ESSAYS ON PRODUCT MARKET DYNAMICS AND CORPORATE CASH HOLDINGS ACROSS COUNTRIES

by

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Presented to the Faculty of the Graduate School of

The University of Texas at Arlington in Partial Fulfillment

of the Requirements

for the Degree of

DOCTOR OF PHILOSOPHY

THE UNIVERSITY OF TEXAS AT ARLINGTON

April 2017

To my parents and my sister,

who may never read beyond this point;

and my two little Texas Cao-boys, Son and Phong,

without whom my dissertation would have been completed earlier.

ACKNOWLEDGEMENTS

"Investments mean forgoing current consumption in expectation of greater future consumption."

~ Bodie, Kane and Marcus, Essentials of Investments ~

About five years ago, I started a medium-term investment in an intangible asset, the doctoral program in Finance. My investment was highly levered and risky with capital structure of 20% equity and 80% debt. Major founding / preferred shareholders were my family. Major debtholders were people I have had opportunity to work with and learn from. Together, they have made my **Ph.**inishe**D.** journey a positive NPV and profitable project, and I am indebted for their support and encouragement all the way through.

First and foremost, I am grateful to my *"Chairman"*, Dr. Sanjiv Sabherwal, for his continuous guidance and inspiration. Professionally, his outstanding scholarship, great dedication, and excellent mentoring have much shaped my academic orientation and interests. Personally, his understanding and stimulation are among the deterministic variables for the completion of my dissertation. He has earned my deep respect and sincere appreciation for the rest of my life as **the best** ~~(and only)~~ advisor I have known.

My gratitude also goes to the *"chief executives"*, Dr. Larry Lockwood, Dr. Mahmut Yasar, and Dr. Salil Sarkar for kindly being part of my *"board of directors"* / dissertation committee and providing valuable insights. Their countless comments and constructive suggestions played a statistically significant role in getting this work finished. I truly hope to continue long-term academic relationships with them.

I am thankful to the *"external governance mechanisms"*, College of Business, and Department of Finance and Real Estate for providing the research facilities, administrative assistance, and financial support. It was also my great pleasure to share the ride with fellow Ph.D. students from not only Finance but a variety of disciplines. I have received exogenous influence from Ramya Aroul, Jinsuk Yang, and especially, Cuong Nguyen, who has become a brother to me; and lots of encouragement from circles of friends at UT Arlington, Shadow Brook Apartment, Community Garden, Phap Quang Buddhist Temple, and other friends around Tarrant County and DFW Metroplex whom I will miss dearly.

Most importantly, this dissertation, by no doubt, is dedicated to my family.

I would have not been able to accomplish this dissertation and the doctoral program without endless love and everlasting support from my family equity holders. My parents, my sister, and especially my two little Texas Cao-boys have had an interest in "*product markets*" and "*cash holdings*" remarkably different from mine. They have been definitely lacking of professional procrastination which I essentially could not live without, thus creating a problem that is called *"principal-agency conflict"*. They also have had obviously zero contribution in connecting literature, collecting data, writing codes, running tests, typing manuscripts, proof-reading, or even paying tuition. At best, they have provided distractions such as field trips and sick days. To them, I was pursuing a career of being the less important of two types of doctors, the type that cannot magically save people from sickness and death. Nonetheless, they have been concerned with my degree completion more than myself and have sacrificed ENORMOUSLY in many uncountable ways. They deserve to come back to their normal courses of life a.s.a.p., and to finally get their long past-due dividends paid off.

On a side note, I can't possibly come up with a full list of you who wondered what I did all day every day during five years and when I would ever be done with school. Well, the dissertation is **Ph.**inally **D.**one!

However, I will not be done with school anytime soon.

It is the new beginning of everything. Stay tuned!

Unrecognized credit should also be made to:

- COB 404 – "room not found" (and 604)
- My office computer, for keeping my files safe
- UTA Maverick Activity Center, for keeping me skinny
- Costco's Kirkland 100% Columbian coffee, for keeping me sleepless

ABSTRACT

PRODUCT MARKET DYNAMICS AND CORPORATE CASH HOLDINGS ACROSS COUNTRIES

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The University of Texas at Arlington, April 2017

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Degree: Doctor of Philosophy in Business Administration (Finance)

My dissertation is composed of two essays that investigate two related yet distinct dynamics of product market and their influence on corporate cash holdings, and both are concerned with these dynamics being determinants of cash policy for international samples over the period of 1999-2015. The samples for the first and second essays respectively cover fourteen and ten countries that span not only developed countries but also emerging economies.

The first essay focuses on the impact of product market competition risk on corporate cash level. I construct a composite score of competition that captures three horizontal dimensions of product pricing competition that can be extended to international context. For all of sample component countries, Australia, Canada, France, Germany, India, Japan, Malaysia, Singapore, South Korea, Sweden, U.K. and U.S., I find that firm-level cash-to-assets ratio is positively associated with industry level of competition. My empirical finding is consistent with Hoberg, Phillips and Prabhala (2014) and supports the precautionary motive of holding cash. My analysis also highlights that the impact of competition on cash

varies across firms and countries. Specifically, precautionary holding of cash under industry competition seems to be weakened for firms that are either dependent on external financing of incapable of raising capital. It is also weakened for firms in countries with better credit market development, weaker stock market development, and stronger investor protection. The functioning difference of credit market versus stock market is crucial in explaining cross-country variation of cash under industry competition.

The second essay concentrates on how product market predation risk affects corporate cash level. I propose two measures of takeover threat that captures the number of merger and acquisition deals and the total dollar value of merger and acquisition deals to target firms in each industry. I find that takeover threat is a determinant of cash holdings in the overall sample and six individual countries out of ten: Australia, Germany, India, Japan, South Korea, and U.S. This empirical result is consistent with Haushalter, Klasa and Maxwell (2007), supporting the holding of cash under precautionary/ deterrence motive. The other four countries, Canada, France, Sweden, and U.K., experience an opposite relationship that seems to be more in line with the monitoring / disciplinary effect of takeover on amount of cash. In addition, the positive impact of takeover threat on cash level is moderated for firms in countries with more developed credit market, higher economic freedom, better accounting standards, and stronger investor protection.

