

2.6 Appendix A: Variable Definitions

Variables	Description
CAR (-1, +1)	Cumulative abnormal return of the client firm one day before and after the IB merger announcement date. Source: CRSP and Eventus
Issuance (M&A) Count	Number of equity and bond underwriting (M&A advisory) services an IB provided to a client firm during the five years prior to the IB merger event. Source: SDC
Issuance (M&A) Value	Cumulative total dollar value (in millions) of transactions of all the equity and bond underwriting (M&A advisory) services an IB provided to a client firm during the five years prior to the IB merger event. Source: SDC
ln(1+Issuance Count)and ln(1+M&A	Natural logarithm of one plus the total number of underwriting services (and M&A advising) a client firm received from all IBs during the five years prior to the IB merger announcement date.
ln(1+ Issuance Value) and ln(1+M&A	Natural logarithm of one plus the total value of underwriting (and M&A) transactions (in millions) a client firm received from all IBs during the five years prior to the IB merger announcement date.
Investor protection	Principal component of the indices of disclosure requirements, liability standards, and anti-director rights. Scale from 0 to 10, with lower scores representing lower investor protection. Source: La Porta et al. (2006)
Common Law Legal Origin	A dummy variable that equals one if the country has a common law legal origin, and zero otherwise. Source: La Porta et al. (2008).
Insider Trading	A measure of insider trading, ranging from one (low level of insider trading) to seven (high level of insider trading). Source: World Economic Forum's Global Competitiveness Report.
Diff in Investor Protection	The difference in country-level investor protection between acquiring IBs and the target IBs (acquirer minus target).
Diff in Common Law Legal Origin	The difference in legal origin between acquiring firms and target firms (acquirer minus target). Equals one if acquiring firm's country has a common law legal origin and target firm's country has a civil law legal origin; equals zero if the
Diff in Insider Trading	The difference in country-level insider trading score between acquiring IBs and the target IBs (acquirer minus target).
Reputation (A>T)	A dummy variable that equals one when the acquirer IB has a higher reputation ranking than the target IB one year prior to IB merger announcement date. Underwriter reputation of IBs are ranked on a scale from 0 to 9, with 9 being the
Book-to-Market Ratio	We follow the definition in Fama and French (2008). Book value is lagged total assets (Compustat Data Item 6) for year t-1, plus balance sheet deferred taxes and investment credit (35) if available, minus liabilities (181), preferred stock

Size	Natural logarithm of total assets (Compustat Data Item 6) of the client firm one year prior to the IB merger announcement date.
Leverage	The ratio between book value of debt and total assets. Book value of debt is the sum of total long-term debt (Compustat Data Item 9) and total debt in current liabilities (34).
GDP Growth	Annual percentage GDP growth rate calculated using market prices based on local currencies. Source: World Bank.
High Acquirer IP & Low Target IP	A dummy that equals one if the acquirer is from an above median investor protection country and the target is from a below median investor protection country, and zero otherwise.
Low Acquirer IP & High Target IP	A dummy that equals one if the acquirer is from a below median investor protection country and the target is from an above median investor protection country, and zero otherwise.
Administrative Distance	The administrative distance between the acquirer and target country (Berry et al.,2010). Source:http://lauder.wharton.upenn.edu/ciber/faculty_research.asp.
Cultural Distance	The cultural distance between the acquirer and target country (Berry et al., 2010). Source:http://lauder.wharton.upenn.edu/ciber/faculty_research.asp.
Demographic Distance	The demographic distance between the acquirer and target country (Berry et al., 2010). Source:http://lauder.wharton.upenn.edu/ciber/faculty_research.asp.
Economic Distance	The economic distance between the acquirer and target country (Berry et al., 2010). Source:http://lauder.wharton.upenn.edu/ciber/faculty_research.asp.
Financial Distance	The financial distance between the acquirer and target country (Berry et al., 2010). Source:http://lauder.wharton.upenn.edu/ciber/faculty_research.asp.
Geographic Distance	The geographic distance between the acquirer and target country (Berry et al., 2010). Source:http://lauder.wharton.upenn.edu/ciber/faculty_research.asp.
Connectedness Distance	The connectedness distance between the acquirer and target country (Berry et al., 2010). Source:http://lauder.wharton.upenn.edu/ciber/faculty_research.asp.
Knowledge Distance	The knowledge distance between the acquirer and target country (Berry et al., 2010). Source:http://lauder.wharton.upenn.edu/ciber/faculty_research.asp.
Political Distance	The political distance between the acquirer and target country (Berry et al., 2010). Source:http://lauder.wharton.upenn.edu/ciber/faculty_research.asp.

Chapter 3 The Regulatory Effect on the Difference of Investment Efficiency Between Family and non-Family Firms: An International Scope

3.1 Introduction

Investment can be an essential activity for a company for it allocates available resources and is directly related to firm performance metrics such as increasing profits, controlling risks, business development, survival, and valuation (Mao et al., 2019). In a perfect capital market with no frictions, there is no taxes and information asymmetry, and thus firms would be expected to achieve an optimal investment level (Modigliani & Miller, 1958). However, it is commonly acknowledged that such a frictionless world does not exist, and investments would not always be efficient. Inefficient investments can be categorized as either overinvestment or under-investment. Overinvestment refers to a company investing in many projects even with the net present value less than zero, whereas underinvestment refers to a company giving up investing in projects with the net present value bigger than zero. Although a company may expand by over-investing, it may easily suffer from such investment due to the negative net present value, and consequently, its value and profitability can deteriorate. On the other hand, underinvestment may prevent a company from growing, for it forfeits the potential addition of the positive net present value, which can result in a stagnation of its growth (Biddle et al., 2009). In either case, the distortion from optimal levels of investment can be a waste of capital resources and detrimental to the development, profitability, and growth of a company.

Although the issue of investment inefficiency is universal for almost all firms, there are some distinctions between comparable subjects such as family firms and non-family firms. Most firms — majority public ones rather than private ones worldwide — are owned and controlled by the founder or by their families (Anderson et al., 2003). Many scholars find that in Asia, Africa, the Middle East, and Latin America, majority of the public firms are indeed controlled by families. In the U.K. and U.S., some of the largest public firms (e.g., Walmart) are also controlled by families (Burkart et al., 2003). On the same stream, Gómez-Mejía et al. (2003) note that around 35 percent of Fortune 500 firms are

largely controlled by families. Faccio et al. (2001) find that 38 percent of firms in Asia and 43 percent of firms in Europe are family businesses.

Empirically, much evidence indicates that family firms are different from non-family firms regarding corporate decisions (Bennedsen et al., 2019) and information disclosure (Ali et al., 2007; Chen et al., 2014). As an example, within family firm the agency conflict between principal and manager could be mitigated, and the information asymmetry could be reduced as well due to the alignment of interest between family owner and family manager (Jensen & Meckling, 1976). During the past a few decades, several theories have been discovered regarding differentiations between family firms and non-family firms, one of which is the socioemotional wealth theory (SEW). According to SEW, the economic profit is not always the primary goal or source of utility for a family firm. These family firms are also driven by other nonpecuniary stimuli such as maintained power (Schulze et al., 2003), the need and sense of belonging and intimacy within the firm, the reputation of their family, the preservation of a dynasty and social capital of the family (Casson, 1999), and altruism towards family members (Gómez-Mejía et al., 2007).

Extensive research discover that SEW represents the main consideration regarding the corporate decisions of a family firm, because those families are more likely to view the preservation of SEW as their priority (e.g., Berrone et al., 2010; García-Sánchez et al., 2020). For instance, family firms are characterized by frequent communication among their members (McCollom, 1998). Casson (1999) echoed such evidence by arguing that founders of family firms see their firm as an asset for descendants to inherit instead of wealth they can enjoy. Chua et al. (1999) argued that family firms pursue a long-term vision by developing their firm to contribute to a better future. Therefore, firm survival is a vital concern for families (Anderson & Reeb, 2003). Berrone et al. (2010) study Spanish olive oil mills and find that family-controlled firms, compared to non-family ones, are far more likely to stay in control rather than cooperating with another firm due to the potential loss of socioemotional wealth. Family firms are long-run oriented when making strategies in order to prolong family control

and dynasty (Gómez-Mejía et al., 2011; De Massis et al., 2015). Burkart et al. (2003) argue that the amenity of family members working in a family firm does not come from the financial profit but from the intimacy among them. Family firms tend to retain their control and are inclined to reject external capital due to the potential threats to this control (Shahzad et al., 2019).

Building on prospect theory (Kahneman & Tversky, 1979), behavioral agency theory states that the decision-making process is a problem-framing issue that can be a comparison between potential gains and potential losses. It also proposes that family decision-makers prefer to avoid loss to preserve accumulated socioemotional wealth, exemplified by promoting long-term business operations even if this means accepting a high risk (Wiseman & Gómez-Mejía, 1998; Gómez-Mejía et al., 2007). However, such a determination to preserve could lead to potential harm befalling family firms. The controlling family may take advantage of their power to extract private benefits at the expense of minority shareholders (Bertrand et al., 2002). Gómez-Mejía et al. (2001) empirically show, however, that the desire to preserve socioemotional wealth can lead to entrenchment. Lubatkin et al. (2006) find that altruism among family members could create unique agency problems inside a family firm. Families are willing to give up good investment opportunities to remain in control (Shahzad et al., 2019). All the aforementioned evidence is a supplement to the proposition that family firms are very likely to choose suboptimal investments. A good regulatory environment is essential for entrepreneurial firms to survive and develop. La Porta et al. (1998) discover that the legal system can limit the scope within which the entrepreneurial firms adopt and comply the corporate governance and then operate. Anderson et al. (2012) posits that domestic culture and law are important factors determining corporate governance, as well as the behavior of investors and stakeholders. Li and Moosa (2014) show that higher regulation aids in reducing operational losses. Boadi and Amegbe (2017) conclude that country-level governance quality significantly impacts international stock market performance. In this study, we attempt to uncover the joint effects of family control and the country-level regulatory quality on the investment efficiency of public firms, using composite governance

indicators for over 200 countries collected by the World Bank (Kaufmann et al., 2010). These indicators are directly relevant to risk-taking behavior, and consequently the investment efficiency of a firm, because they constitute a measure of law and order as well as that of regulatory quality. Such joint effect can help us discover the functions the country-level regulatory environment serves to either deteriorate the relationship between family control and investment efficiency or ameliorate it.

To our knowledge, research examining the relationship between corporate investment efficiency and family firms is very limited. Connelly (2016) studied investment policy of family firms in Thailand. Xu et al. (2013) studied Chinese firms and found Chinese family firms tend to under-invest. Gao et al. (2017) examined whether a family CEO in a private firm benefits investment efficiency, given uncertainty. Shahzad et al. (2019) focused on the mechanism of family's ownership and financial reporting quality on investment efficiency in the Pakistani market. The distinguishing trait of our study is that we explore more theories from multiple areas to compare both underinvestment and overinvestment for both family and non-family firms, such as SEW theory, behavioral agency theory, and resource-based theory. Our sample includes public companies across many countries and jurisdictions encompassing both developed and emerging markets. In addition, we investigate the joint effect of regulatory environment and family control. Thus, our study contributes to the application of theories, corporate governance, family business, as well as how international regulation can affect firm policy.

3.2 Theoretical Foundation and Hypothesis Development

3.2.1 Investment Efficiency and Family Firms

Ideally, in perfect capital markets without frictions, there are no taxes, no information asymmetry, no moral hazard problems, and there is no difference in marginal product of capital or amongst projects in the economy. However, it is commonly realized that such a frictionless world does not exist and thus such tangible frictions will lead to investment inefficiency, which could stem from

information asymmetry (Stein, 2001) between company managers and outside suppliers, and results in adverse selection and moral hazard, both of which are the cause of inefficient investment — either a deviation upward or downward from the optimal level.

On one hand, according to the adverse selection argument, managers are usually better informed than outsiders regarding the intrinsic value of the firm and future development opportunities. Therefore, they may choose to issue equities when the firm is overvalued. When firm managers are better informed than investors about a firm's future progress, they may choose to sell equities at an excessive price. If successful, they would probably overinvest the proceeds gained (Baker et al., 2003). Managers, however, may underinvest due to insufficient funds if the investors behave differently from what managers anticipate (Lambert et al., 2007). On the other hand, moral hazard theory implies that when managers and outside investors do not see parallel on their interests, managers may develop an incentive to make sub-optimal investments to maximize their personal welfare (e.g., empire building) or to be risk averse and purse a quiet life (Jensen, 1986). Moreover, moral hazard can also lead to over or underinvestment based upon the capital resources of a firm (Biddle et al., 2009). For example, if a firm has extensive resources for different projects, the manager tends to excessively over-invest. If the outside suppliers, however, realize this or try to prevent the manager from doing it, they can impose restriction on the usage of the capital, resulting in underinvestment (Stiglitz & Weiss, 1981; Lambert et al. 2007).

Unlike non-family firms, family firms position socioemotional wealth (i.e., family identity, family bonding, transgenerational control, family reputation, etc.) as the priority over financial gains, and thus they make operational and investment decisions rooted in such a mentality (Berrone et al., 2012; Chrisman & Patel, 2012). The SEW theory also assumes that goals of families are defined and stimulated by accumulating endowment (Gómez-Mejía et al., 2000). The SEW theory also contends that family firms consider the preservation of SEW as the reference point when making strategic decisions (Gómez-Mejía et al., 2014; Chrisman & Patel, 2012). Therefore, family firms are inclined to

maintain family control rather than avoiding risk of undesired performance or even a financial loss (Gómez-Mejía et al., 2007; Berrone et al., 2012). Since family executives, in general, are the ones who make investment decisions, it is likely that they may invest in a way such that the control is still in their hands, and at the same time they enjoy private benefits in the form of perks and expropriations, leading to suboptimal investments.

Furthermore, in family firms, information asymmetry and moral hazard problems could be mitigated (e.g., Zahra, 2003). Particularly, in family firms the interests of the owner and manager are aligned (Jensen & Meckling, 1976; Salvato & Moores, 2010). Such alignment of interests stems from the shared view of the long-run horizons and reputational concerns (Fama, 1980; Stein, 1989; Chen et al., 2008). Family managers and owners see their business as an asset of their own and ideas and perspectives can be exchanged more often, and thus less of an information gap would be present in family firms; agency problems are less pronounced in family firms compared to non-family firms, too (Ali et al., 2007). There is, however, an emotional and intimate perspective of the story being ignored. As Schulze et al. (2001) and Berrone et al. (2012) argue, the underlying assumption that family members do not pursue personal goals should be recalculated, which is to say, it is very likely that family members with power choose to sacrifice the firm's wealth or make bad decisions to achieve their own private benefits. Plus, the entrenchment perspective implies that family members who have high cashflow rights (Anderson & Reeb, 2003; Cascino et al., 2010) can result in expropriating the wealth of minority or atomistic shareholders such as undistributed retained earnings, or in the form of nepotism or hiring another family member (Shleifer & Vishny, 1997; Schulze et al., 2003; Morck et al., 2005). Similarly, family members may abuse their power for private information to overinvest or under-invest, or to secretly divert wealth from non-family stakeholders. Gómez-Mejía and Becerra (2010) also discover that managerial entrenchment in family firms is shielded by protections because of family bonding. Gómez-Mejía et al. (2001) provide evidence along this line and show that agency problems resulting from entrenchment maybe worse in family firms than in nonfamily firms.

According to the behavioral agency model, the preference of an individual to make decision is based upon problem framing and loss aversion (Kahneman et al., 1991; Wiseman & Gómez-Mejía, 1998). Decision-makers choose avoiding a loss and taking a risk rather than avoiding a risk but taking a loss. Namely, loss aversion weighs more than risk aversion, especially for family firms because their socioemotional wealth is at risk. Problem framing, in the context of family business, also refers to the gain or loss of socioemotional wealth (Gómez-Mejía et al., 2007). Both standpoints indicate that family firms are more loss averse than non-family firms due to the desire to maintain the success of the family name and control, as well as to preserve the family reputation or dynasty (Gómez-Mejía et al., 2010). Furthermore, myopic loss aversion — derived from Benartzi and Thaler (1995)—acknowledges that intertemporal consideration is necessary to evaluate a project or make an investment decision (Chrisman & Patel, 2012).

Since the individuals are presumed to be loss averse and would take problem framing into consideration, they would value their decisions as one between certain and potential loss to wealth, rather than one between certain and potential gain, and so avoiding losses becomes their primary goal. Maintaining the family dynasty and transgenerational control are essential for long-term growth. Family firms are inclined to advance socioemotional wealth in the long run, even if it may harm their wealth in the short run (Chrisman & Patel, 2012). Family members are likely to be altruistic and trustworthy towards each other (Schulze et al., 2003, Berrone et al., 2010). Unlike nonfamily firms, however, such intimacy between family members may be detrimental to the firm due to unwillingness to resolve a conflict or punish one another when they do not reach an agreement or even when one makes a wrong decision, for the family may prioritize harmony over other things (Berrone et al., 2012). In fact, there is evidence that shows family firms are underperforming firms. Morck et al. (2005) reviewed studies of corporate governance and find family leading can result in inefficiencies. Perrow (1972) concludes that family firms are inherently inefficient. Faccio et al. (2001) also note that family firms are relatively poor performers due to the attempt of managing and controlling by families.

One characteristic of family firms is that a family manager can behave more as a steward than an agent. Chrisman et al. (2005) shows that stewardship implies the accordance between family owners and managers to treat the interests of the firm and each other as their own. Chrisman et al. (2007) propose that stewardship theorists argue that the interests of family managers and owners would be in line if company manager is inclined to pursue the interests of owners. When family managers derive their value from executing family business, they tend to act as stewards (Davis et al., 1997), instead of pursuing opportunistic or personal benefits (Fama & Jensen, 1983; Pearce & Zahra, 1991). Another trait of family firms is altruism, which derives from the field of economics. In family firms, this presents as intra-family nonpecuniary reciprocity regardless of the financial contribution to the company. In other words, family members tend to support and take care of each other even if such behavior may be detrimental to the performance of their company. Family members, therefore, due to family bonding are reluctant to impose monitoring or punishments on one another when they are supposed to, both of which may result in free riding of family agents or even entrenchment (Schulze et al., 2001). Schulze et al. (2001, 2003) show how such altruism in family firms can cause agency problems and free riding within family firms. Etzioni (1961) contends that an altruistic relationship can also cause self-interest in a family firm, and family members may intensify such self-interest, regardless of its harmfulness to the family firm such as spendthrift firm assets, prerequisites, and shirking (Dyer, 2016). Particularly, Gómez-Mejía et al. (2001) find that the Spanish family firms choose to keep family CEO regardless of the performance, but when the family CEO is replaced by an outsider, their performance significantly improved. Villalonga and Amit (2006) intuit a substantial under-performance of family firms when family heirs are appointed to a crucial position. Pérez-González (2006) reports a significant decline in firm valuation, too, when a family firm experiences the same appointment.