JEL classification: G15, G30, G32, G34, K22

Keywords: product market, cash holdings, liquidity policy, agency problem, investor protection, financial market development

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LIST OF ABBREVIATIONS

ADRI	Anti-Directorship Rights Index
CAPEX	Capital Expenditure
CPI	Creditor Protection Index
CRSP	Center for Research in Security Prices
EFN	External Financing Needs
EXCHG	Exchange
GDP	Gross Domestic Product
GVKEY	Global Company Key
HBR	Harvard Business Review
HHI	Hirschman - Hirfindahl Index
IPI	Investor Protection Index
ISO	International Organization for Standardization
M&A	Mergers and Acquisitions
MNC	Multi-National Corporation
NYSE	New York Stock Exchange
PCM	Price-Cost Margin
PLC	Public Limited Company
PPE	Plant, Property and Equipment
R&D	Research and Development
RL	Rule of Law
SDC	Securities Data Corporation
UAI	Uncertainty Avoidance Index
WBES	World Business Environment Survey
WDI	World Development Index
WRDS	Wharton Research Data Services
WSJ	Wall Street Journal

CHAPTER 1

INTRODUCTION

Recently, we have witnessed an upward secular trend of corporate cash, and at the same time, a rise in investor activism against it. Then, why do many firms still choose to maintain large amount of cash regardless of their shareholders' preference? One among the most important motivations for firms to hold excess cash is the financial flexibility that not only facilitates planned events but also help control unplanned events, thus first, to avoid missing investment opportunities and second, to buffer against unexpected negative shocks in the future, especially when external financing is costly or capital supply is uncertain.

Literature on the relationship between product market and corporate cash holdings is very thin. The very few existing studies focus only on U.S. firms and provide ambiguous evidence. To the best of my knowledge, there are only two studies that directly look at the impact of product market dynamics on cash holdings: Hoberg, Phillips and Prabhala (2014) analyze competition risks and Haushalter, Klasa and Maxwell (2007) examine predation risk. These studies conclude that, on one hand, product market could serve as an external governance mechanism and mitigate the agency problem of free cash flows; and on the other hand, there is a strategic dimension of holding cash for companies to be prepared for unexpected future competitive or predatory risks from industry rivals. The biggest limitation of these studies is the use of measures of product market risks that are both single dimensional and not extendable to non-U.S. samples, and at times, provide ambiguous interpretations. For example, high HHI is a commonly used to proxy for high industry concentration/ low competition in literature, but high HHI was also interpreted as high industry predatory threat in (HKM, 2007).

My dissertation aims to extend the literature on product market dynamics and cash holdings by separating the two dynamics of product market: competition risk and predation risk, of which both have disciplinary effect on corporate governance that may induce decrease in corporate cash holdings, while simultaneously imposing high operational risk on firms which may subsequently lead to large corporate cash reserves as a flexible risk hedging tool. One of my major contributions is that I propose new measures for each of these two types of product market risks that are distinctive from each other, capture multiple dimensions of risks, and can be constructed for international samples. Specifically, in the first essay, I create an industry competition score using three horizontal forces of product pricing power (Porter, 1979) borrowed from Economics literature. In the second essay, I proxy for industry mergers and acquisitions (M&A) threat by borrowing two measures of M&A frequency and two measures of M&A intensity from Management literature. For both essays, I then use these proposed measures to first, test the baseline impact of product market risks on corporate cash holdings, and second, examine how these relationships vary across countries under the moderation of country-level factors such as financial market development, economic freedom, accounting standard quality, and investor rights protection.

Using a sample of 14 countries including Australia, Canada, France, Germany, India, Japan, Malaysia, Singapore, South Korea, Sweden, Taiwan, Thailand, U.K., and U.S. over 1999-2015, the first essay finds a consistently significant and positive correlation between industry level of product pricing competition and firm-level holding of cash. For the second essay, Malaysia, Singapore, Taiwan, and Thailand are removed due to limited number of M&A activities, and a significantly positive relationship is found between industry takeover threat and corporate cash holdings. Atogether, the baseline findings in my two essays suggest that product market dynamics can play deterministic role in trade-off model of liquidity choice. Further analyses assert that this impact is moderated by dependence on external financing and ability to raise capital at firm level, and financial market development as well as investor protection at country level, among others. My measure of financial market development emphasizes the functional difference between stock market and credit market in the way they perceive product market

risks. My measure of investor right protection captures both *de jure* and *de facto* aspects of law and regulation. Overall, my essays provide empirical results in support of cash holdings as a risk management tool against unexpected industry competition and/or acquisition shocks and that motive varies across countries.

The main contributions of my dissertation are three folds. First, I expand the product market and cash holdings literature to a global context by using cross-country samples. Second, I provide additional U.S. evidence for our better understanding. And third, I propose new multi-dimensional measures of product market competition and predation risks. Overall, my work supports the strategic role of holding cash, and indicates that the relationship is complex, multi-dimensional, and needs more light to be shed on.

CHAPTER 2

Product Market Competition and Corporate Cash Holdings

Evidence across Countries

Abstract

Literature suggests an ambiguous relationship between product market competition and corporate cash holdings. One possible explanation is the opposite predictions that come from the disciplinary effect of competition on cash, and the risk management role of cash under competition. Another explanation comes from how differently previous studies define and quantify competition.

In this paper, I develop a composite score of competition, which complements existing measures in two ways: it captures multiple dimensions of pricing power that drive product market competition; and it allows for measuring industry competition in a broad global context. My analysis shows that corporate cash level is significantly higher for firms in more competitive product markets across countries and over time. In addition, the positive association between competition and cash reserves is weaker for firms with external financing dependence and firms under financial constraints.

Further tests examine development of equity and credit markets and document that the two external financing mechanisms affect the positive correlation between competition and cash holdings differently: equity market development strengthens it while credit market development weakens it. It is possibly because the credit market is less effective in pooling risks and more sensitive to distress risks than equity market. Finally, I also find that the positive relationship between competition and cash ratio is stronger in countries with weaker investor protection.

JEL classification: G15, G30, G32, G34, K22

Keywords: product market competition, cash holdings, financial market development, investor protection

1. Introduction

"A company's ability to respond to an unplanned event, good or bad, is a prime indicator of its ability to compete."

– Bill Gates (Founder of Microsoft) –

Corporate liquidity provision is not only useful for planned events but may also determine the ability to benefit from unplanned opportunities or even survival under unexpected tough market conditions (Opler, Pinkowitz, Stulz, and Williamson, 1999; Almeida, Campello, and Weisbach, 2004). Examples of unexpected tough markets are costly external financing and uncertain capital supply[1]. Conversely, firms with excessive cash holdings may encounter agency problems, be entitled "inefficient", and suffer from stock market discount (Jensen, 1986). Recently, financial economists break into two camps: one camp doubts that a large cash level is a sign of a healthy company; the other believes that free market could take care of managerial opportunism. Nevertheless, we have witnessed a co-existence of two opposite movements, particularly in the U.S.: an upward secular trend of corporate cash reserves[2], and a rise in investor activism against large cash hoards[3]. This U.S. conundrum in corporate liquidity brings up the question that has increasingly piqued the interest of academics and practitioners in recent years: "What determines the level of cash holdings in today's business environment?" Although literature has considerably broadened the list of cash holdings determinants, it has paid limited attention to (1) product market dynamics, (2) whether the U.S.-based findings apply to other countries, and (3) how country

[1] Lins et al. (2010) survey 204 CFOs from 29 countries and report two liquidity sources for different risks. While credit lines are favored for future business opportunities in good times, cash serves better against future cash flow shocks in bad times.

[2] At the end of 2014, U.S. non-financial companies held a staggering $1.73 trillion in cash, up 4% from $1.67 trillion at the end of 2013, reported by Moody's. U.S. cash and cash equivalents balance amounts to $1.80 trilion as of half way through the year 2014 (Q2), data from Federal Reserve Release B.102 (https://www.federalreserve.gov/Releases/Z1/20140605/accessible/b102.htm).

[3] According to Moody's Investors Service's 2014 shareholder activism report, the number of activist hedge funds and investment advisers' campaigns through proxy contests and public announcements increased from 179 in 2011 to 209 in 2012 and 220 in 2013 (https://www.irmagazine.com/articles/buy-side/20089/shareholder-activism-rise-along-corporate-cash-stockpiles/).

Recent activisms related to large corporate cash holdings are against General Motors (2015) and Apple Inc. (2013-2015).

characteristics moderate this relationship. Providing an international empirical evidence on corporate cash holdings is important for three reasons: first, cash reserves always are the most accessible resources for entrenched managers to exploit private benefits in any country; second, recent surveys show that international firms are also holding significant and increasing amounts of cash[4]; and third, the variations in cash holdings across firms and across countries are both large enough to allow for cross-sectional tests[5]. The purpose of this paper is to expand the literature on corporate cash holdings by embracing "product market competition" as a global driver of corporate liquidity, therefore shedding light on the effect of competition on cash policy around the world.

My predictions are based on three arguments related to the effect of product market competition on cash. First, competition could lead to *lower* cash holdings as it disciplines managers ("*disciplinary effect*"). Second, concentration (the opposite of competition) could lead to higher cash in order to combat the takeover threats from existing rivals ("*predatory threats*") suggesting an *inverse* relationship between competition and cash. And third, competition could lead to *greater* cash holdings as firms stockpile cash so that they are better prepared for unexpected events ("*precautionary motive*").

The first two arguments support *lower* cash holdings in competitive markets. On one hand, product market competition has long been supported in the economics literature as an external governance mechanism since competition leads to the removal of incompetent managers. A number of studies have examined potential channels through which competition can incentivize managers to be more efficient and more aligned with shareholders, theoretically (Holmstrom, 1982; Hart, 1983; Scharfstein, 1988; and Raith, 2003); and empirically (Nickell, 1996; Berger and Hannan, 1998; Griffith, 2001; and Karuna, 2007). Giroud and Mueller (2010, 2011) argue that competition can substitute for weak legal system or bad corporate governance. On the other hand, in industries with high concentration (low competition),

[4] The secular trend reaches peak around 2004-2005 with a slight decline afterwards (Iskandar-Datta and Jia, 2012). Average cash ratio of U.S. public firms more than doubled from 10.5% in 1980 to 23.2% in 2006 (Bates et al., 2009).

[5] Cash-to-assets is up to 20% for U.S. firms (Bates et al., 2009), 12% average for large European firms (Schauten et al, 2011); 15% for EMU firms in 2000 (Ferreira and Vilela, 2004).

firms strategically hoard cash to tackle predatory behaviors of rivals (theory of predation, Bolton and Scharfstein, 1990; Haushalter, Klasa and Maxwell, HKM, 2007); and cash-rich firms can take advantage of opportunities to gain market shares at expenses of cash-poor rivals (theory of risk management, Froot, Scharfstein and Stein, 1993; Fresard, 2010).

The third argument states that product market competition raises the demand for a cash cushion because competition is a source of operational risks (Chod and Lyandres, 2011) that may negatively affect the outcomes of financing and investment decisions. The unfavorable consequences of competition may be an increase in the variability of cash flows and the volatility of idiosyncratic returns (Irvine and Pontiff, 2009), lower post-M&A gains (Hoberg and Phillips, 2010a), or diminishing marginal returns on new and existing investments (Li, Lundholm, and Minnis, 2013).

Product market literature focuses mostly on financing and investment decisions, as well as stock returns, and understudies liquidity policy, with only two studies by HKM (2007) and HPP (2014), to my best knowledge. Both focus on U.S. firms and conclude that cash policy encompasses a "*strategic*" dimension that can positively protect the firm from industry threats and enhance its industry positioning. HKM (2007) argue that higher concentration increases cash while HPP (2014) propose that higher competition increases cash. These seemingly contradictory findings are due to the differences in the way competition is defined in the two studies. Particularly, HKM (2007) use high industry concentration (or low competition) to proxy for high predatory risk from existing rivals, while HPP (2014) develop a text-based measure called "*fluidity*"[6] which captures similarity in product description to proxy for high substitutability risk. My paper aims to develop a multi-dimensional proxy for product market competition that allows for disentangling the U.S. puzzling evidence while extending the question to international context. Empirically, my final international sample is constructed from four Compustat North America

[6] "Fluidity", as changes in a firm's own product description and its rivals' overlapping vocabularies, is a dot product calculated from a matrix by scoring time-varying "cosine" similarity in each firm's language extracted from U.S. firms' 10-K financial reports. Data is generously shared at http://hobergphillips.usc.edu/industryconcen.htm

and Global accounting and stock market datasets and has 241,115 observations from 29,964 public firms in 14 countries during 1999-2015.