Simon and Hitt (2003) conclude that the distinction between family firms and non-family firms can also be manifested in the five capitals, some of which are mixed with both positive and negative

effects. The first is human capital, which includes learned knowledge and skills, as well as one's ability to act distinctly. The positive side is an extraordinary commitment to a warm, friendly, and intimate relationship, which refers to the dual role — both professional and personal — of family members in their family business. These effects can motivate family members to devote more time to their business through more communication, even when off duty. The negative effect is that it is a struggle for a family business to hire a professional manager. Another aspect mixed with opposite effects is social capital, an inherent trait within family firms which covers the legitimacy of bonding and connecting with social capital, and yet, is also bounded by close networks. To put it another way, it is common for family firms to develop and maintain only certain business partners with whom they can potentially share the same goals, ideas, and languages. Moreover, patient financial capital, defined by immunity to the threat of liquidating financial capital from family firm investments, can positively contribute to the effectiveness of managing the capital of the firm. It can, however, be exclusive to certain groups of outside investors who prefer a long horizon investment return. These raise our first research question:

Research question 1: Compared to non-family firms, would family firms invest more efficiently or less efficiently?

3.2.2 Role of Family Ownership

The percentage of family ownership can be taken as a theoretical driver of SEW (Schulze & Kellermanns, 2015). For instance, the survival of business is an important concern for firms, especially for family ones, and thus it is not surprising that family ownership can influence strategic decisions in a family firm. When there is a higher concentration of family ownership, family members would probably have greater incentives to pursue an optimal investment strategy, as their decisions now have more notable influences on their wealth.

Furthermore, Ali et al. (2007) and Anderson et al. (2009) provide evidence that the alignment of interest between families and minority shareholders can be improved with a higher concentration of ownership due to reinforcement of the stewardship and long-term devotion to their firm (Demsetz & Lehn, 1985; Zellweger, 2007) and effective restrictions on the potential extraction of private benefits (Claessens & Fan, 2002; Zhang et al., 2017). Goergen and Renneboog (2001) conclude that in the developed market, ownership structure influences investment patterns or expenditures. They studied the U.K. market and found that higher levels of managerial ownership result in fewer inefficient investments. Basu et al. (2009) test M&As in the U.S. market and find that acquirers with higher level of family ownership outperform those with lower level of family ownership. In addition, La Porta et al., (2002) discovered that increasing degrees of equity concentration may reduce the agency problem of separation between ownership and control.

On the other side of the coin, with a lower ownership, a family manger may choose to under-invest, or not invest at all due to risk aversion, to reduce the volatility of incomes and to secure their position. Conversely, they may also choose to overinvest and extract extra private benefits. Since all the private benefits go to the family rather than minority shareholders or atomistic investors, inefficient investment would be a more likely decision with a lower concentration of family ownership (Connelly, 2016). Nevertheless, the conflict of interest between major and minor shareholders may be more pronounced (Claessens et al., 2002) and result in expropriation of firm value by majority shareholders, or a principal-principal conflict (Luo et al., 2019). Prencipe et al. (2008) and Porta et al. (1999) also argue that asymmetric information would still be present in family firms between family members and minority shareholders in the form of misrepresentation of performance and concealing transactions, and thus over- and under-investments (i.e., investment inefficiency) would be higher in family firms than in non-family firms. Thus, we raise our second research question:

Research question 2: Would family firm's investment efficiency be improved with higher family ownership?

3.2.3 Moderating Role of Female Board Directorship

It has been extensively concluded that gender diversity on the board is beneficial to a firm. Generally, for example, it can introduce alternative stakeholders' views (Westphal et al., 2000), improve the legitimacy of decisions and actions (Hillman et al., 2007), enhance the efficacy of management (Javidan et al., 2016; Poletti-Hughes & Briano-Turrent, 2019), advocate better board monitoring and shareholder protection (Adams & Ferreira, 2009; Hoever et al., 2012), improve the quality of board advice (Amore et al., 2014), uphold the code of ethical conduct (Ibrahim et al., 2009; Cumming et al., 2015), and help firms resolve complicated issues more prudently (Kramer et al., 2006). One of the sources of these benefits can be attributed to the different preferences of riskiness between men and women. Empirically, both finance and psychology literature conclude that women are more risk-averse, and thus, they prefer less risky and more conservative financial decisions compared to men (Croson & Gneezy, 2009; López-Delgado & Diéguez-Soto, 2020). In the same vein, Jianakoplos and Bernasek (1998) also echo such a conclusion.

Owing to the aforementioned characteristics of gender diversity and female directorship, it is reasonable to anticipate that the presence of female director(s) would facilitate the government and coordination of delicate and complex situations and render an improved recognition of better investment opportunities and investment decisions within the firm. Poletti-Hughes and Briano-Turrent (2019) and Chen et al. (2014) reach the same sentiment. As a matter of fact, research has shown such expectations: Lohe and Calabrò (2017) prove that female directors could boost financial performance by balancing the venturing risk and performance hazard risk that a family firm bears to preserve its SEW.

Another strand of research proposes that female directors have a positive effect on corporate governance. According to Chen et al. (2018), firms with a higher proportion of female directors tend to have a more stringent monitoring system, which might mitigate the agency problem and keep managers focused on innovative and value-creating projects. Additionally, female chairs with a collaborative leadership style increase communication efficiency, social support, and cohesion, thus improving decision-making (Nielsen & Huse, 2010; Wang & Kelan, 2013). Anderson et al. (2011) suggests that female directors have different skills and backgrounds compared to men, therefore bringing unique insights and valuable advice. Eagly and Carli (2003) conclude that chairwomen are more likely to be interactive leaders, which improves the board's decision-making quality and ultimately results in increased firm performance.

Numerous articles demonstrate that the influence of female leadership in corporations depends on ownership structure and country-level factors. Nekhili et al. (2017) finds that the influence of female leadership on the performance of French companies is not the same to family and non-family firms. Since female leaders are more likely to exhibit transformational leadership, family firms could improve their effectiveness with female leadership (Vallejo, 2008, 2009). Therefore, we raise our third research question:

Research question 3: Would the presence of female directorship positively or negatively impact the investment efficiency of firms?

3.2.4 Moderating Role of Regulatory Environment

Macro-level of business environments differentiates from country to country. La Porta et al. (1998) argues that the intensity of law enforcement leads to differences amongst countries. Li et al. (2006) studies the effect of corporate governance on monitoring effectiveness and efficiency and find that both shareholder protection and law enforcement influential to institutional investors across

countries. Francis et al. (2009) concludes that a company's free information disclosure leads to more efficient resource allocation. Ding et al. (2012) find that business environments in different countries can be determinants of unethical or illegal decisions of a firm. Research using the WBES dataset has shown that diverse country-level governance environments result in divergent fashions of operational decisions and outcomes amongst entrepreneurial firms. For instance, a number of studies conclude that there is a negative relationship between family involvement and R&D expenditures using U.S. family firms (Gómez-Mejía et al., 2011; Chrisman & Patel, 2012), but the opposite relationship is found in De Massis's research when the environment is switched to China (De Massis et al., 2013). Similarly, Ali et al. (2007) finds that, by studying in a U.S. context, family firms disclose high-quality accounting information. Conversely, Ding et al. (2011) conclude the opposite due to the dominance of type II agency conflict. Anderson et al. (2012) and Ebihara et al. (2012) also come to divergent conclusions on the degree of information asymmetry between U.S. family firms and Japanese ones, respectively. As evidenced above, family firms may behave differently given the quality of regulatory environments. Hence, we expect to observe a certain degree of moderating effect of regulatory environment on the relationship between family control and their investment efficiency. This leads to our fourth research question, which is:

Research question 4: How would the regulatory environment moderate the investment efficiency of a firm?

3.3 Research Methodology

3.3.1 Data

The country-level aggregate and individual governance indicators as well as GDP data are obtained from the World Bank. The indices of regulatory environment values are accessed from www.govindicators.org. The financial fundamental information is obtained from COMPUSTAT and Data Stream, and the Center of Research in Security Prices. The information on family firms, firm-

level governance, and ownership is obtained from the NRG Metrics database. The longitudinal data we use ranges from 2007 to 2018, and it contains 30,897 firm-year observations from 39 countries. Family firm characteristics are obtained from the NRG database.

Dependent Variable

Developed from Biddle et al. (2009) and Chen et al. (2011), we calculate the investment of firms in the following way:

$$\text{Investment}_{i,t} = \alpha_0 + \alpha_1 \text{NE}_{i,t-1} + \alpha_2 \Delta\text{SaleGrowth}\%_{i,t-1} + \alpha_3 \text{NE}_{i,t-1} \times \Delta\text{SaleGrowth}\%_{i,t-1} + \varepsilon_{i,t-1} \quad \text{Eq. (1)}$$

We measure the investment inefficiency as the deviations of residuals from the expected investment — the optimal investment — using Eq. (1) which predicts investment as a function of revenue opportunities. Therefore, both positive and negative deviations from the optimal level of investment are considered inefficient investments. Positive residuals represent over-investment, whereas negative ones represent under-investment. For the main regression, we take the absolute value of residuals as investment inefficiency (*Ineff*), so higher value means more severe the investment inefficiency is. NE is an indicator variable that equals 1 if revenue of the previous year is less than that of the current year, and 0 otherwise.

3.3.2 Empirical Models

The main panel regression of our analysis follows Equation (2) below:

$$\text{Ineff}_{i,t} = \alpha + \beta_1 \text{FF}_{i,t} + \beta_2 \text{Size}_{i,t-1} + \beta_3 \text{ROA}_{i,t-1} + \beta_4 \text{Market-to-Book}_{i,t-1} + \beta_5 \text{Leverage}_{i,t-1} + \beta_5 \text{Cash}_{i,t-1} + \beta_6 \text{Altman-Z}_{i,t-1} + \beta_7 \text{Tangibility}_{i,t-1} + \beta_8 \text{Dividend}_{i,t-1} + \beta_9 \text{GDP Growth} + \theta + \delta + \tau + \varepsilon_{i,t} \quad \text{Eq. (2)}$$

The independent variable family firm (*FF*) is identified as equaling 1 if: 1) the founder or descendant or family member is director or officer or large shareholder>5%, 0 otherwise. 2) the family ownership stake is the largest shareholder, 0 otherwise. We denote FF1 if it satisfies the first definition, and FF2 if a firm satisfies the second definition.

For control variables, we include firm size because smaller firms may be more volatile than bigger ones and they tend to be more eager to survive and develop (Panousi & Papanikolaou, 2012). Compared to small firms, larger firms tend to have higher investment needs. Himmelberg et al. (1999) also point out that larger firms can benefit more from technology and greater diversification than smaller firms. Return on assets as an indicator of profitability is included in our test because better performance can potentially be a sign of better governance structure and managerial discretion, which would consequently lead to more cash to invest. We also include firm leverage, because high leverage of a firm may lead to debt overhang and less financial slack, as well as limited debt capacity (Connelly, 2016). Moreover, Jensen and Meckling (1976) argue that in terms of agency theory, leverage serves as a monitoring tool that restrains potential opportunistic actions. Cash flow is another important factor determining how firms invest. A firm with a higher amount of available cash would have a bigger reservoir of cash and maybe more options of investment. Dividend paying is related to cash holding and can be an indicator of performance. If a firm consistently pays dividends, it is likely because they have enough cash or net profit. We include a binary variable to define whether a firm pays dividends or not. The Altman-Z score is included due to its extensive use in the field of finance to indicate bankruptcy or financial distress prediction. Following Altman et al. (2017), Altman-Z score is calculated as shown Equation 3. Other variables in our test are GDP growth, industry dummy, year dummy, and country dummy. Financial firms (SIC Code 6000–6999) and public utilities (SIC Code 4900–4999) are excluded due to different policies and regulation of their operations. One-year lagged values of these firm-level variables are used to eliminate the simultaneous causality issue. To minimize

the potential effect of outliers, all continuous variables are winsorized at the 1 percent and 99 percent levels. More details are provided in the Appendix B.

$$Z = 3.25 + 6.56*X_1 + 3.26*X_2 + 6.72*X_3 + 1.05*X_4 \quad \text{Eq. (3)}$$

where X_1 is the working capital divided by the total assets; X_2 is measured as the retained earnings divided by the total assets; X_3 is calculated as the earnings before interest and taxes divided by the total assets; and X_4 is the ratio of book value to total liability.

3.4 Empirical Results

3.4.1 Summary Statistics

Summary statistics for the main variables in our sample are presented in Table 3.1. Size is measured as the natural logarithm of the firm's total assets. Market-to-Book the ratio of the market value of equity to the book value of equity. Leverage is the ratio of total liabilities to total assets. FF1 and FF2 are family indicators which equal to 1 if it is a family firm, and 0 otherwise. ROA, return on assets, is defined as earnings before interest and tax scaled by total assets. Altman-Z, the Altman-Z score, is the measure of financial distress following the methodology in Altman et al. (2017). Cash is measured as operating income before depreciation plus working capital less deferred tax scaled by total assets. Tangibility is calculated as the ratio of tangible assets to total assets. Dividend is a binary indicator which equals to 1 if the firm distributes dividends, and 0 otherwise. Ineff is the measure of investment inefficiency of a firm following Biddle at el. (2009) and Chen et al. (2011). The mean and median of investment inefficiency (*Ineff*) is 15.548 and 9.296, respectively. The mean of independent variables, FF1 and FF2, is 0.35 and 0.214, respectively. All non-binary variables are winsorized at 1 percent and 99 percent levels to eliminate the outlier effect. The correlations between key variables are presented in Table 3.2.

Table 3. 1 Summary Statistics

This table show descriptive summary statistics of the key variables of interest. The sample consists of international public companies from 2007 to 2018. We report the statistics of mean, first quartile, second quartile (median), third quartile, standard deviation, and the observations. Ineff is calculate as the absolute value of deviation to the residual in Equation 1. FF1 is a dummy indicator which equals 1 if the founder or descendant or family member is director or officer or large shareholder>5%, 0 otherwise. FF2 is a dummy indicator which equals 1 if the family ownership stake is the largest shareholder, 0 otherwise. Detailed definitions of the variables are provided in Appendix B.

Variable	Mean	p25	Median	p75	Std	Obs
Ineff	15.548	9.041	9.296	9.583	29.352	25578
FF1	0.350	0	0	1	0.477	29679
FF2	0.214	0	0	0	0.410	29679
$Size_{t-1}$	8.243	6.371	7.870	9.707	2.737	25578
ROA_{t-1}	0.079	0.038	0.075	0.121	0.093	25578
$Leverage_{t-1}$	0.537	0.401	0.544	0.671	0.201	25578
$Market\text{-}to\text{-}Book_{t-1}$	2.053	0.015	0.986	2.300	3.973	25578
$Tangibility_{t-1}$	0.274	0.103	0.233	0.399	0.208	25578
$Altman\text{-}Z_{t-1}$	6.588	4.814	6.196	7.977	3.299	25578
$Cash_{t-1}$	0.115	-0.055	0.120	0.285	0.272	25578
$Dividend_{t-1}$	0.751	1	1	1	0.433	25578

Table 3. 2 Correlation Matrix

This table presents the correlations between key variables of interest in our sample. Details on variable construction are available in Appendix B.

	1	2	3	4	5	6	7	8	9	10	11
Ineff	1										
FF1	0.06***	1									
FF2	0.05***	0.71***	1								
$Size_{t-1}$	–0.20***	–0.21***	–0.19***	1							
ROA_{t-1}	–0.04***	0.00	0.02*	0.10***	1						
$Leverage_{t-1}$	–0.09***	–0.04***	–0.01	0.08***	–0.17***	1					
$Market\text{-}to\text{-}Book_{t-1}$	0.11***	–0.02**	–0.02***	–0.07***	0.30***	0.04***	1				
$Tangibility_{t-1}$	–0.16***	–0.07***	–0.01	0.17***	–0.02**	0.01	–0.03***	1			
$Altman\text{-}Z_{t-1}$	0.09***	0.07***	0.06***	–0.12***	0.49***	–0.68***	0.08***	–0.15***	1		
$Cash_{t-1}$	0.14***	0.06***	0.04***	–0.07***	0.54***	–0.52***	0.15***	–0.24***	0.76***	1	
$Dividend_{t-1}$	–0.11***	–0.08***	–0.04***	0.33***	0.39***	–0.07***	0.04***	–0.01	0.23***	0.18***	1

(t statistics in parentheses * $p<0.10$ ** $p<0.05$ *** $p<0.01$)

Table 3.3 contains the number of firm-year observations at the country/jurisdiction level. We exclude countries/jurisdictions whose observations are less than 50. The total number of observations is 29,679. The U.S. has the highest observations, followed by the U.K. and Japan. Croatia and Romania have the lowest numbers of observations amongst all countries.

Table 3.4 provides sample characteristics of key variables for both family firms and non-family firms. Panel A shows the comparison when FF1 is used to define family firm; Panel B shows the comparison when FF2 is used to define family firm. On average, in both panels the investment inefficiency of family firms is significantly higher than that of non-family firms. Overall, family firms are smaller in size (Anderson & Reeb, 2003). Family firms also have significantly lower liability ratios than non-family firms, and significantly higher cash, Altman-Z scores, and more tangible assets than non-family firms.

Table 3. 3 Observations by Jurisdictions

This table shows the distribution of firm-year observations by jurisdiction in our sample from 2007 – 2018.