One major challenge in my study is finding a competition measure that complements existing ones and can be developed for different countries. I construct a composite score that captures three horizontal dimensions of pricing power identified by Porter (1979)[7], namely threat from existing rivals, threat from potential entrants, and threats of product substitutes. These dimensions are considered direct drivers of price competition of product market and they are respectively adapted from industry concentration (Herfindahl – Hirschman Index, HHI); entry cost (MacKay and Phillips, 2005); and price-cost margin (Lerner Index) to fit with the use of global accounting data. Specifically, HHI represents the de-concentration of product market, where lower concentration means either more existing rivals and/or lower individual market power. Entry cost represents the fixed capital required for new firms to set up similar business in the same industry, with a lower entry cost implying that it is less costly for potential entrants to enter the product market. Price-cost margin represents the power to set product price above marginal cost, with a higher margin implying more profitable opportunities for substitute products. Besides the continuous variable which is the equally weighted average of three individual dimensions, I also create binary identifiers for high versus low competition markets within each country-year. As far as I know, this is the first study to provide a comprehensive measure of product market competition.

Another major challenge my study tackles is investigating how the impact of competition on cash varies across companies, product markets, and nations. More specifically, I identify firm-, industry- and country-level factors that may govern the relationship between competition and cash holdings. A large body in liquidity management literature addresses the importance of financial flexibility under constrained conditions (Almeida et al., 2004; Duchin, Ozbas and Sensoy, 2010; Ang and Smedema, 2011). Another large body emphasizes the compelling importance of controlling for agency problems

[7] The two vertical dimensions of competition from Porter's Five Forces, bargaining power of customers and bargaining power of suppliers, relate more to pricing power of product and not as much to intra-industry competitive among firms.

(Harford, 1999; Dittmar and Mahrt-Smith, 2007; and Harford, Klasa and Maxwell, 2008). I focus on factors that shape the *cost of* and *access to* external financing since external financing is an alternative to cash funding or other internal funding for investments. In this section, I use two different ways to control for the endogeneity issue that may arise from the use of accounting data: the firm-level factors are from out-of-sample, which means that they are generated from historical accounting data from the previous three years; and whenever possible, I also use aggregated industry-level factors to smooth out the firm-level idiosyncratic volatilities.

I further examine the moderating role of firm-level and country-level factors that may affect the cost of external financing, hence the benefit and cost of cash holdings, including firm dependence on external financing and financial constraints, national investor protection, and development of financial markets.

My test design follows the trade-off model of liquidity which incorporates the most extensive list of firm-level cash holdings determinants. My variable of interest is industry-level competition. For control variables, I include firm size, age, leverage, profitability, dividend policy, R&D intensity, industry sales growth and industry volatility of cash flow following Opler et al. (2009) and Bates, Kahle and Stulz (2009); and country factors following Dittmar et al. (2003) and Pinkowitz, Stulz and Williamson (2006). These firm characteristics and risk factors represent *transaction motive* and *common precautionary motive* of corporate liquidity. *Tax motive* of cash holdings is comtrolled by a binary identifier for multinational corporations (Foley, Hartzell, Titman, and Twite, 2007). Any excess cash beyond these three motives is considered under *agency motive* (Jensen, 1986). I run two-sided tobit regressions with different fixed effects and standard error clustering to control for omitted variable issue from unobservable country and industry characteristics.

I obtain four major results. First, my baseline tests show a significantly positive association between product market competition and corporate cash holdings that is consistent across countries and over time. Second, the positive impact of competition on cash is stronger for firms with internal financing

independence or less financially constrained. Third, the positive impact of competition on cash is strengthened in more developed equity markets, but weakened in more developed credit markets, and can be partly explained by the functional differences between the two external financing mechanisms: credit market is more sensitive to risks and failures while competition is a source of risks. And fourth, the governing role of credit market is similar to that of investor protection. Collectively, my empirical results support more cash holdings for preparedness under competition in trade-off model.

I perform a number of tests to validate my competition score[8] and to check the robustness of my findings, including alternative measures of cash holdings or industry classifications, subsample and subperiod analysis, and panel data regressions. The results are statistically and economically significant and exempt from potential dominating effects from U.S. firms, R&D-intensive firms, cash-rich firms, or post-crisis periods[9]. Large firm sample selection bias for not including private firms should not be a problem since economies of scale in large firms actually deflate average cash holdings. I reject the possibility of reverse causality issue for which one could argue that competition intensity does not lead to increase in cash holdings, but rather cash-rich firms choose to operate in competitive industries.

This study contributes to liquidity and product market literature in several ways. The main contribution is to visit the relationship of competition and cash using samples extended beyond U.S. firms. Several recent cross-country studies examine the value of cash but not the level of cash (Pinkowitz et al., 2006; Dittmar and Mahrt-Smith, 2007). Some studies look at trends of cash (Ferreira and Vilela, 2004; Iskandar-Datta and Jia, 2012), but none look at the impact of product market competition.

Another contribution is to provide an empirical evidence to the U.S.-focused puzzle. My story is similar to HPP (2014): competition enhances cash for both U.S. and cross-country samples.

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[8] I also compare my competition score to a global qualitative measure of competition from World Business Environment Survey (WBES) that focus more on small- and medium-sized firms (Beck, Demirgüç-Kunt and Maksimovic, 2004) WBES was conducted by World Bank in 1999-2000. Data available at http://go.worldbank.org/RV060VBJU0 for over 10,000 firms in 80 countries. However, 5 out of 14 countries in my sample are not included in the survey.

[9] Some results are not tabulated for the sake of space but are available upon request.

I also contribute to product market literature by developing a new comprehensive measure for industry competition based upon economic theories which is multi-dimensional and applicable to a global context. Some previous measures of competition includes industry concentration (Giroud and Mueller, 2011), Census HHI (Hoberg and Phillips, 2010b; Byoun and Xu, 2016), shifts in import tariffs (Hoberg, 2010), 10-K text count of "competitive" terms (Li et al., 2013), 10-K text-based measure of product similarity (Hoberg and Phillips, 2010a), and price-cost margin (Peress, 2010; Byoun and Xu, 2016).