Jurisdiction	Observations	Jurisdiction	Observations
Australia	1078	Netherlands	420
Austria	235	New Zealand	82
Belgium	391	Norway	708
Brazil	236	Philippines	173
Canada	1088	Poland	169
Croatia	50	Portugal	237
Denmark	360	Qatar	67
Finland	636	Romania	54
France	1821	Russia	326
Germany	1905	Singapore	421
Greece	1126	Slovenia	70
Hong Kong	457	South Africa	335
India	581	Spain	568
Indonesia	268	Sweden	928
Ireland	191	Switzerland	860
Israel	100	Thailand	214
Italy	929	Turkey	468
Japan	2017	USA	7601
Malaysia	164	United Kingdom	2252
Mexico	93	Total	29679

Table 3. 4 Comparison between Family Firms and Non-family Firm

This table shows the subsample statistics and the comparison of key variables in two subsamples (Family firm and non-family firm). Panel A shows the comparison between subsample of family firm (denoted as FF1) and non-family firm, respectively. Panel B shows the comparison between subsample of family firm (denoted as FF2) and non-family firm, respectively. The very last column shows the t-stats of mean for each key variable. Detailed definition of all variables is provided in Appendix B. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively.

Panel A	Family firm (FF1)			Non-family firm			Equality of Mean
Variable	Mean	Median	Obs	Mean	Median	Obs	t-test
Ineff	18.195	9.327	10374	14.126	9.279	19305	–4.06***
$Size_{t-1}$	7.523	7.263	10374	8.630	8.220	19305	1.10***
ROA_{t-1}	0.078	0.074	10370	0.080	0.076	19280	0.00*
$Market\text{-}to\text{-}Book_{t-1}$	2.056	0.963	10310	2.051	1.003	19162	0.00
$Leverage_{t-1}$	0.514	0.517	10364	0.550	0.557	19301	0.03***
$Cash_{t-1}$	0.128	0.140	8995	0.108	0.111	17085	–0.02***
Altman-Z_{t-1}	6.930	6.509	10174	6.405	6.061	19017	–0.52***
$Tangibility_{t-1}$	0.834	0.896	9052	0.805	0.872	17070	–0.02***
Panel B	Family firm (FF2)			Non-family firm			
Variable	Mean	Median	Obs	Mean	Median	Obs	t-test
Ineff	18.848	9.356	6347	14.650	9.280	23332	–4.19***
$Size_{t-1}$	7.419	7.170	6347	8.467	8.059	23332	1.04***
ROA_{t-1}	0.081	0.073	6344	0.079	0.075	23306	0.00
$Market\text{-}to\text{-}Book_{t-1}$	2.226	1.133	6314	2.005	0.946	23158	–0.22***
$Leverage_{t-1}$	0.529	0.537	6345	0.540	0.547	23320	0.01***
$Cash_{t-1}$	0.161	0.173	5579	0.103	0.107	20501	–0.05***
Altman-Z_{t-1}	6.848	6.481	6266	6.517	6.130	22925	–0.33***
$Tangibility_{t-1}$	0.849	0.903	5589	0.806	0.872	20533	–0.04***

3.4.2 Comparison of Investment Efficiency Between Family and Non-family Firms

Table 3.5 reports the results of panel regression of investment inefficiency on family firms to answer our first research question. As shown in the table, the positive and statistically significant coefficients of 3.593 and 1.136, at the significant level of 0.1 percent and 5 percent, respectively, indicate that when comparing firms, the investment of family firms is inefficient, which answers our first research question. Such a result could be attributed to the effect of loss-aversion and altruism outweighing the reduction of conflict between principle and agencies. For instance, it is likely that due to altruism, a family member who works in the family firm would expropriate wealth or would not behave in the best interest of the firm or the family but rather themselves, because of job security. Another reason can be that, according to resource-based theory, in total or on average, the negative effect outweighs the positive ones. For example, family firms only prefer to maintain limited connections or business circles to have more trusted people, and so they would voluntarily under-invest. As present in column (1) and (2), the inefficient investment of family firm would be statistically significant increase 12.2% (3.593/29.352) and 3.9% (1.136/29.352), as a percentage of its standard deviation, associated with a change the explanatory variable from zero to one.

Table 3. 5 Panel Regression of Investment Inefficiency on Family Firms

This table shows panel regression estimation results determining the relationship between investment inefficiency and family control. Ineff is calculate as the absolute value of deviation to the residual in Equation 1. FF1 is a dummy indicator which equals 1 if the founder or descendant or family member is director or officer or large shareholder>5%, 0 otherwise. FF2 is a dummy indicator which equals 1 if the family ownership stake is the largest shareholder, 0 otherwise. Detailed definitions of the variables are provided in Appendix B. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively.

	(1) Ineff	(2) Ineff
FF1	3.593***	
	(7.35)	
FF2		1.136*
		(2.44)
$Size_{t-1}$	-2.084***	-2.122***
	(-11.37)	(-11.58)
ROA_{t-1}	0.329	0.286
	(0.19)	(0.16)
$Market\text{-}to\text{-}Book_{t-1}$	0.180***	0.181***
	(5.58)	(5.59)
$Leverage_{t-1}$	-4.657***	-4.837***
	(-3.96)	(-4.11)
$Cash_{t-1}$	0.190	0.201
	(0.24)	(0.25)
$Altman\text{-}Z_{t-1}$	-0.619***	-0.618***
	(-7.91)	(-7.88)
$Tangibility_{t-1}$	4.497***	4.576***
	(3.72)	(3.79)
$Dividend_{t-1}$	-0.188	-0.192
	(-0.62)	(-0.63)
GDP Growth	-1.069*	-1.089*
	(-2.16)	(-2.20)
Constant	31.82***	32.34***
	(4.06)	(4.13)
Industry	Yes	Yes
Year	Yes	Yes
Country	Yes	Yes
Obs	25578	25578
R^2	0.176	0.174

Table 3.6 provides the results of a test on the relationship of family ownership in percentage and investment inefficiency. Columns 1 and 2 show the result when FF1 is used as family firms in the regression, whereas columns 3 and 4 show the result when FF2 is used as family firms. FOS is family-owned stakes (in percentage) in the family firms. FOS^2 is the square term of it, which is only included in columns 2 and 4. As presented in the table, the coefficients of FOS (except -0.024) indicate that the investment inefficiency of family firms is significantly negative to the stakes owned by the family. Particularly, as the percent of stakes a family hold increases, the investment inefficiency decreases, which echoes the evidence that increasing ownership would motivate a family to prioritize maximizing economic benefit, while reducing agency problems in the firm. However, the positive coefficients of 0.03 and 0.04 (significant at 5 percent level) represents that there is a threshold of family ownership beyond which the family ought not to be holding, in order to maximize their investment efficiency. This can be attributed to the principal-principal conflict and majority-minority shareholder conflict when the family holds a significantly large portion of shares of the company. Table 3.7 provides the results of tests on the relationship of family ownership within the executive team in family firms and investment inefficiency, wherein FOwE is the measure of family-owned stakes within the executive teams. As presented in Table 3.7, overall, except for the marginal significance on the coefficient of -0.105 in Column 1, there is no evidence from the regression showing any relationship between the family-owned stake within executive teams and the investment inefficiency in family firms.

Table 3. 6 Effect of Family-owned Stakes on Investment Inefficiency

This table shows panel regression estimation results determining the relationship between investment inefficiency and family control using family firm subsample. FOS (FF1, FF2) is the ratio of the number of shares of all classes held by the family to total shares outstanding for family firm1 and family firm2, respectively. Detailed definitions of the variables are provided in Appendix B. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively.

	(1) Ineff	(2) Ineff	(3) Ineff	(4) Ineff
FOS (FF1)	-0.050*	-0.205**		
	(-2.01)	(-2.68)		
FOS (FF2)			-0.024	-0.322*
			(-0.69)	(-2.40)
$(FOS)^2$		0.003*		0.004*
		(2.14)		(2.30)
$Size_{t-1}$	-2.818***	-2.823***	-2.339***	-2.327***
	(-6.53)	(-6.54)	(-4.46)	(-4.44)
ROA_{t-1}	0.213	0.211	0.376	0.358
	(0.58)	(0.57)	(0.76)	(0.72)
$Market\text{-}to\text{-}Book_{t-1}$	0.333***	0.332***	0.117	0.119
	(4.62)	(4.61)	(1.35)	(1.37)
$Leverage_{t-1}$	-7.157*	-0.071*	-9.046*	-0.092*
	(-2.49)	(-2.50)	(-2.35)	(-2.41)
$Cash_{t-1}$	-0.702***	-0.705***	0.244	0.243
	(-4.42)	(-4.44)	(1.13)	(1.13)
Altman-Z_{t-1}	-0.448**	-0.448**	-0.781**	-0.783**
	(-2.75)	(-2.75)	(-3.20)	(-3.21)
$Tangibility_{t-1}$	5.164+	5.291+	7.686*	7.761*
	(1.82)	(1.86)	(2.01)	(2.03)
$Dividend_{t-1}$	0.728	0.738	1.242+	1.228+
	(1.21)	(1.22)	(1.73)	(1.71)
GDP Growth	-0.877	-0.834	-0.287	-0.226
	(-0.94)	(-0.89)	(-0.26)	(-0.20)
Constant	91.63***	91.86***	97.84***	101.7***
	(4.23)	(4.24)	(4.40)	(4.57)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
Obs	7933	7933	5234	5234
R^2	0.254	0.255	0.252	0.254

Table 3. 7 Effect of Family-owned Stakes within Executives on Investment Inefficiency

This table shows panel regression estimation results determining the relationship between investment inefficiency and family control using family firm subsample. FOwE (FF1, FF2) is the percentage of family ownership within executives using family firm1 and family firm2, respectively. Detailed definitions of the variables are provided in Appendix B. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively.

	(1) Ineff	(2) Ineff	(3) Ineff	(4) Ineff
FOwE (FF1)	-0.105+	-0.123		
	(-1.70)	(-0.54)		
FOwE (FF2)			-0.095	-0.075
			(-1.24)	(-0.26)
$(FOwE)^2$		0.001		-0.001
		(0.08)		(-0.07)
$Size_{t-1}$	-3.507***	-3.504***	-3.183***	-3.184***
	(-6.19)	(-6.18)	(-4.55)	(-4.55)
ROA_{t-1}	0.034	0.034	0.114+	0.114+
	(0.73)	(0.72)	(1.91)	(1.91)
$Market\text{-}to\text{-}Book_{t-1}$	0.528***	0.529***	-0.139	-0.138
	(4.36)	(4.37)	(-1.00)	(-0.99)
$Leverage_{t-1}$	-2.412	-0.0242	0.246	0.002
	(-0.68)	(-0.68)	(0.05)	(0.05)
$Cash_{t-1}$	-0.0776	-0.0763	0.506*	0.506*
	(-0.38)	(-0.37)	(1.98)	(1.98)
Altman-Z_{t-1}	-0.683***	-0.683***	-0.336	-0.336
	(-3.39)	(-3.38)	(-1.20)	(-1.20)
$Tangibility_{t-1}$	11.05**	11.06**	15.45**	15.46**
	(2.93)	(2.94)	(3.08)	(3.08)
$Dividend_{t-1}$	-2.055*	-2.059*	-1.200	-1.200
	(-2.57)	(-2.57)	(-1.32)	(-1.32)
GDP Growth	-0.128	-0.125	0.364	0.363
	(-0.11)	(-0.10)	(0.28)	(0.28)
Constant	33.93	33.92	37.73	37.70
	(1.00)	(1.00)	(1.07)	(1.07)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
Obs	4854	4854	3046	3046
R^2	0.301	0.301	0.274	0.274

Table 3.8 shows the moderating effect of female board directorship in the firm. Female is measured as the percent of female members of the board directors. Column 1 represents the regression of investment inefficiency when FF1 is used as an independent variable; column 2 represents the regression of investment inefficiency when FF2 is used as an independent variable. The interaction terms of FF×Female reveal the effect of the involvement of female directors on the investment efficiency of the firm. The coefficient of -5.294, at a significant level of 0.1 percent, indicates that with more female directors serving on the board, the family firm would invest less inefficiently than their non-family firm counterparts in which female board directors also serve. This positive role of the female director can be explained by several of the literatures we discussed, such as enhancing the efficacy of management (Javidan et al., 2016) and decision-making quality (Eagly & Carli, 2003), and improvement of financial performance (Lohe & Calabrò, 2017), which provides sufficient reasoning to answer our third question.

Table 3. 8 Moderating Effect of Female Directorship on Investment Inefficiency

This table shows panel regression estimation results determining the relationship between investment inefficiency and family control with moderating effect of female directorship. Ineff is calculate as the absolute value of deviation to the residual in Equation 1. Detailed definitions of the variables are provided in Appendix B. Column (1) and (2) show the regression result when FF1 or FF2 is used as independent variable, respectively. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively.

	(1) Ineff	(2) Ineff
FF1	2.809***	
	(5.33)	
FF2		0.474
		(0.91)
Female	-5.294***	-6.680***
	(-4.47)	(-6.08)
FF×Female	-5.134**	-2.037
	(-2.82)	(-1.00)
$Size_{t-1}$	-1.857***	-1.885***
	(-10.31)	(-10.47)
ROA_{t-1}	0.219	0.213
	(0.13)	(0.13)
$Market\text{-}to\text{-}Book_{t-1}$	0.217***	0.218***
	(7.06)	(7.08)
$Leverage_{t-1}$	0.172	0.076
	(0.17)	(0.08)
$Cash_{t-1}$	-1.631*	-1.623*
	(-2.23)	(-2.22)
$Altman\text{-}Z_{t-1}$	-0.318***	-0.314***
	(-5.48)	(-5.40)
$Tangibility_{t-1}$	1.306	1.286
	(1.18)	(1.16)
$Dividend_{t-1}$	0.783	-0.447
	(0.03)	(-0.02)
GDP Growth	-0.176	-0.201
	(-0.38)	(-0.44)
Constant	20.45**	20.91**
	(2.64)	(2.70)
Industry	Yes	Yes
Year	Yes	Yes
Country	Yes	Yes
Obs	22020	22020
R^2	0.150	0.149

Following De Massis et al. (2018), for the regression shown in column 1 in Table 3.9, we use the regulatory environment measured as the sum of six indicators (Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption), denoted as RegEnv. For the regression shown in column 2, we code regulatory environment as a binary variable which equals 1 if the sum of the six indicators is above the median of all counted. For the regression shown in columns 3, 4, and 5, we divide the sum of all six indicators into quartiles. RegEnv (low) is coded as 1 if the regulatory value is within the lowest quartile, and 0 otherwise. RegEnv (mid) is coded as 1 if the regulatory value is within the middle two quartiles, and 0 otherwise. RegEnv (high) is coded as 1 if the regulatory value is within the highest quartile, and 0 otherwise. The coefficients of interaction terms in column 1 (0.399) and 2 (1.768) are both only positively significant at 5 percent level and the 1 percent level, respectively, which means that the regulatory environment contributes positively to the relationship between a family firm and investment inefficiency. In other words, a better regulatory environment indicated by a higher number of regulatory values would deteriorate the inefficiency. Similarly, when the governance that is above the median index is taken into consideration, as shown in column 2, it even more negatively affects the relationship between the family firm and the investment inefficiency, too.

Table 3. 9 Regulatory Environment Effect on Investment Inefficiency (FF1)

This table shows panel regression estimation results when FF1 is used as independent variable with moderating effect of regulatory environment. Detailed definitions of the variables are listed in Appendix B. Regressions in all columns are estimated with the full sample. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively.

	(1) Ineff	(2) Ineff	(3) Ineff	(4) Ineff	(5) Ineff
FF1	0.656	2.663***	4.044***	2.373***	3.343***
	(0.52)	(4.65)	(7.87)	(4.01)	(6.70)
RegEnv (sum)	0.184				
	(0.82)				
RegEnv (>median)		-0.211			
		(-0.61)			
RegEnv (low)			-3.261***		
			(-4.86)		
RegEnv (mid)				0.496	
				(1.12)	
RegEnv (high)					-0.320
					(-0.66)
FF1×RegEnv	0.399*	1.768**	-1.953**	1.085+	-1.473*
	(2.56)	(3.09)	(-2.86)	(1.78)	(-2.11)
$Size_{t-1}$	-2.081***	-2.080***	-2.081***	-2.294***	-2.292***
	(-11.37)	(-11.36)	(-11.37)	(-12.42)	(-12.41)
ROA_{t-1}	0.523	0.383	0.449	-0.269	-0.295
	(0.30)	(0.22)	(0.26)	(-0.16)	(-0.17)
$Market\text{-}to\text{-}Book_{t-1}$	0.177***	0.180***	0.182***	0.185***	0.186***
	(5.49)	(5.57)	(5.63)	(6.26)	(6.28)
$Leverage_{t-1}$	-4.641***	-4.712***	-4.764***	-5.938***	-5.939***
	(-3.95)	(-4.00)	(-4.05)	(-4.82)	(-4.82)
$Cash_{t-1}$	0.116	0.173	0.232	-2.110**	-2.103**
	(0.15)	(0.22)	(0.29)	(-2.85)	(-2.84)
$Altman\text{-}Z_{t-1}$	-0.623***	-0.622***	-0.624***	-0.552***	-0.552***
	(-7.95)	(-7.95)	(-7.97)	(-7.16)	(-7.15)
$Tangibility_{t-1}$	4.526***	4.554***	4.646***	5.928***	5.910***
	(3.75)	(3.77)	(3.85)	(4.75)	(4.73)
$Dividend_{t-1}$	-0.245	-0.188	-0.189	-0.072	-0.068
	(-0.80)	(-0.62)	(-0.62)	(-0.25)	(-0.24)
GDP Growth	-1.063*	-1.077*	-1.247*	-0.856+	-0.851+
	(-2.15)	(-2.17)	(-2.51)	(-1.85)	(-1.84)
Constant	29.73***	31.61***	31.89***	32.95***	33.53***
	(3.67)	(4.04)	(4.08)	(4.63)	(4.70)
Industry	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes
Obs	25578	25578	25578	25578	25578
R^2	0.177	0.177	0.176	0.172	0.171

On the contrary, when the governance is split into three sections, namely, the highest quartile, the middle two quartiles, and the lowest, it exhibits a non-linear effect. The significant coefficients of -1.953 (at 1 percent level) and -1.473 (at 5 percent level) on the interaction term indicate that the poorest and the best regulatory environments weaken the negative relation between a family firm and investment inefficiency.