Additionally, my study contributes to financial flexibility and financial development literature by differentiating two mechanisms of external financing, namely equity and private credit markets and how distinctive their influence on external financing cost and access are (Hsu et al., 2014).

The remainder of the paper is organized as follows. Section II presents existing literature that builds the framework for this study. In section III, I discuss the construction of data and methodology. In section IV, I describe my empirical model and report my empirical results. Finally, I conclude this paper in section V. Variable definition and construction details are included in the appendices.

2. Literature Background

The *"trade-off model"* of liquidity holdings suggests a significant but **indecisive** impact of competition on optimal level of cash depending on the optimal balance of marginal benefits and marginal costs of holding cash under high competition. Main cost of holding cash is the opportunity cost of forgoing investments for holding liquid assets; and main benefit is avoiding the costs of cash shortage, which include financial distress probability, losing unexpected investment opportunities, and costly external financing.

Liquidity literature also asserts that there are four major motives of holding cash: the transaction motive, the tax motive, the precautionary motive, and the agency motive (Bates et al., 2009). Common firm characteristics such as size and leverage, among others, are associated with the *transaction motive*

(Opler et al., 1999) which has reduced over time due to better equity and credit markets (Lins, Servaes and Tufano, 2010). Evidence of *tax motive* is provided by Foley et al. (2007) where multinational firms tend to have high cash holdings to avoid tax consequences should they repatriate their foreign earnings. The *agency motive* has the weakest support. While Pinkowitz et al. (2006) report that firms hold more cash in countries with severe agency problems and their cash is discounted more heavily, Dittmar et al. (2003) suggest that agency motive is not evident in U.S. studies since shareholders are well protected; and more evident elsewhere when outside capital is more costly. So far, the *precautionary motive* in trade-off model is the most empirically supported one. It evolves around different types of risks[10], especially during times of financial constraints , since cash provides an alternative hedging tool to derivatives as they allow firms to reduce downside exposure to risk without losing the upside potential (HKM, 2007)[11].

The precautionary motive for holding cash is based on the effect of asymmetric information on the ability to raise financing, particularly the cost of raising funds, and the opportunity cost of cash shortfall. It asserts a major benefit of holding cash as allowing firms to use liquid assets to fund their activities and investments if other sources of financing are not available or are excessively costly (Opler et al., 1999). Impact of competition on cash may vary across countries due to changes in the cost of and access to external financing through legal systems or financial markets. On one hand, effective legal system is a useful manifestation of within-country effective corporate governance, developed financial markets, and efficient capital allocation (La Porta, Lopez-de-Silanes, Shleifer and Vishny, 2000). On the other hand, effective financial markets serve as direct sources of funding, provide long-term capital, and enhance economic growth (Rajan and Zingales, 1998). Consequently, in economies where investors are not well protected or financial markets are not well developed, capital-intensive industries can be more concentrated because new firms cannot be financially strong enough to enter, and established firms may earn high profits and grow from their internal financing (Demirgüc-Kunt and Maksimovic, 1998).

[10] Such as, shocks from financial distress (Almeida et al., 2004; Harford et al., 2014), cash flow volatility and idiosyncratic risk (Irvine and Pontiff, 2009), and more nuanced recently, product market threats (HKM, 2007; HPP, 2014).
[11] See Appendix A for fundamental differences in predictions among models.

3. Data and Methodology

3.1. Sample construction

My final sample contains nearly 250,000 observations of almost 30,000 firms in 14 countries, including both surviving and non-surviving public firms during 1999-2015.

I first collect and combine four data files from Compustat North America and Global, and CRSP North America and Global[12]. I identify firms' countries of operation and product market competition as the countries of headquarters. It is reasonable to assume that product markets around the world are more segmented than integrated, due to political and physical barriers, tariff and non-tariff barriers, transaction and shipping costs, wage differences, exchange rate variability, etc. I remove countries[13] without anti-directorship protection index (ADRI). There are still some limitations in identifying firms' country locations. For example, Fiat Chrysler Automobiles (GVKEY: 15172) is an Italian-American multinational automobile manufacturer. The company is incorporated in Netherlands, headquartered in United Kingdom, primarily listed on Borsa Italiana and a secondary listing on the New York Stock Exchange, also listed on NYSE Euronext Paris and Berlin. In such case, country of headquarter (U.K.) will be used to identify competition location. For cross-listed and dual-listed firms, I keep only the primary listing and generate two binary identifiers for multi-listing and U.S.-crosslisting firms[14].

I remove firms with main operation in financial services (SIC 6000-6999) because statutory capital requirements result in large inventories of marketable securities and cash holdings, and consequently non-

[12] There are disadvantages and advantages of using WRDS-platform database. Accounting data for non-US non-Canadian firms does not have specific items and quarterly data as for North American firms, yet offers international data at a higher degree of detail for both active and inactive publicly held firms while avoiding several issues that exist with Worldscope, such as small firm bias and inflated cash holdings. Also, Compustat created a consistent normalizing process to support comparability across global accounting standards and practices, and Worldscope has no clear suggestion on how to make data from different accounting conventions more comparable across countries.

[13] "Country" are not only United Nations members but more as "countries, territories, and sovereign states" the way it is treated in Compustat, similarly to World Bank (WB) and International Monetary Fund (IMF). Sovereign territories can be members of World Trade Organization (WTO), have own ISO country codes (www.iso.org/iso/country_codes) and currency codes (http://www.iso.org/iso/currency_codes).

[14] U.S. cross-listing represents only non-U.S. companies with secondary listing on U.S. stock market, either via ADR or OTC.

comparable financial ratios; firms in utilities (SIC 4900-4999) because their cash holdings may be heavily influenced by regulatory supervision; and quasi-governmental firms (SIC 9000-9999) following DMS (2003). I also remove all duplicate accounting data due to restatement procedure. To be kept in the sample, firms must have positive values for cash holdings, assets, sales, stock price, and shares outstanding, and not missing Standard Industry Code (SIC)[15]. To avoid data input errors and outlier biases, all accounting data is winsorized to 1st and 99th percentiles. All values are then converted to a single currency which is U.S. Dollar using monthly average exchange rate from The Pacific Exchange Rate Service[16].