In Table 3.10, when FF2 is used as an independent variable and interacts with the regulatory environment, all significance disappears except the interaction terms in column 1. The coefficients of -2.373 and -1.562 at 1 percent and 5 percent significance level, respectively, also represent the reduction effect of the poorest and best regulatory environments on the relationship between a family firm and investment inefficiency. As Hodgson (2015) and De Soto (2000) point out, formulating and reinforcing property rights are crucial for economic advancement. The optimality of allocations of sources and the distribution of incomes can often be determined by the intensity of regulations on property rights within a country (Claessens & Luclaeven, 2003; Dorobantu & Odziemkowska 2017). In countries where the strength of regulation is high, the behavior of family firm is better constrained, which potentially leads to reduced type II agency problem. Plus, due to the well-defined laws and regulations, firms tend to operate in a standardized fashion across the market and tend not to break the norm, which ultimately results in better efficiency. On the other hand, when the regulatory environment is less than average, there would be less order and protection. For instance, Krug and Hendrischke (2008) argue that family firms can be the target of illegitimate actions or even impositions by whoever is in power due to vaguely defined property rights, which would be detrimental to their daily operations, decision-making, and optimal allocation of sources. In such cases, the economic goal of family firms would outweigh the non-economic goals, which is to say, profitability, survival, and growth would be the priority in lieu of preservation of SEW. Therefore, they would be motivated to merge their goals to search for alternative approaches to boost their financial performance (De Massis et al., 2018), which consequently can improve their investment efficiency or weaken their investment inefficiency.

Table 3. 10 Regulatory Environment Effect on Investment Inefficiency (FF2)

This table shows panel regression estimation results when FF2 is used as independent variable with moderating effect of regulatory environment. Detailed definitions of the variables are listed in Appendix B. Regressions in all columns are estimated with the full sample. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively.

	(1) Ineff	(2) Ineff	(3) Ineff	(4) Ineff	(5) Ineff
FF2	0.661	0.229	1.636***	0.0715	1.224**
	(0.78)	(0.41)	(3.32)	(0.14)	(2.59)
RegEnv (sum)	0.326				
	(1.51)				
RegEnv (>median)		0.0467			
		(0.15)			
RegEnv (low)			-3.262***		
			(-4.86)		
RegEnv (mid)				0.444	
				(1.07)	
RegEnv (high)					-0.455
					(-0.99)
FF2×RegEnv	0.0772	1.924**	-2.373**	1.784**	-1.562*
	(0.68)	(2.93)	(-3.09)	(2.82)	(-2.10)
$Size_{t-1}$	-2.117***	-2.113***	-2.125***	-2.336***	-2.337***
	(-11.55)	(-11.53)	(-11.60)	(-12.65)	(-12.66)
ROA_{t-1}	0.410	0.336	0.416	-0.360	-0.391
	(0.23)	(0.19)	(0.24)	(-0.21)	(-0.23)
$Market\text{-}to\text{-}Book_{t-1}$	0.180***	0.181***	0.182***	0.186***	0.186***
	(5.57)	(5.61)	(5.62)	(6.26)	(6.28)
$Leverage_{t-1}$	-4.843***	-4.847***	-4.963***	-6.088***	-6.093***
	(-4.11)	(-4.11)	(-4.22)	(-4.94)	(-4.95)
$Cash_{t-1}$	0.153	0.183	0.227	-2.056**	-2.044**
	(0.19)	(0.23)	(0.29)	(-2.78)	(-2.76)
Altman-Z_{t-1}	-0.622***	-0.620***	-0.622***	-0.551***	-0.551***
	(-7.93)	(-7.92)	(-7.94)	(-7.14)	(-7.13)
$Tangibility_{t-1}$	4.637***	4.659***	4.723***	6.055***	6.002***
	(3.84)	(3.85)	(3.91)	(4.85)	(4.80)
$Dividend_{t-1}$	-0.229	-0.193	-0.191	-0.0825	-0.0774
	(-0.75)	(-0.63)	(-0.63)	(-0.28)	(-0.27)
GDP Growth	-1.096*	-1.096*	-1.263*	-0.854+	-0.844+
	(-2.21)	(-2.21)	(-2.54)	(-1.85)	(-1.83)
Constant	29.17***	31.94***	32.24***	33.39***	34.06***
	(3.61)	(4.08)	(4.12)	(4.69)	(4.77)
Industry	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes
Obs	25578	25578	25578	25578	25578
R^2	0.174	0.175	0.173	0.169	0.169

3.4.3 Additional Test

The subsample analysis by U.S and non-U.S. jurisdictions is represented in Table 3.11, the positive and statistically significant coefficients of 4.800 and 1.244 show that in non-U.S. jurisdictions, a family firm would invest inefficiently compared to a non-family firm. In the U.S. there is no significant difference between family and non-family firms. The reason can be that the regulatory environment in the U.S is much stricter than the average of all non-U.S. jurisdictions.

Table 3. 11 Subsample Analysis on Investment Inefficiency by US and Non-US Jurisdiction

This table shows the comparison of the relationship between investment inefficiency and family control using two subsamples. Definitions of variables are listed in Appendix B. Column (1) and (2) shows the result when non-US countries are included. Column (3) and (4) shows the result when US countries are included. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively.

	Non-USA		USA	
	(1)	(2)	(3)	(4)
	Ineff	Ineff	Ineff	Ineff
FF1	4.800***		0.023	
	(7.16)		(1.37)	
FF2		1.244*		0.019
		(2.06)		(0.98)
$Size_{t-1}$	-1.959***	-2.027***	0.042***	0.041***
	(-11.64)	(-12.06)	(4.87)	(4.82)
ROA_{t-1}	2.729	2.767	0.675***	0.673***
	(1.17)	(1.18)	(8.07)	(8.04)
$Market\text{-}to\text{-}Book_{t-1}$	18.09***	17.76***	31.46***	31.45***
	(4.92)	(4.82)	(12.48)	(12.48)
$Leverage_{t-1}$	-6.146***	-6.206***	-0.063	-0.065
	(-3.97)	(-4.01)	(-1.23)	(-1.27)
$Cash_{t-1}$	-2.543*	-2.485*	0.175***	0.175***
	(-2.10)	(-2.05)	(4.22)	(4.21)
$Altman\text{-}Z_{t-1}$	-0.604***	-0.601***	-0.013***	-0.013***
	(-5.69)	(-5.65)	(-3.67)	(-3.66)
$Tangibility_{t-1}$	8.406***	8.410***	-0.097*	-0.096*
	(5.12)	(5.11)	(-2.01)	(-1.99)
$Dividend_{t-1}$	-0.367	-0.353	-0.026	-0.027+
	(-0.96)	(-0.92)	(-1.62)	(-1.68)
GDP Growth	-0.928	-0.949+	-0.574***	-0.577***
	(-1.62)	(-1.65)	(-7.28)	(-7.32)
Constant	30.49***	33.11***	9.004***	9.019***
	(6.35)	(6.90)	(40.04)	(40.22)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
Obs	19279	19279	6400	6400
R^2	0.207	0.206	0.181	0.180

3.4.4 Robustness Tests

It is commonly agreed that many regressions would not be immune to endogeneity issues such as omitted variables and selection bias. Since our sample is drawn from a pool of international data consisting of both family and non-family firm, it is likely that we would suffer from such endogeneity issues as well. Therefore, three techniques are employed to address such issues, namely, two-stage least square, and Heckman two-stage. Probit two-stage least square method (probit-2SLS) is employed to address the endogeneity issue in our research. We apply Probit-regression instead of OLS-regression in the first stage. Firm age can be used as an instrument because the firm's stage of growth may affect its investment policy, such as the choice of either debt or equity financing (Wu et al., 2007). Steijvers and Voordeckers (2009) also argue that mature firms have better bargaining positions with creditors than young firms, which may lead to a lower interest rate, and such a low interest rate can ultimately affect firms' decision on the choices of projects in which they invest. We thus choose firm age as the instrumental variable. In the first stage, instrumental variables, firm age is used as independent to regress family firm dummy variables (FF1, FF2, respectively). In the second stage, the predicted values of the FF1 and FF2 from the first stage are used for further analysis. Table 3.12 provides the regression results. Column 1 shows the result of regression in the first stage when FF1 is used as the dependent variable. Column 2 shows the second stage of the regression when the predicted value of FF1 is included as the independent variable. Similarly, column 3 shows the result of regression in the first stage when FF2 is used as the dependent variable. Column 4 shows the second stage of the regression when the predicted value of FF2 is included as the independent variable. The significant coefficients of firm age in column 1 (-0.228) and 3 (-0.196) express a significant correlation between the exogenous instruments and the independent variable. The significant coefficients of 15.89 and 20.97 indicate the main finding still holds, proving the robustness of our methodology when addressing the endogeneity.

Table 3. 12 Probit-2SLS Regression

This table reports the regression results of (probit) two-stage least square analysis. Column (1) and (3) show the result in the first stage when *FF1* or *FF2* is instrumented; Column (2) and (4) shows the result in the second stage when estimated FF1 ($\widehat{FF1}$) or estimated FF2 ($\widehat{FF2}$) is used as the independent variable. Definitions of all variables are provided in Appendix B. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively.

	(1) Stage 1 FF1	(2) Stage 2 Ineff	(3) Stage 1 FF2	(4) Stage 2 Ineff
Firm age	-0.228***		-0.196***	
	(-11.60)		(-8.88)	
$\widehat{FF1}$		15.89*		
		(1.98)		
$\widehat{FF2}$				20.97**
				(3.03)
$Size_{t-1}$	-0.056***	-2.407***	-0.056***	-2.386***
	(-7.51)	(-8.28)	(-6.90)	(-8.95)
ROA_{t-1}	-0.122	-0.220	0.564**	-3.252
	(-0.75)	(-0.09)	(3.12)	(-1.22)
$Market\text{-}to\text{-}Book_{t-1}$	-0.009***	0.145**	-0.016***	0.172***
	(-3.60)	(3.26)	(-5.24)	(3.82)
$Leverage_{t-1}$	-0.0348	-6.685***	0.455***	-8.936***
	(-0.41)	(-4.07)	(4.67)	(-5.03)
$Cash_{t-1}$	0.255**	0.351	0.105	0.851
	(3.21)	(0.23)	(1.18)	(0.60)
$Altman\text{-}Z_{t-1}$	0.020***	-0.926***	0.038***	-0.998***
	(3.47)	(-7.03)	(5.35)	(-7.51)
$Tangibility_{t-1}$	-0.079	-4.487*	0.303***	-6.267***
	(-1.16)	(-2.54)	(4.03)	(-3.46)
$Dividend_{t-1}$	0.027	-0.614	0.129***	-1.201**
	(0.91)	(-1.52)	(3.92)	(-2.61)
GDP Growth	-0.081	-0.619	0.056	-1.142+
	(-1.30)	(-0.97)	(0.83)	(-1.89)
Constant	-0.679***	44.67***	-1.508***	47.26***
	(-3.51)	(4.73)	(-7.34)	(5.06)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
Obs	18193	17803	18254	17861
R^2	0.192	0.203	0.217	0.202

We use Heckman's two-stage model (1979) to deal with the potential endogeneity issue. In the first stage, we conduct a Probit regression analysis of family firm definition on instrument variables and use FF1 and FF2 as dependent variables, respectively, as family firm. For instrument variables, we include CEO age and descendant active (see Appendix B) that we remove in the second stage. We use CEO age as an instrument since we believe that the CEO in a family firm reaches the top position faster than their counterparts in non-family firms (Blanco et al., 2021), which would be a latent factor differentiating family and non-family firms. In addition, the presence of descendants in the firm could be related to the firms' intention for transgenerational control (Chrisman & Patel, 2012). We then calculate the inverse Mills ratio and incorporate it into the second stage regression. Table 3.13 presents Heckman's two-stage regression results. The coefficient of CEO age is negative and significant while the coefficient of descendant active is positive and significant, as we expected. In the second stage analysis, the coefficient of inverse Mills ratio is marginally significant when the dependent variable is FF2. After controlling the potential selection bias, the coefficients of both FF1 (2.939) and FF2 (3.258) are positive and significant, which is consistent with the previous result.

Table 3. 13 Heckman Analysis for Investment Inefficiency

This table shows regression results using Heckman (1979). All variables are defined in Appendix B. Columns (1) and (3) show the result in the first stage; Column (2) and (4) shows the result in the second stage. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively. Year, industry, and country fixed effect are included in all regressions.

	(1) FF1	(2) Ineff	(3) FF2	(4) Ineff
CEO Age	-0.069+		-0.022***	
	(-1.67)		(-5.16)	
Descendant	3.946***		1.517***	
	(24.16)		(57.86)	
Size	-0.969***		-0.769***	
	(-22.54)		(-18.13)	
ROA	-0.026		0.200*	
	(-0.28)		(1.97)	
Market-to-Book	-0.642**		0.247	
	(-2.75)		(1.05)	
Tangibility	0.712***		0.866***	
	(13.81)		(15.48)	
FF1		2.939**		
		(3.14)		
FF2				3.258*
				(2.50)
Inverse Mills		0.150		-1.289+
		(0.27)		(-1.81)
$Size_{t-1}$		-1.898***		-1.887***
		(-10.08)		(-10.01)
ROA_{t-1}		0.262		0.137
		(0.15)		(0.08)
MB_{t-1}		0.188***		0.188***
		(5.56)		(5.55)
$Leverage_{t-1}$		-3.262**		-3.421**
		(-2.93)		(-3.07)
$Cash_{t-1}$		0.255		0.236
		(0.31)		(0.29)
Altman-Z_{t-1}		-0.461***		-0.451***
		(-7.15)		(-6.98)
$Tangibility_{t-1}$		4.496***		4.200***
		(3.61)		(3.35)
$Dividend_{t-1}$		-0.024		-0.028
		(-0.08)		(-0.09)
GDP Growth		-1.090*		-1.125*
		(-2.12)		(-2.19)
Constant	-1.350***	41.59***	-0.995***	41.46***
	(-4.35)	(4.35)	(-4.64)	(4.32)
Obs	27247	22729	27247	22729
R^2	0.269	0.179	0.186	0.177

3.5 Conclusion

In this study, we investigate the direct relationship between a family firm and their investment efficiency rooted mainly in the SEW theory, behavioral agency theory, and the resource-based theory using a sample of international public companies. Prior studies show that SEW theory plays a role in the relationship, and we explore both the positive and negative sides of it. We find results showing that overall, their negative effect outweighs their positive effect, leading to family firms investing inefficiently compared to non-family firms. We also find that the family-owned stakes in family firms is non-linearly negatively related to investment inefficiency, which can be attributed to the incentive to maximize firm value and profitability when family ownership increases, but then they may shift to prioritize their own goals and wealth when holding a significant portion of shares. Regarding the role that female directorship plays in the relationship between a family firm and investment efficiency, it weakens the negatively relationship. Another finding of ours is that the regulatory environment non-linearly affects the investment inefficiency of family firms. Particularly, when the regulatory environment is the poorest or the best, the investment inefficiency would be ameliorated, which may result from the preservation of property rights. As far as the average quality, the regulatory effect may not comparably steer the investment efficiency.

Despite of our effort to reach thoroughness of this study, the analysis is subject to certain limitations. One of which is that the panel data is not highly balanced. Another is that our data is not up-to-date due the accessibility of database. However, our study can be enlightening for future research. For it involves strategic decisions of family firm, board size and the number of family member serving on the board could be taken into consideration since these aspects can both navigate the decision-making process; Conditional on the accessibility and availability of data, individual characteristics such as age and educational background can also be treated as a control since they may both contribute different perspectives to the decision-making process.

3.6 Appendix B: Variable Descriptions

Variables	Description
Ineff	Investment inefficiency, measured by deviation of residuals from zero in Eq (1).
FF1	Equals 1 if the founder or descendant or family Member is Director or Officer or Large Shareholder>5%, 0 otherwise
FF2	Equals 1 if the Family ownership stakes is the largest shareholder, 0 otherwise.
FOS	Family ownership stake: Ratio of the number of shares of all classes held by the family to total shares outstanding.
FOwE	The percentage of family ownership within executives.
Size	Natural log of total assets
ROA	Measured by EBIT divided by total assets at the end year
Market-to-Book	market value by book value; Market equity is the product of stock price and shares outstanding as of year-end. Book Value is calculated as the stockholder's equity -
Leverage	total liability / total asset
Cash	operating income before depreciation plus working cap less defer tax/ total asset
Altman-Z	3.25 + 6.56*work cap/total asset + 3.26*retained earnings/total asset + 6.72*EBIT + 1.05*book value/liability, following Altman et al. (2017)
Tangibility	Tangible asset by total asset
Dividend	An indicator variable that takes the value of one if the firm paid a dividend and zero otherwise.
Female	Ratio of female directors by total number of board members
Firm age	Natural log of years since the firm was listed on COMPUSTAT
GDP Growth	Annual percentage GDP growth rate calculated using market prices based on local currencies. Source: World Bank.
RegEnv (sum)	Sum of all six regulatory environment indicators (Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness,
RegEnv (>median)	Dummy variable: equals 1 if the sum is above median value
RegEnv (low)	Dummy variable: equals 1 if the regulatory value is within the lowest quartile, 0 otherwise
RegEnv (mid)	Dummy variable: equals 1 if the regulatory value is within middle two quartile, 0 otherwise
RegEnv (high)	Dummy variable: equals 1 if the regulatory value is within the highest quartile, 0 otherwise
Descendant	Dummy variable: equals 1 if descendant actively managing firm as CEO or Chair, 0 otherwise.

Chapter 4 The Market Reaction to R&D Intensities: Family Firms vs Non-family Firms

4.1 Introduction

4.1.1 Research & Development

Research and development (R&D) investments are widely recognized as an essential driver of long-term economic growth and productivity (Romer, 1990; Solow, 1957). In addition to innovation, long-term success, and long-term viability (Cohen & Levinthal, 1990; Gu, 2016), R&D activities are essential to gaining or maintaining market competitive advantages (Artz et al., 2010; Morbey, 1988; Kung and Schmid, 2015), improving firm performance and increasing firm value (Abdoh & Liu, 2021; Hirschey, Skiba, Wintoki 2012). Research and development can also serve as a measure of asymmetry of information between insiders and outsiders (Faleye, 2007; Wintoki, 2007), managerial discretion (Himmelberg et al., 1999), operational environment, and should be selected as a means of maximising enterprise value (Hirschey et al., 2012).

4.1.2 R&D in family business

Family business and non-family businesses are differential from one another in many ways, including firm goals (Lee & Rogoff, 1996), ethics (Adams et al., 1996), financial structure (McConaughy & Phillips, 1999; Romano et al., 2000), strategic plan (Tsang, 2002; Zahra, 2003), and firm governance (Randøy & Goel, 2003). They differ in many ways, but one distinction is socioemotional wealth (SEW), which refers to non-monetary wealth such as transgenerational control and non-normative benefits associated with social capital and close kinship within families (Berrone, Cruz et al., 2010, 2012; Gómez-Mejía et al., 2007, 2010; Zellweger et al., 2012).

A number of scholars believe that preserving the SEW is a priority when it comes to corporate decisions in family firms (Berrone et al., 2010; Garca-Sánchez et al., 2020).It has been shown that family firms tend to make risky decisions in order to preserve socioeconomic wealth, even when they

accept a declining long-term economic benefit (Berrone et al., 2010; Gómez-Mejía et al., 2007; Gómez-Mejía et al., 2010). It was also found that family firms are long-term driven when making strategies in order to prolong family control (Gómez-Mejía et al., 2011; De Massis et al., 2015). It is possible that such goals may be contrary to the R&D investment due to potential socio-emotional losses, such as diluted family ownership and a loss of some controlling power as a result of R&D (Morck & Yeung, 2003; Chrisman and Patel, 2012; Gómez-Mejía, 2013). As a result, families tend to minimize or even avoid spending on research and development (Chen & Hsu; 2009; Chrisman & Patel, 2012; Kotlar et al., 2013). In a study by Choi et al. (2015), it was found that family ownership is negatively associated with investment in R&D. The study conducted by Block (2012) found that family ownership can negatively affect research and development.

In family firms, information asymmetry and moral hazard problems may be mitigated (Zahra, 2003). According to the alignment argument, the interests of family owner and family manager are well aligned in family businesses (Jensen and Meckling, 1976; Salvato & Moores, 2010). It is mainly due to the shared understanding of long-term horizons as well as reputational concerns that such alignment of interests occurs (Fama, 1980; Stein, 1989; Chen et al., 2008). Often, family business owners and managers exchange ideas and perspectives, which results in less of an information gap in family businesses, which leads to fewer problems associated with type I agency (Ali et al., 2007).

R&D investments, however, are usually time-consuming and do not always succeed, which could lead to an agency problem. Asymmetric information may predominate, for example, if the manager has more detailed information and a greater chance of succeeding the project than the outsiders. Due to the fear of unpredicted costs associated with R&D, the moral hazard issue may prevail when the manager deliberately chooses less risky and short-term projects over more risky and long-term investments (Block 2012; Myers and Majluf, 1984). Alternatively, agency theory indicates that outside managers could renounce long-run value-enhancing projects (e.g., R&D) (Latham &

Braun, 2009), while families may be inclined to invest in long-term projects (Jensen & Meckling, 1976). Family owners, thus, could favor R&D investment (Lee & O'Neill, 2003).

4.1.3 Market reaction on R&D

In spite of the fact that R&D is considered to be an essential step for the success of a firm and to improve its performance, it may sometimes result in undesirable costs and outcomes. A study by Pastor and Veronesi (2004) argues that volatility is typically viewed as a reflection of uncertainty. Shiller (2000) also demonstrates that stock returns of a company can fluctuate more than their fundamental values as a result of excess volatility. Studies conducted around the year 2000 demonstrate that many firms in the technology sector are overvalued as a result of unpredicted future returns, resulting in the bubble bursting (Mazzucato & Tancioni 2012).

Further, R&D expenditures represent sunk costs that must be repaid over a long period of time, thus involving considerable risk (e.g., Kor, 2006; Short et al., 2009). In addition, R&D projects require specialists for management and monitoring, which can constrain a firm's managerial capacity (Carney, 2005). The use of asymmetric information may also have an impact on R&D decisions with uncertain future cash flows, as previously mentioned Fung (2006). Moreover, a fixed amount of budget would need to be allocated beforehand exclusively for the purpose of R&D expenditures. A committed cash outflow over time may also increase the risk of leverage and future returns, and it is not uncommon for a R&D project to fail to achieve its predetermined objectives. All of these factors can negatively affect stock return volatility (Gavetti et al., 2012). Additionally, a significant portion of the value of a firm can be attributed to intangible assets, such as research and development. According to the Efficient Market Theory, the stock price of a firm should contain the value of its R&D expense, and therefore there is no necessary relationship between R&D and stock performance (Chan et al., 2001). Furthermore, the R&D expenses should ideally remain stable over time, or at least not fluctuate drastically from year to year, in order to be sustainable in the long run (Kor and Mahoney, 2005; Brown

and Petersen, 2010). Investors, thus, tend to view volatile R&D expenditures as a disadvantageous trait of a company (Xiang et al., 2020).

4.1.4 Market reaction on family business

In order to survive and develop, a company's perception among investors is imperative, since it determines whether those investors will invest in and promote that company (Lyon and Cameron, 2004; Coombs and Holladay, 2005). Ma et al. (2016) found that non-professional investors react significantly stronger to family-controlled accounting restatements than to nonfamily firms. To assess the perception of outside investors on decisions of family business, Specifically, Maung et al. (2020) examined the market reaction to the philanthropic actions of both family and nonfamily firms, and he concluded that the market would react positively to such actions. Some traits, such as long-term oriented, of family firms can attract positive judgement or viewpoint from investors (Chrisman et al., 2008; Krappe et al., 2011). In a study of public family businesses, Zou et al. (2020) discovered that the intergenerational succession of the company negatively correlated with stock price movements (i.e., market reaction).

The risk aversion of investors may however change if they are provided with more information regarding family firms. By combining experimental and qualitative study, Lude and Prugl (2019) concluded that nonprofessional investors could change their risk preference when they process post hoc decisions made by family firms. They argued that Investors have a tendency to favor family businesses due to their positive perceptions of them, such as being credible, long-lasting, and low risk, and thus, these investors will act accordingly. Fang et al. (2019) extended this argument by exploring bounded rationality, which refers to irrational judgement solely based on one’s own cognition (Kahneman, 2003). A bias such as this could be caused by several variables, including anchoring, representativeness, stereotype heuristic, and the availability of information (Fang et al., 2019). In this study, we explore stereotype heuristic and information availability as potential causes of bias.

Stereotype heuristic explains investors' behavior that they choose to overlook evidence to be analyzed and only focus on "prejudiced" stereotype in their mind (Tversky & Kahneman, 1974). For instance, Duran et al. (2016) discussed a positive stereotype of family firms being superior to nonfamily ones in the society perceived by the locals. On the other hand, family firms may be viewed negatively by the public due to the belief that they are unethical or opportunistic. As far as information availability, it refers to the behavior of concluding too quickly without obtaining or considering all the information available. For example, it is possible to judge a family firm as "bad" based on one negative piece of news released today and disregard all other positive information released days ago. Alternatively, they may disregard the fact that a public family firm involves a complex operation and cooperation between the departments involved. Therefore, the availability or efficacy of information is important to the market since business depends on trust and confidence to succeed and develop. Leung et al. (2012) shows that family firms disclose more information than nonfamily firms. They found family business show more firm specific volatility of stock price than their non-family counterparties.

The purpose of this study is to extend both the viewpoints of Lude & Prügl (2019) and Chevy Fang et al. (2019) to empirically examine what the market reaction would be in the case of a family firm making decision on R&D expenses in line with investors' perceptions. Namely, we investigate the joint effect of R&D expenditures of and family involvement on the volatility of stock return. To our knowledge, neither theoretical nor empirical research focuses the jointly effect of family firm and systematic measures of R&D on the volatility of stock returns, and this piece of study can be contributing to the field of family business strategy and finance.

4.2 Theoretical Foundation and Hypothesis

Not every firm is willing to invest substantial funds in research and development because of the risk involved in the process, even though it is a vital part of firm growth and development. R&D

usually requires a significant amount of money as sunk cost (Kor, 2006) and it is not a straightforward process and is not always successful due, for example, lacking resources or skills.

On the other hand, socioemotional wealth, the non-monetary wealth of a family firm, is an essential element that a family firm must consider when making strategic decisions and/or innovative decisions. According to Kotlar et al. (2014), family firms may even use either an increase or a decrease in such control as a reference point. Therefore, the decision to invest in R&D is rather a delicate one than a simple test drive of a project, as the outcomes of a project, whether desired or undesirable, are very important to the future of the company.

Positive side

Investment in R&D can result in various advancements, upon the successful innovation, to a firm, such as the stronger competitiveness (Ahuja et al., 2008; Bushee, 1998; Palmer & Wiseman, 1999). McGrath and Nerkar (2004) discovered that R&D investment promote economic growth and valuation enhancement of a firm. Moreover, Miller and Le Breton-Miller (2005) assert that managers of family businesses may invest more in research and development despite the risks associated with such investments over the long term because of the potential advantages associated with successful outcomes. The payoff of a successful R&D project can eventually enhance socioemotional wealth by advancing the economic status and reputation of the family firm through outperformance of peer firms (Choi et al., 2015).

Unlike nonfamily firms, family firms often establish an environment with commitment and loyalty (Miller & Le Breton-Miller, 2005). Such environment would build a sense of trust and confidence amongst family members to resolve issues and obstacles, which also stipulate the intentions to pursue R&D investment despite potential risks (Zahra, 2003). According to Simon and Hitt (2003), patient capital is one of the unique characteristics of family firms, which is beneficial to achieving long-term goals. In addition, family firms prefer to maintain social ties with some stakeholders, such

as suppliers and capital providers, which may offer support with resources. Therefore, these social ties are also beneficial for research and development.

Negative side

Nevertheless, many studies under the topic of family ownership and R&D investments discovered a negative relation between them such as in Taiwan (Chen & Hsu, 2009), European countries (Munari et al., 2010), and in North America (Muñoz-Bullón et al., 2011; Block, 2012).

Investing in research and development diverts short-term wealth to uncertain long-term profits, which can adversely affect the firm's profitability. Additionally, the resources and money used on R&D projects may be used for other projects in a more flexible and certain manner. Thus, family managers would avoid risky projects to ensure the firm's longevity (Wu et al., 2005). It usually takes years for R&D to generate decisional results, requiring thorough planning both financially and timewise. It may be necessary for family managers to partially give up their authorities or even pass them on to external professionals who are more qualified and experienced to reveal their capability, experience, and R&D plan (Gómez-Mejía et al., 2010). Managers of family firm may consider R&D investment as a limitation of their discretion. Similarly, from the perspective of agency theory, family firms may suffer a greater Type II agency problem between majority and minority shareholders than their counterparts (Morck et al., 1989; Shleifer and Vishny, 1997), leading to the expropriation of family wealth at the expense of minority shareholders (Villalonga and Amit, 2006). However, R&D investments require more transparent disclosure, which would force family members to distribute more earnings to minority shareholders or outside investors.

From the perspective of socioemotional wealth theory, one distinctive characteristic of family firms that differs from non-family firms is that, as several studies have demonstrated, family firms tend to invest in R&D expenditures less than their counterpart nonfamily firms because of the potential loss of SEW in the sense of family control and the risk associated with R&D projects.(Chrisman & Patel,

2012; Muñoz-Bullon & Sanchez-Bueno, 2011). Choi et al. (2015) also argues that family owners tend to discourage R&D investments because of new rules, routines, and possible compromise of family control. For instance, their longing for family ownership and control, as well as managerial discretion may render less aggressive strategic decisions (Habbershon et al., 2003; Gómez-Mejía et al., 2010). On the same stream, Miller and Bromiley (1990) argue that increasing R&D expenditures carries higher possibility of bankruptcy which entails the loss of SEW of a family firm such as diluting control and reduced economic wealth. In addition, Gómez-Mejía (2014) introduced a mixed gamble scenario in which if a family's SEW are at risk, managers may shift strategic decisions towards reducing R&D investments, since increased R&D often results in a reduction of the family's SEW.

Transgenerational control is another uniqueness of family firm (Chua et al., 2011). As Block (2012) points out, the intent to transfer asset and business to the next generation, as well as the reputation of the firm, make it necessary for current family business owners to have a long-term strategy (Deniz and Suarez, 2005; Dyer and Whetten, 2006). As a result of such an intention, family firms will strive to create dynastic legacies for future generations in order to ensure the continuity and growth of their businesses. Nonetheless, risky investments such as R&D can adversely affect their business' survival and stability (Lee, 2006). Moreover, R&D processes and their outcomes are closely related to family identity and reputation, as well as connections with other parties, thus a failure to engage in R&D would adversely affect a family firm's social and economic standing (Kotlar et al. 2013; Dunn, 1996). According to SEW theory, a descent reputation enhances the economic and social status of a family business and will ultimately have detrimental effects on future generations.

The SEW theory has its foundation in the behavioural agency model (BAM). In the view of BAM, when making strategic decisions, family goals are the most critical because the socioemotional endowment of the family firm is at risk, (Berrone et al. 2010; Chrisman and Patel 2012). BAM's framework indicates that family firms generally take fewer risky projects due to their loss aversion toward SEW. For example, Gómez-Mejía (2014) concluded that family firms generally take fewer

risky projects. Additionally, family members often invest their own wealth in the family business, (Eisenhardt, 1989; Fama and Jensen, 1983), in which case, risky investments in research and development may lead to economic losses for both the family and the business. As a result, family owners and managers are not inclined to prioritize R&D investments due to the potential consequences (Schulze et al., 2002).

The fields of family business and R&D have been explored for decades by researchers from finance department, management department, and accounting department. A variety of theories and arguments have been developed and applied to related topics, including the behavioral agency model (Wiseman & Gómez-Mejía, 1998) and socioemotional wealth theory (Gómez-Mejia et al., 2007). According to Lude and Prugl (2019), however, investors' perceptions of family businesses and their strategies remain limited. In a few studies, the perceptions of consumers (Beck & Kenning, 2015) as well as potential employees (Khalert, Botero & Prugl, 2017) were examined, concentrating on consumers' perceptions. The former discovered that investors' perception of family firms positively correlated with the acceptance of new products, while the study of the latter found that job applicants may view family firms as good environments to foster mutual care and self-development. It is still necessary to examine how investors' perceptions of family firms will affect their investment decisions and behavior affecting the stock market (e.g., stock return volatility).

Under the topics of finance, it is widely accepted that stock prices represent future cashflow and growth. When firms invest in R&D, the market or the investors would expect that there would be an enhancement of economic value and growth upon the success of the R&D investment, which is why they may be striving for future profits. However, when the reality demonstrates otherwise, there may be some adjustment of investment behavior on the stock market which leads to stock return volatility (Mazzucato & Tancioni 2013). Empirically, Mazzucato and Tancioni (2008) study innovative sectors which involve a high level of R&D expenditures and find that the higher a company's expenditures on R&D, the greater the volatility of its stock market. According to the overreaction hypothesis, investors

sometimes price securities of interest based on the information they receive, either favorable or unfavorable, and they may react strongly on such information, resulting in at least short-term volatility on the stock market. Using Fortune 500 companies as their sample, Bremer and Sweeney (1991) confirm this hypothesis and demonstrate a significant price drop within a single day. Individuals will be asked to provide information, such as disclosure reports, media, and newspapers, to determine how well they like or trust the firm (Collins and Stevens, 2002). As far as the view of information availability, one source of cognitive biases (Fang et al., 2019), however, individuals often rely on available information to make decisions as though they have obtained all the available one. Therefore, the source and accessibility of the information directly determine how accurate the evaluation is (Tversky & Kahneman, 1974). In addition, the investors tend to focus only on the available information, ignoring the fact that family firms are not structured in the manner of a sole proprietorship, but rather as a complex organization requiring synergy and collaboration.

Compared to non-family firms, family ones differentiate by the perception of outsiders and investors (Miller et al., 2014; Orth and Green, 2009). Some studies conclude that one of the differences between family firms and their counterparties is that family ones are considered as a more trustworthy firms than non-family firms (Binz et al., 2013; Orth and Green, 2009). Such positive perceptions of family business also favor the strategy and influence of family firms, since investors believe that negative outcomes, such as uncertain investment in R&D, can be outweighed by positive beliefs about family business (Luhmann, 2009). Fang et al. (2019) present in their commentary that stereotype heuristic, another source of cognitive biases, would lead to the above conclusion. Tversky & Kahneman (1974) distinguished stereotype heuristic as the act of following a predetermined stereotype rather than a rational and comprehensive analysis of the material presented to one. Similarly, Kahneman (2003) discuss bounded rationality as a bias of individuals who make decisions based upon their subjective opinions and guess other than objective facts. For example, when investors on the market believe that transgenerational control and dynastic legacy serve as the primary goal of family

firms, they may have corresponding expectations on the behavior and the strategic plan of family firms (Ganesan, 1994). According to French & Poterba (1991), a familiarity bias can explain the tendency for individuals to favor things they are familiar with and are familiar with (Baker & Nofsinger, 2002). Also, Lude & Prugl (2019) point out that the trust and belief accorded to family firms can influence investor behavior, resulting in them taking risks they would not otherwise take (Chaudhuri & Holbrook, 2001).

Research question: What would be the market reaction, reflecting on the stock return volatility, to the historical R&D intensities of family firms?

4.3 Research Methodology

In this study we concentrate on public companies on the U.S. market. The financial information is obtained from COMPUSTAT and CRSP. The information on family firms is obtained from the NRG Metrics database. To systematically investigate the joint impact of R&D investment and family firm on the market reactions of investors reflected by the stock return volatility, we assemble the longitudinal data that ranges from 2007 to 2019 and contains 3,385 firm-year observations. To address the endogeneity issue, two-square least square (2SLS) is performed. We also use alternative construction to handle our data by replacing missing R&D values with zero. More details are introduced in the following paragraphs.