Firms are classified into product markets using SIC which is not the most accurate way but it is readily available and widely used in both governmental reporting and academic research[17]. SIC has a hierarchical, top-down structure where the first two digits represent the major industry sector, the third digit describes the sub-classification of business group, and the fourth digit refers to specialization. For example, SIC code 3672 (printed circuit boards) belongs to industry group 367 (electronic, component and accessories), which is a part of major group 36 (electronic and other equipment) that belongs to the division of manufacturing (SIC codes 2000-3999).

Lastly, I exclude countries with less than 300 all-time firms, leaving the final sample of 29,964 firms in 14 countries. The sample spans a wide range that includes both developed countries such as the U.S., the U.K., and Japan, and emerging economies such as India, Malaysia, and Thailand[18].

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[15] SIC was established in U.S. in 1937 and has three major limitations according to U.S. Census: (1) the definition and mistaken classification of employee groups; (2) SIC codes were developed for traditional, manufacturing-based industries prior to 1970 and not the growing service-based industries; and consequently, (3) SIC is not keeping up with changes in new and emerging industries, especially those in technology sector.

Firm-years with data on sales but not cash holdings are included in constructing competitive measures and excluded in regressions. Firm-years with data on cash holdings but not sales are not included at all.

[16] Data is generously provided by Prof. Werner Antweiler at the University of British Columbia's Sauder School of Business (http://fx.sauder.ubc.ca/) (AUD, EUR, GBP, and NZD are indirectly quoted against USD).

[17] Kahle and Walkling (1996) states that Compustat SICs are more powerful than CRSP SICs, and that 4-digit SICs are more powerful than 2-digit SICs. The dataset is large enough for 4-digit SICs but I also use 3-digit and 2-digit SIC for robust check.

[18] Appendix A illustrates step-by-step sample construction process.

3.2. Measure of cash holdings

I define cash holdings, or cash-to-asset ratio as the ratio of cash and cash equivalents (Compustat data item #1) divided by total assets (#6). Cash-to-asset ratio ranges within (0; 1). For robustness, I also use the net cash ratio and the cash to sales ratio, as defined in Appendix D. The alternative measures do not materialistically affect my main results and conclusions.

$$CASHTA_{ijct} = \frac{Cash\_and\_cash\_equivalents_{ijct}}{Total\_assets_{ijct}} \quad (1)$$

Subscriptions *i, j, c, t* respectively represent firm i that belongs to industry j in country c for year t. Variables subscripted *ijct* are at firm level, *jct* are at industry level, and *ct* are at country level.

Table I Panel A summarizes my sample and provides some intuition on the level and secular trend of cash holdings across countries and over time. My analysis shows that, in nearly 30,000 non-financial non-utilities firms across 14 countries, from 2000 to 2015, the average corporate cash holdings varies as little as within 3.6% – 5.6% in India, to as much as 13.4% – 25.0% in Australia[19].

U.S. is not the country with highest cash ratio. In fact, the U.S. is not even in the top three, most likely because the U.S. has a significant number of large public firms, which do not have to hold as much cash as small firms. India, Thailand, and South Korea, before 2010, consistently maintain cash levels much below international average. It could be that Compustat's coverage of these countries leaves out most of medium and small firms, hence *deflating* their cash ratio. Nevertheless, since the test design controls for within-country variation across industries, one should not be concerned about comparability issue.

[19] Iskandar-Datta and Jia (2012) report a similar pattern of sharp increase for the most part followed by a mild decrease for the more recent years and an abnormally high pattern for Australian firms. They suggest that the stand-alone pattern of Australia may be explained by Australia's shallow private credit market where cash reserves get curbed earlier on.

3.3. Measure of product market competition

Since I focus on domestic competitive threats that come from interdependence of growth opportunities among industry rivals, I apply Porter (1979) and construct independent measures for three horizontal dimensions of product market pricing competition, namely threats from existing rivals, threats from potential entrants, and threats of product substitutes.

First, threat from existing rivals (RIVALS) represents the competitiveness or de-concentration of product markets, where lower concentration typically means each firm has less market power[20]. It is adapted from Hirschman – Herfindahl Index (HHI) and predicts that when there are more firms or each firm has significantly less market share, pricing competition increases (+).

$$RIVALS_{jct} = 10000 - HHI_{jct} = 10000 - \sum_{i=1}^{N}\left(MKTSHARE_{ijct}\right)^2 \quad (2a)$$

where each firm's market share $MKTSHARE_{ijct} = \frac{SALE_{ijct}}{\sum_{i=1}^{N} SALE_{ijct}}$

Although HHI is the traditional measure of industry concentration and can be accepted as a proxy for competition, more recent empirical studies have supported high product market competition in both spectrums of HHI which are competitive and oligopolistic market forms. If market structure is exogenous, lower concentration means the industry has more firms for same demand and hence increases the intensity of price competition. Otherwise, if market structure is endogenous, higher concentration can be the consequence of high product market competition and the actual impact depends heavily on product substitutability and entry costs. More concentrated market with high substitutability or less concentrated market with low entry costs can both indicate intense competition (Raith, 2003). Therefore, I use HHI to proxy for threat from rivals and propose additional dimensions for threats from entrants and substitutes[21].

[20] Variations of HHI include HHI for 50 largest companies, HHI using total assets sales, and four-firm concentration ratio (CR4).

[21] HHI takes into account the relative size distribution of the firms in the industry and increases with fewer firms and more disparity in firm sizes. Compustat-based HHI will exclude private firms and show lower correlation with true competition, however, HHI index is widely accepted as an exogenous indicator of industry concentration (Ali et al., 2009).