4.3.1 Empirical Models

The main panel regression models are listed below:

Model 1: $\text{Volatility} = \alpha + \beta_1 \text{R\&D}_{t-1} + \beta_2 \text{ROA}_{t-1} + \beta_3 \text{Size}_{t-1} + \beta_4 \text{aslack}_{t-1} + \beta_5 \text{unslack}_{t-1} + \beta_6 \text{pslack}_{t-1} + \beta_7 \text{Cash}_{t-1} + \beta_8 \text{Leverage}_{t-1} + \beta_9 \text{MB}_{t-1} + \beta_{10} \text{dividend}_{t-1} + \beta_{11} \text{firm age} + \beta_{12} \text{loss}_{t-1} + \text{Year dummy} + \text{Industry dummy} + \varepsilon$

Model 2: Volatility = $\alpha + \beta_1 FF + \beta_2 R\&D_{t-1} + \beta_3 FF*R\&D_{t-1} + \beta_4 ROA_{t-1} + \beta_5 Size_{t-1} + \beta_6 aslack_{t-1} + \beta_7 unslack_{t-1} + \beta_8 pslack_{t-1} + \beta_9 Cash_{t-1} + \beta_{10} Leverage_{t-1} + \beta_{11} MB_{t-1} + \beta_{12} dividend_{t-1} + \beta_{13}$ firm age + $\beta_{14} loss_{t-1}$ + Year dummy + Industry dummy + ε

Model 3: Volatility = $\alpha + \beta_1 FF + \beta_2 R\&D_{t-1} + \beta_3 FF*R\&D_{t-1} + \beta_4 (R\&D_{t-1})^2 + \beta_5 FF*(R\&D_{t-1})^2 + \beta_6 ROA_{t-1} + \beta_7 Size_{t-1} + \beta_8 aslack_{t-1} + \beta_9 unslack_{t-1} + \beta_{10} pslack_{t-1} + \beta_{11} Cash_{t-1} + \beta_{12} Leverage_{t-1} + \beta_{13} MB_{t-1} + \beta_{14} dividend_{t-1} + \beta_{15}$ firm age + $\beta_{16} loss_{t-1}$ + Year dummy + Industry dummy + ε

For the dependent variable, we measure stock return volatility (*vol*) as the standard deviation of monthly stock return rolling for the past 12 months. The main independent variables used in the regressions are R&D measures (*R&D inten1* and *R&D inten2*). They are measured as the annual ratio of a firm's R&D expenditure to its total sale, and deviation of R&D expenditure over total sale from industry median (David et al., 2006; Block 2012; Sciascia et al., 2015; Abdoh and Liu, 2021). For R&D expenditure in year t, we use three-year average of R&D, namely, the average R&D of year t-1, year t, and year t+1. The moderator family firm (*FF*) is identified as an indicator that equals one if: 1). the founder or descendant or family member is director or officer or large shareholder>5%, 0 otherwise; AND 2). the family ownership stake is the largest vote holder, 0 otherwise. For the robustness check, we denote FF1 as family firm if a firm satisfies the first condition, and we denote FF2 as family firm if a firm satisfies the second condition.

For control variables, Chrisman & Patel (2012) show that return on asset (*ROA*) is closely related to overall efficiency of a firm, and it often serves as an indicator, as better performance can potentially be a sign of better managerial discretion, which can directly impact the amount of cash available. We include firm size (*size*) as small firms are usually more volatile than large firms. (Panousi & Papanikolaou, 2012). Himmelberg et al. (1999) also argue that bigger firms can benefit from technology and greater diversification more than smaller firms. Sciascia et al. (2015) point out that large firms maybe easier to set up strategic plans and have a better control on their performance. He and Wintoki (2016) state that firms may choose to hoard cash for R&D smoothing, and such hoarding

could be sensitive to changes in the volatility of the issuance of equity. Brown et al. (2012) and Brown and Petersen (2015) both discover that cash flows can have significant influence on R&D investment. Cash is also closely related to available resources (Kotlar et al., 2014). Hence, we include cash as one of the control variables. We also include firm leverage (*leverage*) since it may indicate threats to the survival of a firm with different financial activities (Gómez-Mejía et al., 2010). Following Chrisman and Patel (2012) and De Massis et al. (2018), we also include measures of absorbed slack (*aslack*), unabsorbed slack (*unslack*), and potential slack (*pslack*). The absorbed slack measures the ratio of selling, general and administrative expenses to the total sales. The unabsorbed slack captures the liquidity of a firm by calculating the ratio of current assets to current liabilities. As far as the potential slack, it denotes the finance structure of a firm. Dividend distribution often depends on cash holding of a firm and it can be an indicator of financial performance. Usually, a firm does not constantly pay dividends unless they have enough cash or profit. Thus, we include dividend (*dividend*) in our regression. In all regressions, we use one-year lagged values of these firm-level financial variables to reduce reverse causality problems and eliminate the simultaneous causality issue (Sciascia et al., 2015). As commonly used, we measure firm age as the number of years since a firm is listed on Compustat. Brown et al. (2011) points out that firm age can be substantially related to asymmetric information problems. More detailed definitions are shown in the Appendix. Financial firms (SIC Code 6000–6999) and public utilities (SIC Code 4900–4949) are excluded due to different policies and regulation of their operations that can potentially affect firm performance (Guney et al., 2017). To reduce the potential effect of outliers, all continuous variables are trimmed by winsorizing at the 1 percent and 99 percent cut off points levels. We include industry dummy variables to denote each two-digit SIC code as well as year dummy for fixed effect. We also control for serial correlation.

4.3.2 Empirical Results

Summary statistics for variables in our empirical analysis are presented in Table 4.1. The mean (0.055) and median (0.052) of volatility are close to each other. The mean of independent variables, RD inten1 and RD inten2, is 0.288 and 0.292, respectively. The mean of Family Firm, the main moderator variable is 0.133.

Table 4. 1 Summary Statistics

This table show descriptive summary statistics of the key variables of interest. The sample consists of public companies on the U.S. market from 2007 to 2018. We report the statistics of mean, first 25 percentile, median, third 25 percentile, standard deviation, and the observations. Volatility is calculated as the standard deviation of monthly stock return for the past 12 months. Family Firm 1 is a dummy indicator which equals 1 if the founder or descendant or family member is director or officer or large shareholder>5%, 0 otherwise. Family Firm 2 is a dummy indicator which equals 1 if the family ownership stake is the largest vote holder, 0 otherwise. Family Firm means a firm satisfies both definitions of Family Firm 1 and Family Firm 2. Detailed definitions are provided in Appendix C.

Variable	Mean	P25	Median	p75	Std	Obs
Volatility	0.055	0	0.052	0.092	0.058	5408
Family Firm	0.133	0	0	0	0.339	5408
Family Firm 1	0.301	0	0	1	0.459	5408
Family Firm 2	0.133	0	0	0	0.340	5408
RD inten1$_{t-1}$	0.288	0.006	0.027	0.095	2.873	3740
RD inten2$_{t-1}$	0.292	0.002	0.013	0.061	2.767	3740
ROA$_{t-1}$	0.102	0.064	0.103	0.151	0.120	5406
Size$_{t-1}$	8.639	7.608	8.638	9.686	1.544	5404
Aslack$_{t-1}$	0.260	0.112	0.211	0.332	0.531	5129
Unbslack$_{t-1}$	2.322	1.293	1.852	2.674	1.923	5229
Pslack$_{t-1}$	0.689	0.134	0.438	0.833	1.893	5392
Leverage$_{t-1}$	0.219	0.095	0.204	0.315	0.175	5392
Cash$_{t-1}$	0.309	0.038	0.092	0.199	2.003	5124
(Market/Book)$_{t-1}$	3.826	1.850	2.918	4.711	8.860	5402
Dividend$_{t-1}$	0.020	0	0.012	0.030	0.026	5406

Table 4. 2 Correlation Matrix

The following tables display the correlations between key variables of interest in our sample. Details on variable construction are available in Appendix C.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
vol	1						
Family Firm	0.08***	1					
RD inten1$_{t-1}$	0.11***	0.04*	1				
RD inten2$_{t-1}$	0.10***	–0.00	0.86***	1			
ROA$_{t-1}$	–0.19***	0.02	–0.41***	–0.31***	1		
Size$_{t-1}$	–0.38***	0.03*	–0.03*	–0.00	0.30***	1	
Aslack$_{t-1}$	0.15***	0.06***	0.94***	0.81***	–0.48***	–0.06***	1
Unslack$_{t-1}$	0.21***	0.01	0.14***	0.18***	–0.03*	–0.19***	0.16***
Pslack$_{t-1}$	–0.06***	–0.03*	–0.01	–0.02	–0.06***	0.03	–0.03*
Leverage$_{t-1}$	–0.08***	–0.11***	–0.04**	–0.03	–0.05***	0.04**	–0.07***
Cash$_{t-1}$	0.11***	0.03	0.79***	0.68***	–0.27***	–0.05**	0.78***
Loss$_{t-1}$	–0.28***	0.04**	–0.01	0.04*	0.20***	0.69***	–0.03*
(Market/Book)$_{t-1}$	–0.00	0.02	0.05***	0.04*	0.03*	0.12***	0.08***
Dividend$_{t-1}$	–0.30***	0.02	–0.04**	–0.03	0.35***	0.27***	–0.05***

(t statistics in parentheses * p<0.10 ** p<0.05 *** p<0.01)

Table 4. 2 Correlation Matrix (Continued)

	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Unslack$_{t-1}$	1						
Pslack$_{t-1}$	–0.10***	1					
Leverage$_{t-1}$	–0.24***	0.25***	1				
Cash$_{t-1}$	0.26***	–0.02	–0.06***	1			
Loss$_{t-1}$	–0.13***	0.01	–0.02	–0.03	1		
(Market/Book)$_{t-1}$	0.00	0.70***	–0.04*	0.03	0.06***	1	
Dividend$_{t-1}$	–0.04*	0.00	0.08***	–0.04*	0.30***	0.08***	1

(t statistics in parentheses * p<0.10 ** p<0.05 *** p<0.01)

The correlations matrix of key variables is presented in Table 4.2. Rarely the key variables have a correlation bigger than 0.5 with each other (except 0.86, 0.79, 0.81, 0.68, 0.69, 0.78, 0.70), and so multicollinearity may not be a major issue in the regression analysis.

Table 4.3 reports the results of panel regression of stock return volatility on R&D measures, family firm measures and the interaction terms between them. As shown in column (1) and (2), neither there is any significant relationship between R&D and volatility nor a significant moderating effect of family involvement, given the coefficients of 0.32, -0.02, and 0.33. In column (3), however, the coefficients of linear interaction terms -3.13 (at 5% significant level) and that of quadratic interaction term of 46.45 (at 5% significant level) indicate that there is a non-linear relationship between R&D intensities and volatility when family firm is taken into consideration. Similarly, in column (5) it presents the coefficients of R&D intensity1 (RD inten1_{t-1})^2 as 10.60 (at 1% significant level) and -30.59 (at 1% significant level), respectively, and so there exists another non-linear relationship between volatility and R&D intensity1 only when family firm is considered.

For non-family firms, however, as shown in column (6) the coefficient of quadratic term of R&D intensity1 (-31.47) is only marginally significant. As shown in Figure 4.1, there is an invested U-shape relationship between stock return volatility of family firms and their R&D intensity1. There is a positive relationship between stock return volatility and R&D investments till the ratio of R&D investments reaches about 0.35. In terms of signaling theory (Connelly et al., 2011), it is likely that the investors overreact to an increase of R&D investments of a family firm as a negative behavior against their perception. Once there is a pattern, however, of increasing R&D investments, the investor may pick up such pattern as a signal of strategic plan of family firm and adjust their acceptance accordingly.

Table 4. 3 Panel Regression of Stock Return Volatility on R&D Intensity1

This table shows panel regression estimation results determining the relationship between stock return volatility and R&D investments (RD inten1$_{t-1}$), with or without the differentiation of family firm. The dependent variable (vol) is calculated as the standard deviation of monthly stock return for the past 12 months. FF*RD inten1$_{t-1}$ and FF*(RD inten1$_{t-1}$)^2 are both interaction terms. All other variables are defined in Appendix C. The regression in column (4) to (6) are estimated using sub-samples. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively. Industry and year fixed effect are included in the regression.

	(1) Full vol	(2) Full vol	(3) Full vol	(4) Family vol	(5) Family vol	(6) NonFamily vol	(7) NonFamily vol
Family Firm		0.01*	0.01**				
		(2.52)	(3.21)				
RD inten1$_{t-1}$	0.32	-0.02	2.93+	1.67	10.60*	-1.21+	1.57
	(0.64)	(-0.05)	(1.67)	(0.60)	(2.22)	(-1.73)	(0.86)
FF*RD inten1$_{t-1}$		0.33	-3.13**				
		(0.85)	(-2.82)				
(RD inten1$_{t-1}$)^2			-43.02*		-30.59*		-31.47+
			(-2.32)		(-2.28)		(-1.66)
FF*(RD inten1$_{t-1}$)^2			46.45**				
			(2.86)				
ROA$_{t-1}$	-2.91*	-2.95**	-2.72*	-5.28	-2.41	-3.30**	-3.13**
	(-2.56)	(-2.58)	(-2.38)	(-1.33)	(-0.58)	(-2.78)	(-2.64)
Size$_{t-1}$	-0.87***	-0.86***	-0.87***	-0.73**	-0.80**	-0.82***	-0.84***
	(-9.23)	(-9.20)	(-9.12)	(-2.68)	(-2.96)	(-8.23)	(-8.40)
Cash$_{t-1}$	0.33+	0.38*	0.40+	1.39	3.63*	0.00	0.18
	(1.93)	(2.11)	(1.83)	(1.00)	(2.14)	(0.05)	(0.81)
Aslack$_{t-1}$	-0.75	-0.74	-0.99	-3.59+	-7.71**	1.04	0.02
	(-1.40)	(-1.38)	(-1.11)	(-1.94)	(-3.01)	(1.45)	(0.03)
Unslack$_{t-1}$	-0.76	-0.80	-0.89	0.75	-0.72	-0.59	-0.73
	(-1.42)	(-1.50)	(-1.61)	(0.41)	(-0.38)	(-1.07)	(-1.32)
Pslack$_{t-1}$	1.03	1.07	0.63	-12.2***	-10.30**	0.32	0.33
	(0.26)	(0.27)	(0.16)	(-4.02)	(-3.27)	(0.81)	(0.82)
Leverage$_{t-1}$	0.59	0.64	0.63	11.14***	10.34***	0.22	0.21
	(1.14)	(1.24)	(1.22)	(4.93)	(4.55)	(0.42)	(0.39)
(Market/Book)$_{t-1}$	1.11	1.10	1.21	19.40***	16.09***	0.56	0.53
	(1.32)	(1.31)	(1.42)	(4.21)	(3.35)	(0.65)	(0.63)
Dividend$_{t-1}$	-0.50	-0.53	-0.54	1.76+	1.56	-0.53	-0.56
	(-1.38)	(-1.45)	(-1.48)	(1.73)	(1.55)	(-1.39)	(-1.45)
Loss$_{t-1}$	-1.45*	-1.47*	-1.42*	-3.25	-3.05	-0.99	-0.94
	(-2.18)	(-2.22)	(-2.14)	(-1.57)	(-1.48)	(-1.42)	(-1.35)
Age	-0.15***	-0.15***	-0.15***	-0.14***	-0.14***	-0.15***	-0.14***
	(-12.38)	(-12.33)	(-12.18)	(-4.71)	(-4.62)	(-11.56)	(-11.47)
Constant	0.21***	0.21***	0.21***	0.13***	0.15***	0.20***	0.20***
	(4.75)	(4.74)	(4.74)	(4.87)	(5.19)	(4.63)	(4.69)
Obs	3385	3385	3385	378	378	3007	3007
R^2	0.395	0.394	0.400	0.582	0.601	0.417	0.420

Figure 4. 1 Plot of Volatility on Quadratic R&D intensity 1

In this figure, we plot stock return volatility as function of R&D inten1 and $(\text{RD inten1}_{t-1})^2$ for family firm only according to the regression result in column (5) of Table 4.3

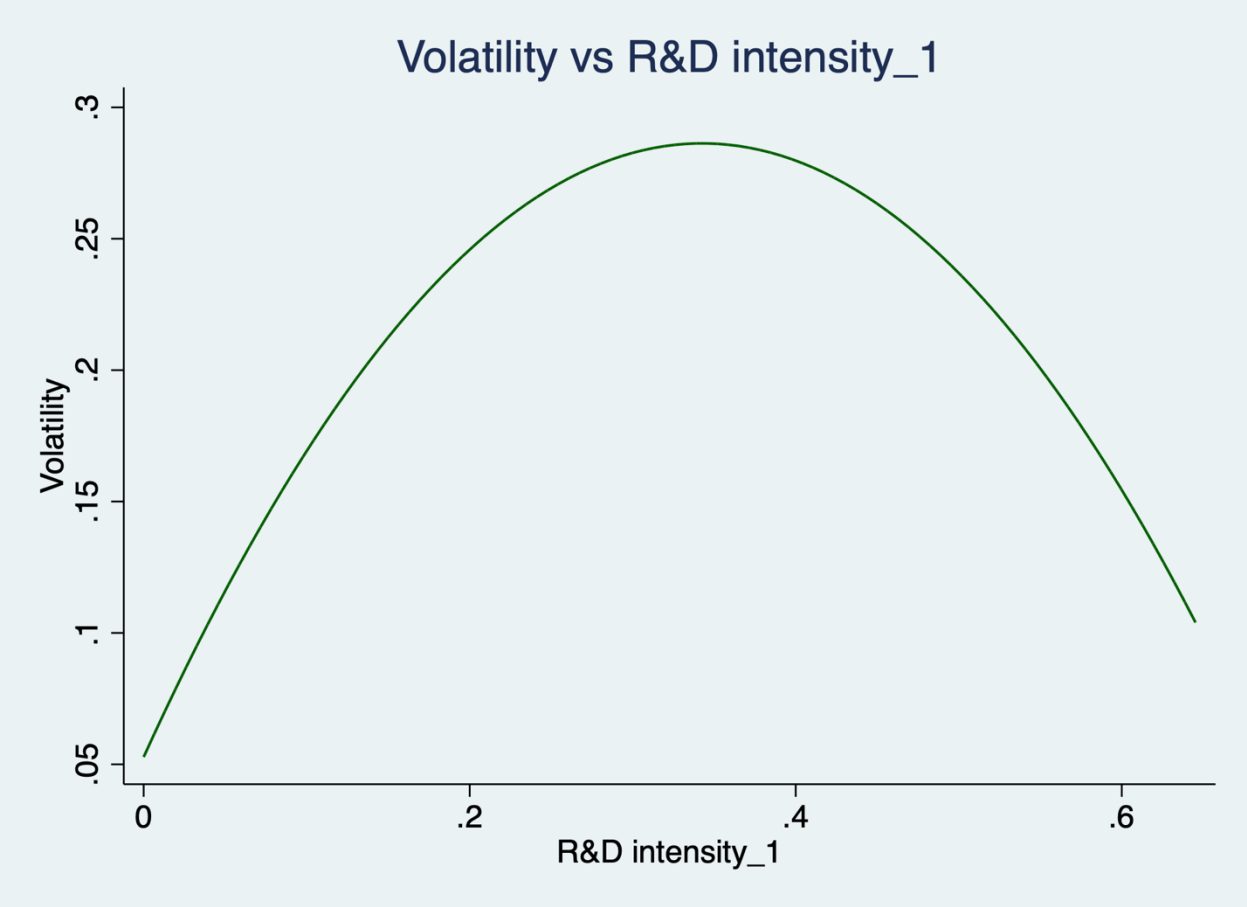


Table 4.4 reports the results of panel regression of stock return volatility on R&D measures, family control and the interaction terms between them. As shown in column (1) and (2), neither there is any significant relationship between R&D and volatility nor a significant moderating effect of family involvement. In column (3), however, the coefficients of linear interaction terms -26.02 (at 5% significant level) and that of quadratic interaction term of 4.41 (at 1% significant level) indicate that there is a non-linear relationship between R&D intensities and volatility when family firm is taken into consideration. Similarly, in column (7) it presents the coefficients of R&D intensity2 (RD inten2$_{t-1}$)^2 as 13.97 (at 5% significant level) and -4.38 (at 1% significant level), respectively, and so there exists another non-linear relationship between volatility and R&D intensity1 only when it is non-family firm. For family firms, however, as shown in column (5) the coefficients of R&D intensity2 and its quadratic term are only marginally significant. As shown in Figure 4.2, there is an invested U-shape relationship between stock return volatility of nonfamily firms and their R&D intensity2. There is a positive relationship between stock return volatility and deviations of R&D investments to industry-median till the ratio of R&D investments reaches about 0.35. In this regression analysis, the means (0.000207) and median ($9.06*10^{-6}$) of R&D intensity2 for family firm and mean (0.000302) and median (0.00001) of R&D intensity2 for non-family firm show that (not showing in this context) overall the deviation of family firms are much smaller than that of nonfamily firms, which is to say that, within industry, R&D investment of family firm is closer to the benchmark than is non-family firm due to less deviation to the industry-median. Since R&D is considered as a risky decision and it usually requires a fixed amount of cash, investor may prefer family firms to be less aggressive on R&D investments and thus there is no significant stock return volatility since they probably would not react dramatically.

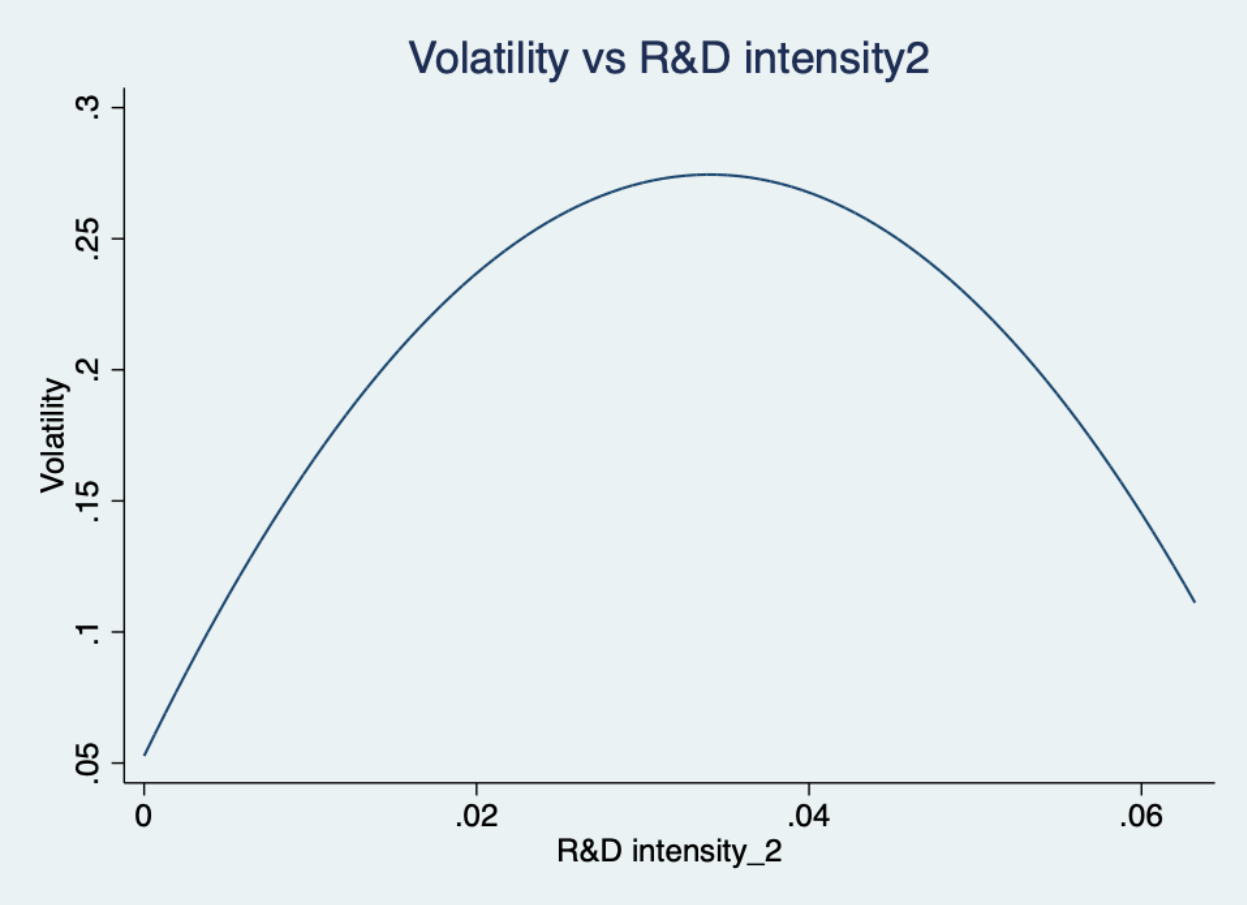
Table 4. 4 Panel Regression of Stock Return Volatility on R&D Intensity2

This table shows panel regression estimation results determining the relationship between stock return volatility and deviation of R&D investments to industry-median (RD inten2$_{t-1}$), with or without the differentiation of family firm. All other variables are defined in Appendix C. The regression in column (4) to (6) are estimated using sub-samples. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively. Industry and year fixed effect are included in the regression.

	(1) Full vol	(2) Full vol	(3) Full vol	(4) Family vol	(5) Family vol	(6) NonFamily vol	(7) NonFamily vol
Family Firm		0.01*	0.01**				
		(2.54)	(3.00)				
RD inten2$_{t-1}$	4.32	2.60	12.99+	20.23	46.10+	-0.29	13.97*
	(1.29)	(0.67)	(1.95)	(1.05)	(1.93)	(-0.07)	(2.06)
FF*RD inten2$_{t-1}$		2.97	-26.02*				
		(0.76)	(-2.15)				
(RD inten2$_{t-1}$)^2			-3.75*		-0.00+		-4.38**
			(-2.28)		(-1.79)		(-2.63)
FF*(RD inten2$_{t-1}$)^2			4.41**				
			(2.65)				
ROA$_{t-1}$	-3.04**	-3.13**	-2.88*	-6.35	-5.36	-3.66**	-3.21**
	(-2.70)	(-2.76)	(-2.52)	(-1.56)	(-1.30)	(-3.10)	(-2.71)
Size$_{t-1}$	-0.87***	-0.86***	-0.86***	-0.70**	-0.71**	-0.83***	-0.84***
	(-9.19)	(-9.15)	(-9.13)	(-2.59)	(-2.64)	(-8.30)	(-8.41)
Cash$_{t-1}$	0.33+	0.34*	0.36+	1.17	3.50*	0.00	0.14
	(1.91)	(2.00)	(1.80)	(1.06)	(2.05)	(0.02)	(0.70)
Aslack$_{t-1}$	-0.79*	-0.90*	-0.41	-3.60**	-4.51***	0.10	0.31
	(-2.12)	(-2.25)	(-0.90)	(-2.83)	(-3.33)	(0.21)	(0.60)
Unslack$_{t-1}$	-0.76	-0.78	-0.83	1.08	0.09	-0.59	-0.72
	(-1.42)	(-1.46)	(-1.54)	(0.60)	(0.05)	(-1.07)	(-1.31)
Pslack$_{t-1}$	0.82	0.81	0.55	-13.0***	-12.0***	0.31	0.31
	(0.20)	(0.20)	(0.14)	(-4.14)	(-3.80)	(0.77)	(0.78)
Leverage$_{t-1}$	0.62	0.66	0.69	11.47***	11.36***	0.22	0.26
	(1.19)	(1.26)	(1.33)	(5.08)	(5.04)	(0.41)	(0.48)
(Market/Book)$_{t-1}$	1.18	1.18	1.24	20.31***	18.37***	0.59	0.60
	(1.40)	(1.39)	(1.47)	(4.30)	(3.79)	(0.69)	(0.70)
Dividend$_{t-1}$	-0.48	-0.51	-0.52	1.96+	1.99+	-0.51	-0.53
	(-1.32)	(-1.40)	(-1.42)	(1.92)	(1.96)	(-1.34)	(-1.39)
Loss$_{t-1}$	-1.46*	-1.46*	-1.48*	-3.22	-3.08	-0.95	-0.97
	(-2.19)	(-2.21)	(-2.23)	(-1.56)	(-1.49)	(-1.37)	(-1.41)
Age	-0.14***	-0.14***	-0.14***	-0.14***	-0.13***	-0.14***	-0.14***
	(-12.35)	(-12.33)	(-12.19)	(-4.76)	(-4.36)	(-11.60)	(-11.38)
Constant	0.21***	0.21***	0.20***	0.14***	0.13***	0.20***	0.20***
	(4.74)	(4.75)	(4.73)	(4.84)	(4.84)	(4.67)	(4.67)
Obs	3385	3385	3385	378	378	3007	3007
R^2	0.396	0.395	0.400	0.591	0.605	0.416	0.422

Figure 4. 2 Plot of Volatility on Quadratic R&D intensity 2

In this figure, we plot stock return volatility as function of R&D inten2 and $(\text{RD inten2}_{t-1})^2$ for non-family firm only according to the regression result in column (7) of Table 4.4



4.3.3 Robustness Check

While Gómez-Mejía et al. (2013) points out that according to SEC rules, Compustat does not disclose R&D expenses which is too small to have a material impact on decision-making of a firm (National Science Foundation, 2010), we follow previous published papers to set the missing data points of R&D as zero (e.g., Uotila, Maula, Keil, & Zahra, 2009; Anderson et al., 2012; Gómez-Mejía et al., 2013; Chi et al., 2020). As shown in Table 4.5, the coefficients of linear interaction term and quadratic interaction term is -3.02 (at 5% significant level) and 51.62 (at 1% significant level). Likewise, in Table 4.6, the coefficient of the quadratic interaction term is 3.01 (at 5% significant level). They all indicate a non-linear relationship between volatility and R&D intensity 1 (R&D intensity 2) as we observed when the missing R&D expenditure is not replaced with zero.

Table 4. 5 Panel Regression of Stock Return Volatility on R&D Intensity1 without Missing

This table shows panel regression estimation results determining the relationship between stock return volatility and RD inten1$_{t-1}$. RD inten1$_{t-1}$ is calculated using R&D expenditure which is replaced by zero if it is a missing value. All other variables are defined in Appendix C. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively. Year and industry fixed effect are both included in all regressions.

	(1) vol	(2) vol	(3) vol
Family Firm		0.01+	0.01*
		(1.76)	(2.35)
RD inten1$_{t-1}$	0.71**	0.45	3.70***
	(3.25)	(1.21)	(3.76)
FF*RD inten1$_{t-1}$		0.32	-3.02**
		(0.82)	(-2.70)
(RD inten1$_{t-1}$)^2			-50.49***
			(-3.59)
FF*(RD inten1$_{t-1}$)^2			51.62***
			(3.69)
ROA$_{t-1}$	-1.19*	-1.19*	-0.90
	(-2.01)	(-2.01)	(-1.47)
Size$_{t-1}$	-1.05***	-1.05***	-1.06***
	(-13.23)	(-13.20)	(-13.32)
Cash$_{t-1}$	0.29**	0.30**	0.36***
	(3.09)	(3.20)	(3.52)
Aslack$_{t-1}$	-0.90***	-0.92***	-1.03***
	(-5.05)	(-5.11)	(-5.34)
Unslack$_{t-1}$	-1.18*	-1.21*	-1.28**
	(-2.46)	(-2.52)	(-2.68)
Pslack$_{t-1}$	2.81	2.93	3.01
	(0.74)	(0.77)	(0.79)
Leverage$_{t-1}$	0.99*	1.02*	1.02*
	(2.25)	(2.33)	(2.33)
(Market/Book)$_{t-1}$	0.55	0.53	0.49
	(0.70)	(0.67)	(0.63)
Dividend$_{t-1}$	-0.54+	-0.55+	-0.55+
	(-1.89)	(-1.93)	(-1.96)
Loss$_{t-1}$	-0.95+	-0.98+	-0.96+
	(-1.68)	(-1.72)	(-1.70)
Age	-0.13***	-0.13***	-0.13***
	(-13.56)	(-13.55)	(-13.34)
Constant	0.16***	0.16***	0.16***
	(6.29)	(6.28)	(6.32)
Obs	4701	4701	4701
R^2	0.351	0.350	0.356

Table 4. 6 Panel Regression of Stock Return Volatility on R&D Intensity2 without Missing

This table shows panel regression estimation results determining the relationship between stock return volatility and deviation of R&D investments to industry-median (RD inten2$_{t-1}$). RD inten2$_{t-1}$ used in this table is calculated using R&D expenditure which is replaced by zero if it is a missing value. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively. Year and industry fixed effect are both included in all regressions.

	(1) vol	(2) vol	(3) vol
Family Firm		0.00+	0.01*
		(1.74)	(2.00)
RD inten2$_{t-1}$	6.82**	3.59	14.47*
	(3.11)	(1.03)	(2.20)
FF*RD inten2$_{t-1}$		4.47	-11.62
		(1.14)	(-1.14)
(RD inten2$_{t-1}$)^2			-2.75*
			(-1.99)
FF*(RD inten2$_{t-1}$)^2			3.01*
			(2.14)
ROA$_{t-1}$	-1.29*	-1.27*	-1.29*
	(-2.19)	(-2.14)	(-2.16)
Size$_{t-1}$	-1.05***	-1.05***	-1.04***
	(-13.20)	(-13.18)	(-13.15)
Cash$_{t-1}$	0.28**	0.30**	0.30**
	(2.99)	(3.14)	(3.04)
Aslack$_{t-1}$	-0.85***	-0.89***	-0.87***
	(-4.93)	(-5.05)	(-4.69)
Unslack$_{t-1}$	-1.19*	-1.21*	-1.25**
	(-2.50)	(-2.53)	(-2.61)
Pslack$_{t-1}$	2.55	2.76	2.44
	(0.67)	(0.73)	(0.64)
Leverage$_{t-1}$	1.01*	1.03*	1.05*
	(2.30)	(2.35)	(2.39)
(Market/Book)$_{t-1}$	0.63	0.58	0.665
	(0.80)	(0.74)	(0.84)
Dividend$_{t-1}$	-0.53+	-0.54+	-0.53+
	(-1.86)	(-1.91)	(-1.89)
Loss$_{t-1}$	-0.96+	-0.98+	-0.99+
	(-1.70)	(-1.74)	(-1.75)
Age	-0.14***	-0.14***	-0.13***
	(-13.57)	(-13.59)	(-13.57)
Constant	0.16***	0.16***	0.16***
	(6.29)	(6.29)	(6.31)
Obs	4701	4701	4701
R^2	0.351	0.351	0.353

We also conducted robustness check using two definitions of family firms separately for both missing R&D expenditures and no missing R&D expenditures. As presented in column (2) and (4) in Table 4.7, when R&D intensity1 is used as the main independent variable and FF1 is used as the moderator, none of the coefficients of interaction terms FF1*RD inten1$_{t-1}$ (-0.48 and 0.21) and FF1*(RD inten1$_{t-1}$)^2 (-4.49 and -4.97) is significant. We also observe such insignificant relationship in Table 4.8, which indicates there is no significant joint effect of FF1 and R&D intensity1 on stock return volatility, regardless of whether the R&D expenditure is replaced with zero or not.

Table 4. 7 Panel Regression of Stock Return Volatility on R&D Intensity1 using Family Firm 1

This table shows panel regression estimation results determining the relationship between stock return volatility and RD inten1$_{t-1}$. Family Firm1 is an indicator which equals 1 if the firm is family firm, zero otherwise. Columns (1) and (2) show the result of analysis where missing R&D expenditure is not treated; Column (3) and (4) show the result of analysis where missing R&D is treated. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively. Year and industry fixed effect are both included in all regressions.

	(1) missing vol	(2) missing vol	(3) no missing vol	(4) no missing vol
Family Firm1	0.01***	0.01**	0.01*	0.01+
	(3.92)	(3.21)	(2.41)	(1.89)
RD inten1$_{t-1}$	4.22**	-0.56	4.15**	0.05
	(2.80)	(-0.21)	(2.95)	(0.02)
FF1*RD inten1$_{t-1}$	-3.92**	-0.48	-3.45*	0.21
	(-2.76)	(-0.19)	(-2.48)	(0.09)
(RD inten1$_{t-1}$)^2		4.54+		4.99+
		(1.77)		(1.95)
FF1*(RD inten1$_{t-1}$)^2		-4.49+		-4.97+
		(-1.75)		(-1.94)
ROA$_{t-1}$	-2.27*	-2.46*	-1.05+	-1.13+
	(-1.97)	(-2.13)	(-1.76)	(-1.87)
Size$_{t-1}$	-0.88***	-0.84***	-1.05***	-1.04***
	(-9.34)	(-8.91)	(-13.30)	(-13.01)
Cash$_{t-1}$	0.33+	0.32+	0.30**	0.29**
	(1.93)	(1.89)	(3.20)	(3.08)
Aslack$_{t-1}$	-0.71	-0.23	-0.91***	-0.89***
	(-1.32)	(-0.39)	(-5.10)	(-4.93)
Unslack$_{t-1}$	-0.95+	-0.85	-1.27**	-1.23*
	(-1.76)	(-1.59)	(-2.64)	(-2.57)
Pslack$_{t-1}$	1.36	1.17	3.03	2.87
	(0.34)	(0.29)	(0.80)	(0.76)
Leverage$_{t-1}$	0.80	0.76	1.06*	1.05*
	(1.52)	(1.45)	(2.42)	(2.39)
(Market/Book)$_{t-1}$	1.03	1.08	0.48	0.53
	(1.23)	(1.28)	(0.61)	(0.67)
Dividend$_{t-1}$	-0.50	-0.49	-0.54+	-0.54+
	(-1.38)	(-1.36)	(-1.90)	(-1.90)
Loss$_{t-1}$	-1.35*	-1.44*	-0.89	-0.94+
	(-2.03)	(-2.17)	(-1.57)	(-1.66)
Age	-0.14***	-0.14***	-0.13***	-0.13***
	(-11.71)	(-11.89)	(-13.07)	(-13.20)
Constant	0.20***	0.20***	0.16***	0.15***
	(4.70)	(4.66)	(6.18)	(6.17)
Obs	3385	3385	4701	4701
R^2	0.402	0.401	0.355	0.354

Table 4. 8 Panel Regression of Stock Return Volatility on R&D Intensity2 using Family Firm 1

This table shows panel regression estimation results determining the relationship between stock return volatility and RD inten2$_{t-1}$. Family Firm1 is an indicator which equals 1 if the firm is family firm, zero otherwise. Columns (1) and (2) show the result of analysis where missing R&D expenditure is not treated; Column (3) and (4) show the result of analysis where missing R&D is treated. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively. Year and industry fixed effect are both included in all regressions.