Second, threat from potential entrants (ENTRANTS) is the industry proxy for net value of the cost of property, plant and equipment to total assets (PPENT/TA), where lower ratio means lower cost of entry. It is adapted from property, plant and equipment per employee (MacKay and Phillips, 2005), and Karuna (2007)'s measure. Since PPENT/TA is highly skewed, I log transform it before calculating industry weighted average where weights are market shares. When entry costs decreases, price competition becomes more intense because more firms may enter the market (+).

$$ENTRANTS_{jct} = \frac{\sum_{i=1}^{N}(MKTSHARE_{ijct} * (-ln(PPENT_{ijct}/TA_{ijct})))}{\sum_{i=1}^{N} MKTSHARE_{ijct}} \quad (2b)$$

Third, threat of product substitutability (SUBSTITUTES) is the proxy for industry price-cost margin (PCM), where larger difference means higher profitability opportunity. PCM was initiated by Lerner (1934) to measure firms' power to price their products above their marginal cost[22]. Each firm's PCM is the ratio of sales to total operating costs (the summation of cost of goods sold and general and administrative expenses). To control for skewness, I also log transform PCM before aggregating to industry weighted average. When the gap between cost and price enlarges, substitute products will be available, thus driving up the pricing competition (+).

$$SUBSTITUTES_{jct} = \frac{\sum_{i=1}^{N}(MKTSHARE_{ijct} * (ln\left(\frac{SALE_{ijct}}{COGS_{ijct}+XSGA_{ijct}}\right)))}{\sum_{i=1}^{N} MKTSHARE_{ijct}} \quad (2c)$$

Since all these three variables are postulated to have positively correlation with competition, I create a capture-all measure (COMPSCORE) for each industry on a country-year basis which is the average of country-year percentile ranking of all three dimensions. The percentile ranking helps avoid potential unequal distribution problem across countries. I delete all industries with competition score of 0 because it means there is only one firm in these industries. To my understanding, there has not been a comprehensive measure for product market competition in published work.

[22] When the difference between costs and price reduces, firms are having costs further from to the long-run balance of a perfectly competitive market where it is believed that marginal cost should be equal to price. , and Lerner Index (1943) has been widely used in industrial organization literature.

$$COMPSCORE_{jct} = \frac{1}{3}(pct\_RIVALS_{jct} + pct\_ENTRANTS_{jct} + pct\_SUBSTITUTES_{jct}) \quad (2d)$$

Besides the continuous variable, I create a binary variable (HIGHCOMP) to sort firms into above and below country-year median competition scores. A product market is considered more competitive in a year if it is characterized by a combination of low concentration, low entry cost, and high price-cost margin[23]. I also create a more conservative measure (HIGHALL) where an industry is highly competitive in years that all of its RIVALS, ENTRANTS, and SUBSTITUTES dimensions are above median. Statistics on each competition dimension and the composite score are reported in Table I Panel B.

3.4. Control variables

The cash holdings determinants follow the trade-off model in liquidity literature (Opler et al., 1999; Bates et al., 2009; Dittmar et al., 2003). The variables are as follows (in parentheses are Compustat data item numbers and expected signs of correlations with cash holdings)[24].

(1) *Market-to-book ratio*: to proxy for investment opportunities as firms with better opportunities value cash more and financial constraints are more costly for these firms. The ratio is measured as market value of assets divided by book value of assets ((#6−#60+#25*#24)/#6) (+)

(2) *Size rank*: to proxy for life cycle as there are economies of scale to holding cash, measured as the country-year percentile ranking[25] of book value of assets ((#6)) (−)

(3) *Cash flow to assets*: to proxy for profitability as firms with higher cash flow accumulate more cash, all else equal, measured as earnings after interest, dividends, and taxes but before depreciation, divided by book value of assets ((#13−#15−#16−#21)/#6) (+)

[23] Examples of industries and firms with high competition scores are given in Appendix C.

[24] See Appendix D for detailed definition and construction of variables.

[25] Percentile ranking transformation will take care of the variations in firm sizes and size distribution across countries.

(4) *Net working capital to assets*: to proxy for liquidity demand and substitute for cash, measured as working capital subtracting cash to book value of assets ((#179−#1)/#6) (−)

(5) *Capital expenditures to assets*: to proxy for productivity, temporary investment requirements and financial distress, measured as ratio of capital expenditures to book value of assets (#128/#6) (?)

(6) *Leverage*: to proxy for financial distress costs as firms will use cash to reduce leverage in case of sufficiently constrained debts or use cash as a hedge, measured as total debts, or the sum of long-term debt and debt in current liabilities, divided by book value of assets ((#9+#34)/#6) (?)

(7) *Dividend payout dummy*: to proxy for payout policy, an alternative of cash holdings. Dividend payers are in general more mature, less risky, and have greater capital access. The binary variable takes value of one in years a firm pays common dividend, and zero otherwise (#21) (−)

(8) *R&D to sales*: to proxy for growth opportunities as R&D-intensity firms and industries potentially have greater financial distress costs. It is measured as R&D spending over sales where firms that do not report R&D expenses are considered to have zero R&D expenses (#46/#12) (?)

(9) *Acquisitions to assets*: to proxy for investment policy via acquisition activities. It is measured as acquisition expenditures divided by book assets, where the first item reflects only the cash outflows associated with acquisitions (#129/#6) (-)

I also control for some industry-level factors.

(10) *Industry cash flow volatility*: to proxy for cash flow uncertainty at industry level, measured by industry market share-weighted average of individual firm's cash flow volatility over the past 5 years (+).

(11) *Industry sales growth*: to proxy for the potential increase in industry sales as a whole, measured by industry market share-weighted average of individual firm's sales growth over the past 5 years (+).

(12) *Manufacturing industries*: to proxy for "old economy" and heavy industrial companies that generally have less liquidity flexibility, proxied by a binary variable for SIC codes 2000-3999) (−).

(13) *R&D-intensive industries*: to proxy for potentially higher level of competition, also because high-tech firms have relative advantage in foreign cash holdings and income repatriation policies[26] (+).

(14) *Multinational corporations (MNCs)*: to proxy for their tax motive because these corporations have more flexibility in income tax management, measured by a binary variable to identify firms with accounting statements from more than one country[27] (+).

(15) *U.S. cross-listing*: to proxy for U.S. market financing access of non-U.S. firms and the signaling behavior, since U.S. stock markets are considered the most prestigious financial market among all, measured by a binary variable that identify firms headquartered elsewhere but have stock secondarily traded on U.S. exchanges, including OTC markets and ADRs (issue codes 90 and above) (+).