	(1) missing vol	(2) missing vol	(3) no missing vol	(4) no missing vol
Family Firm1	0.01**	0.01**	0.01+	0.00
	(3.24)	(3.26)	(1.78)	(1.58)
RD inten2$_{t-1}$	7.67	-0.49	7.82	-13.22
	(1.59)	(-0.03)	(1.37)	(-0.66)
FF1*RD inten2$_{t-1}$	-5.46	-7.15	-1.25	13.48
	(-0.91)	(-0.44)	(-0.21)	(0.69)
(RD inten2$_{t-1}$)^2		3.68		14.34
		(0.41)		(1.05)
FF1*(RD inten2$_{t-1}$)^2		-3.23		-13.98
		(-0.36)		(-1.03)
ROA$_{t-1}$	-2.73*	-2.82*	-1.28*	-1.39*
	(-2.37)	(-2.45)	(-2.17)	(-2.34)
Size$_{t-1}$	-0.87***	-0.85***	-1.04***	-1.04***
	(-9.21)	(-9.08)	(-13.18)	(-13.09)
Cash$_{t-1}$	0.34*	0.32+	0.28**	0.27**
	(1.96)	(1.85)	(3.03)	(2.86)
Aslack$_{t-1}$	-0.62	-0.45	-0.85***	-0.82***
	(-1.45)	(-1.03)	(-4.84)	(-4.64)
Unslack$_{t-1}$	-0.88	-0.84	-1.23**	-1.19*
	(-1.64)	(-1.57)	(-2.58)	(-2.47)
Pslack$_{t-1}$	0.98	0.88	2.62	2.43
	(0.24)	(0.22)	(0.69)	(0.64)
Leverage$_{t-1}$	0.80	0.76	1.08*	1.05*
	(1.54)	(1.45)	(2.46)	(2.39)
(Market/Book)$_{t-1}$	1.16	1.18	0.61	0.69
	(1.38)	(1.40)	(0.78)	(0.88)
Dividend$_{t-1}$	-0.49	-0.49	-0.53+	-0.53+
	(-1.33)	(-1.35)	(-1.89)	(-1.88)
Loss$_{t-1l}$	-1.42*	-1.42*	-0.95+	-0.95+
	(-2.14)	(-2.15)	(-1.67)	(-1.68)
Age	-0.15***	-0.14***	-0.13***	-0.13***
	(-12.01)	(-12.13)	(-13.39)	(-13.50)
Constant	0.20***	0.20***	0.16***	0.16***
	(4.72)	(4.72)	(6.21)	(6.23)
Obs	3385	3385	4701	4701
R^2	0.402	0.400	0.354	0.352

However, in Table 4.9. when FF2 is used as the moderator and R&D intensity1 is used as the independent variable. It shows a non-linear relationship between the joint effect and stock return volatility as the coefficients of FF2*RD inten1$_{t-1}$ (-3.05) and FF2*(RD inten1t-1)^2 (45.77) in column (2), and those of FF*RD inten1$_{t-1}$ (-2.96) and FF2*(RD inten1t-1)^2 (51.01) in column (4) are all statistically significant. Likewise, in Table 4.10, as shown in column (2) the coefficients of FF2*RD inten2$_{t-1}$ (-26.64) and FF2*(RD inten2$_{t-1}$)^2 (4.46), and as shown in column (4) the coefficient of FF2*(RD inten2$_{t-1}$)^2 (3.05) are all statistically significant. Follow Bromiley et al. (2017), we instrument one-year lagged value of total asset, debt, employee number, and sale growth. As presented in Table 4.11, the panel regression result shows consistent direction and significant level, and thus, our analysis is robust.

Table 4. 9 Panel Regression of Stock Return Volatility on R&D Intensity1 using Family Firm 2

This table shows results of panel regression estimation with the moderating effect of family firm. Columns (1) and (2) shows the result of analysis when R&D expenditure is used as reported, column (3) and (4) show the result of analysis when R&D is replaced by zero if it is a missing value. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively. Year and industry fixed effect are both included in all regressions.

	(1) missing vol	(2) missing vol	(3) no missing vol	(4) no missing vol
Family Firm2	0.01*	0.01**	0.00	0.01*
	(2.22)	(2.90)	(1.49)	(2.08)
RD inten1$_{t-1}$	-0.03	2.90+	0.44	3.66***
	(-0.06)	(1.65)	(1.19)	(3.72)
FF2*RD inten1$_{t-1}$	0.35	-3.05**	0.34	-2.96**
	(0.89)	(-2.74)	(0.85)	(-2.64)
(RD inten1$_{t-1}$)^2		-42.51*		-49.98***
		(-2.29)		(-3.56)
FF2*(RD inten1$_{t-1}$)^2		45.77**		51.01***
		(2.82)		(3.65)
ROA$_{t-1}$	-2.95**	-2.74*	-1.19*	-0.90
	(-2.59)	(-2.39)	(-2.01)	(-1.47)
Size$_{t-1}$	-0.86***	-0.87***	-1.05***	-1.05***
	(-9.19)	(-9.12)	(-13.20)	(-13.32)
Cash$_{t-1}$	0.38*	0.40+	0.30**	0.36***
	(2.11)	(1.84)	(3.19)	(3.52)
Aslack$_{t-1}$	-0.75	-1.00	-0.92***	-1.03***
	(-1.39)	(-1.13)	(-5.11)	(-5.35)
Unslack$_{t-1}$	-0.79	-0.87	-1.20*	-1.28**
	(-1.49)	(-1.60)	(-2.51)	(-2.66)
Pslack$_{t-1}$	1.06	0.62	2.92	3.00
	(0.26)	(0.16)	(0.77)	(0.79)
Leverage$_{t-1}$	0.64	0.63	1.02*	1.01*
	(1.23)	(1.21)	(2.32)	(2.32)
(Market/Book)$_{t-1}$	1.10	1.20	0.53	0.49
	(1.31)	(1.42)	(0.67)	(0.63)
Dividend$_{t-1}$	-0.52	-0.53	-0.54+	-0.56+
	(-1.44)	(-1.46)	(-1.92)	(-1.95)
Loss$_{t-1}$	-1.47*	-1.42*	-0.97+	-0.96+
	(-2.21)	(-2.14)	(-1.72)	(-1.69)
Age	-0.14***	-0.14***	-0.14***	-0.13***
	(-12.34)	(-12.19)	(-13.56)	(-13.35)
Constant	0.21***	0.21***	0.16***	0.16***
	(4.75)	(4.74)	(6.29)	(6.33)
Obs	3385	3385	4701	4701
R^2	0.394	0.400	0.350	0.356

Table 4. 10 Panel Regression of Stock Return Volatility on R&D Intensity2 using Family Firm 2

This table shows panel regression result of moderating effect of family firm. RD inten2$_{t-1}$ is deviation of R&D investments to industry-median. Column (1) and (2) shows the result of analysis when missing R&D expenditure is not treated; Column (3) and (4) show the result of analysis when missing R&D is treated. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively. Year and industry fixed effect are both included in all regressions.

	(1) missing vol	(2) missing vol	(3) no missing vol	(4) no missing vol
Family Firm2	0.01*	0.01**	0.00	0.00+
	(2.24)	(2.72)	(1.47)	(1.75)
RD inten2$_{t-1}$	2.62	13.09*	3.63	14.60*
	(0.67)	(1.96)	(1.04)	(2.22)
FF2*RD inten2$_{t-1}$	2.96	-26.64*	4.45	-12.07
	(0.76)	(-2.20)	(1.14)	(-1.18)
(RD inten2$_{t-1}$)^2		-3.79*		-2.77*
		(-2.31)		(-2.01)
FF2*(RD inten2$_{t-1}$)^2		4.46**		3.05*
		(2.69)		(2.17)
ROA$_{t-1}$	-3.13**	-2.88*	-1.26*	-1.30*
	(-2.77)	(-2.52)	(-2.14)	(-2.17)
Size$_{t-1}$	-0.86***	-0.86***	-1.04***	-1.04***
	(-9.15)	(-9.12)	(-13.18)	(-13.15)
Cash$_{t-1}$	0.34*	0.35+	0.30**	0.30**
	(2.00)	(1.79)	(3.13)	(3.03)
Aslack$_{t-1}$	-0.90*	-0.40	-0.89***	-0.86***
	(-2.25)	(-0.87)	(-5.05)	(-4.68)
Unslack$_{t-1}$	-0.77	-0.82	-1.20*	-1.25**
	(-1.45)	(-1.53)	(-2.51)	(-2.60)
Pslack$_{t-1}$	0.80	0.53	2.74	2.41
	(0.20)	(0.13)	(0.72)	(0.63)
Leverage$_{t-1}$	0.66	0.69	1.03*	1.05*
	(1.26)	(1.32)	(2.34)	(2.38)
(Market/Book)$_{t-1}$	1.18	1.25	0.58	0.67
	(1.40)	(1.48)	(0.74)	(0.85)
Dividend$_{t-1}$	-0.50	-0.51	-0.54+	-0.53+
	(-1.38)	(-1.41)	(-1.91)	(-1.88)
Loss$_{t-1}$	-1.46*	-1.47*	-0.98+	-0.99+
	(-2.21)	(-2.22)	(-1.73)	(-1.75)
Age	-0.14***	-0.14***	-0.14***	-0.13***
	(-12.34)	(-12.20)	(-13.60)	(-13.58)
Constant	0.21***	0.20***	0.16***	0.16***
	(4.75)	(4.73)	(6.29)	(6.31)
Obs	3385	3385	4701	4701
R^2	0.395	0.400	0.351	0.353

Table 4. 11 Two-Stage Least Square Analysis

This table reports the regression results of two-stage least square analysis using the entire sample. Columns (1) shows the result when R&D inten1 is instrumented; Column (2) shows the result of analysis when R&D inten2 is instrumented. The definitions of all variables are listed in Appendix C. t-stats are reported in parentheses. +, *, **, and *** represent significance at the 10%, 5%, 1%, and 0.1% levels, respectively. Year and industry fixed effect are both included in all regressions.

	(1) vol		(2) vol
Family Firm	0.01***	Family Firm	0.01**
	(3.68)		(3.18)
RD $\widehat{\text{inten}}1_{t-1}$	28.38***	RD $\widehat{\text{inten}}2_{t-1}$	-40.80
	(3.58)		(-1.27)
FF* RD $\widehat{\text{inten}}1_{t-1}$	-5.59**	FF* RD $\widehat{\text{inten}}2_{t-1}$	-32.64*
	(-2.80)		(-2.16)
RD $\widehat{\text{inten}}1_{t-1}^{2}$	-7.67***	RD $\widehat{\text{inten}}2_{t-1}^{2}$	-8.17***
	(-4.38)		(-3.99)
FF*RD $\widehat{\text{inten}}1_{t-1}^{2}$	8.33***	FF*RD $\widehat{\text{inten}}2_{t-1}^{2}$	7.66***
	(4.82)		(4.28)
ROA_{t-1}	-10.39***	ROA_{t-1}	1.24
	(-3.66)		(0.55)
$Size_{t-1}$	-8.90***	$Size_{t-1}$	-8.64***
	(-9.37)		(-9.10)
$Cash_{t-1}$	1.30**	$Cash_{t-1}$	1.29***
	(3.85)		(3.63)
$Aslack_{t-1}$	-25.89**	$Aslack_{t-1}$	6.12*
	(-3.22)		(2.11)
$Unslack_{t-1}$	-0.44	$Unslack_{t-1}$	-0.68
	(-0.73)		(-0.97)
$Pslack_{t-1}$	-2.21**	$Pslack_{t-1}$	0.90
	(-2.86)		(1.29)
$Leverage_{t-1}$	0.15	$Leverage_{t-1}$	0.46
	(0.28)		(0.85)
$(Market/Book)_{t-1}$	5.76***	$(Market/Book)_{t-1}$	-0.76
	(3.62)		(-0.50)
$Dividend_{t-1}$	1.42*	$Dividend_{t-1}$	-1.51*
	(2.02)		(-2.19)
$Loss_{t-1}$	-1.98**	$Loss_{t-1}$	-1.09
	(-2.91)		(-1.56)
Age	-0.17***	Age	-0.13***
	(-11.32)		(-11.18)
Constant	0.23***	Constant	0.19***
	(5.25)		(4.42)
Obs	3381	Obs	3381
R^2	0.408	R^2	0.402

4.4 Conclusion

In this study, we examine the relationship between stock return volatility as a reflection of market reaction of investors and the R&D investments with the moderating effect of family firms using public companies on U.S. market from 2007-2018. We document a quadratic pattern of change of stock return volatility as R&D investments increases. Moreover, such pattern is more pronounced for family firms as R&D investments increase and is more pronounce for non-family firms as the deviation of R&D investments to industry-median increases. This study provides a channel to investors who are interested in investing family firms, as well as CEO, top management team in family business so that they could monitor changes in stock and be aware of possible stock return volatilities.

Although we attempted to cover all angles both theoretically and empirically, there is indeed some limitations. One of which is that the reported value of R&D. As discussed in several journal articles including Anderson et al., (2012), Coles et al., (2006), and Uotila et al., (2009), we have to treat the missing R&D expenses. If not, however, we will have unbalanced panel data. Another is that our annual data is not up-to-date due to the accessibility to the database.

For future improvement or extension of this study, although the industrial fixe effect was controlled, one thing we can do further is to split industries into intensive R&D ones and light ones to compare the potential differences. We can also include data of recent years once it is available. Another thing be improved is that we can focus on NYSE, NASDAQ, or AMEX only in order to eliminate some potential noise from, for example, penny stocks. Internationalization of family firms can also be studies since nowadays it is not uncommon for any public company to have oversea divisions. By considering internationalization, it is possible to see how the synergy of projects influence the financial performance of a company. To solve the missing value of R&D expense, survey and questionnaires can be used if the top management team and officers are willing to disclose that information.

4.5 Appendix C: Variable Definitions and Measures

Variable Definitions	Measures
Volatility	Standard deviation of monthly stock return for the past 12 months
R&D inten1	R&D expense/Sale
R&D inten2	R&D expense/Sale - industry median of (R&D expense/Sale)
Family Firm1	Equals 1 if the Founder or descendant or Family Member is Director Officer or Large or Shareholder>5%, 0 otherwise (FF1).
Family Firm2	Equals 1 if the Family ownership stake is the largest vote holder, 0
Family Firm	Family Firm1*Family Firm2 (FF)
ROA	Ratio of net income to total asset at the end of year
Size	Natural log of market value
Cash	(cash + marketable security)/sale
Aslack	Selling, General and Administrative Expense/sale (available slack)
Unslack	Current Asset/Current Liability (unavailable slack)
Pslack	Total long - term debt/total common equity (potential slack)
Leverage	Ratio of long-term liability to total asset
Market to Book Ratio	Ratio of Market value to Book value
Dividend	Amount of dividend paid/total asset
Loss	Dollar amount of net income (loss)
Age	Years of firm since it is on COMPUSTAT

Chapter 5 General Conclusion

This dissertation consists of three topics which fit in the field of corporate finance: 1) Chapter 2: The Role of Investor Protections on the Value of Investment Banking Relationships: International Evidence; 2) Chapter 3: The Regulatory Effect on the Difference of Investment Efficiency Between Family and non-Family Firms: An International Scope; 3) Chapter 4: The Market Reaction to R&D Pattern: Family Firms vs Non-family Firms.

In Chapter 2, we examine the role of country-level investor protection on the value of relationships between IBs and client firms by using cross-country acquisitions between IBs as external shocks to these relationships. Using an event-study approach, we document evidence consistent with implications of Bebchuk and Neeman (2010) that the clients of target IBs acquired by IBs from stronger (weaker) investor protection countries realize lower (higher) announcement returns. This is primarily due to the substitutive relationship between country-level investor protections and IB-level monitoring. The results are robust using two additional proxies for investor protection, including common law legal origin and insider trading. In addition, we find that the underwriting reputation of the IB banks positively moderates the relationship between the relative strength of acquirer-IB and target-IB country investor protections and announcement return when using legal origin as the proxy for investor protections. Overall, our analysis highlights the economic role of country-level investor protections on the value of relationships between IBs and client firms.

In Chapter 3, we investigate the direct relationship between a family firm and their investment efficiency rooted mainly in the SEW theory, behavioral agency theory, and the resource-based theory using a sample of international public companies. We find that overall family firms invest more inefficiently than non-family firms. We also find that the family-owned stakes in family firms is non-linearly negatively related to investment inefficiency. Regarding the role that female directorship plays in the relationship between a family firm and investment efficiency, it weakens the negatively relationship. Another finding of ours is that the regulatory environment non-linearly affects the

investment inefficiency of family firms. Particularly, when the regulatory environment is the poorest or the best, the investment inefficiency would be ameliorated, which may result from the preservation of property rights. As far as the average quality, the regulatory effect may not comparably steer the investment efficiency.

In Chapter 4, we examine the relationship between stock return volatility as a reflection of market reaction of investors and the R&D investments with the moderating effect of family firms using public companies on U.S. market from 2007-2018. We document a quadratic pattern of change of stock return volatility as R&D investments increases. Moreover, such pattern is more pronounced for family firms as R&D investments increase and is more pronounce for non-family firms as the deviation of R&D investments to industry-median increases.

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