3.5. Descriptive statistics

Table I Panel C provides the 1999-2015 average values of the control variables for each individual country and for the whole sample. It seems like large sample selection bias may be an issue of several countries, but again, we strictly control for country-year fixed effects and focus on within-country-year cross-industry variation, so comparability is not a concern. U.S. and Canada are the two markets with exceptionally higher market-to-book and leverage values. Japan has the highest percentage of firms that pay out dividend (85.3%) which is consistent with the cultural notion that dividend payment is a norm in Japan and failing to pay dividend will cost firms significantly on stock market. U.S. firms are far more invested in R&D, followed by Canadian firms, compared to the rest of world. U.S. is also the top country

[26] High-tech industries are those with SIC 3571, 3572, 3575, 3577, 3578, 3661, 3663, 3669, 3674, 3812, 3823, 3825, 3826, 3827, 3829, 3841, 3845, 4812, 4813, 4899, and 7370, 7371, 7372, 7373, 7374, 7375, 7378, and 7379 (Loughran and Ritter, 2004).

Alternatively, tech stocks are from of 3-digit SIC of 283, 357, 366, 367, 382, 384, and 737 (Brown et al., 2007)

[27] For example, many U.S.-based computer and pharmaceutical MNCs find it easy to place their intellectual properties, i.e. trademarks, logos, and patents, in another country to park their cash off-shore, accrue their income there, and avoid paying the tax difference should they bring cash home, where the local corporate tax rate is highest in the world.

when it comes to acquisition expenditures. 70% of Canadian firms are cross-listed on U.S. stock markets, and interpretation on the impact of U.S. cross-listing may be driven by them. Pairwise Pearson and Spearman-rank correlation tests are reported in Table I Panel D.

At country level, I use three proxies for the development of financial and legal systems.

(16) *Equity market development*: to proxy for the size of equity external financing, measured by total stock market capitalization, scaled by GDP[28] (+).

(17) *Credit market development*: to proxy for the size of credit external financing, measured by total bank credits, scaled by GDP (+).

(18) *Investor Protection Index (IPI)*: to proxy for both *de jure* and *de facto* law in each country, measured by the product of ADRI and Rule of law (RL), scale by 1/10.

Market development measures are calculated from values collected form World Bank's Worldwide Development Index (WDI) following Rajan and Zingales (1998) and Hsu et al. (2014). IPI follows Durnev and Kim (2005). As reported in Table I Panel D, equity market development and credit market development vary across countries to a great extent.

4. Empirical analysis and results

In this section, I investigate whether product market competition affects managers' choice of liquidity holdings. I perform this analysis with both uni-variate tests and multi-variate tobit regressions.

4.1. Uni-variate tests

The uni-variate test results in Table II Panels A through C, show that, each competition dimension alone cannot fully explain the variation of cash holdings across different competition levels. For example,

[28] Although stock market capitalization/GDP is not a direct measure of new equity financing available, it relatively represents the size of equity market and therefore is accepted as a good proxy for equity market development.

high industry concentration is positively correlated to cash in Canada, Malaysia and Thailand; while high entrant risk is negatively correlated to cash in Australia; and high profit margin is negatively correlated to cash in Canada. Using competition score, Table II Panel D shows an upward trend of cash holdings across competition deciles and this trend is observed for individual countries as well as the whole sample. The difference in cash holdings between firms in most competitive and least competitive industries are significantly positive, based on the t-test results for both decile and quintile differences. This result also holds true for both individual countries and the whole sample. On average, compared to firms in the bottom competition decile industries, firms in the top competitive decile industries carry more cash as a percentage of total assets. Specifically, the difference ranges from as little as approximately 3% in Malaysia, Singapore, South Korea, and Thailand, to as high as about 16% in Canada and roughly 18% in US. The positive correlation between competition and cash exists in these uni-variate tests before I even control for any firm characteristics such as size and leverage.

4.2. Multi-variate regressions

Since my dependent variable is truncated at zero and one, I employ two-sided tobit regression with different fixed effects and standard error clustering (Petersen, 2009). My base model is as follow.

$$Cashta_{ijct} = \alpha + \beta\, Compscore_{jct} + \gamma\, Control_{ijct} + \theta\, C_c + \upsilon\, T_t + \varepsilon_{ijct} \qquad (3)$$

where subscripts i, j, c, t respectively refer to individual firm i of industry j in country c for year t.

Compscore is a vector of different product market competition dimensions. *Control* is a vector of listed firm and industry characteristics. C_c is a vector of 13 country dummies and T_t is a vector of 16 year dummies to control for country and time fixed effects, respectively. I do not include firm fixed effects because the competition scores do not vary too much over time; however, I use standard error clustering at both the country and industry levels.

Table III Panel A reports estimates of regressions for my baseline model, where model (6) and model (12) show that cash holdings is positively correlated with each dimension of competition and with the composite competition score. *F*-test results confirm that, compared to model (7), models (6) and (12) significantly enhance the explanatory power of the model by adding three competition dimensions (F (3, 213258) = 1084.36) with each of them has significantly non-zero impact on cash holdings (F (3, 213258) = 1283.73); or adding competitive score (F (1, 213260) = 560.41). The result suggests a few things: industry concentration has weakest impact on cash among three dimensions; when used collectively, industry concentration, entry cost, and price-cost margin can explain much better the increase of cash than when each of them when used individually; and competition score can serve efficiently as a capture-all alternative. Model (12) states that, for the overall sample, firms in most competitive industries on average hold 13.5% more of total assets in liquid assets than firms in least competitive industries.

In Table III Panel B, I run the same test but for subgroups of individual countries and have some interesting findings. First, my regressions for U.S. firms in model (14) support the positive association between competition and cash documented by Hoberg et al. (2014). Second, the same relationship is found not only for my cross-country sample, but also for almost every country except for France and Sweden, which can be a consequence of small number of observations and thus, limited within-country variation. And third, after controlling for firm characteristics and fixed effects, the difference in cash holdings between firms in most competitive industries and firms in least competitive industries now ranges from 1.5% – 1.9% in Malaysia, South Korea and Thailand, to 22.0% in US and 14.9% in Canada.

My baseline finding is in line with the trade-off model of cash holdings, which asserts that firms choose to hold an optimal level of cash depending on the balancing between marginal benefits and marginal costs of cash holdings. My empirical finding suggests that in highly competitive product markets, the benefits of holding cash outweigh the opportunity costs, resulting in an increase in cash level. In the next subsections, I conduct more tests to examine some economic mechanisms that may

further affect the benefits of cash holdings (the cost of cash shortage) and subsequently affect the role of competition on cash holdings.

4.3. Dependence on external financing

In this subsection, I examine how being dependent on external financing can affect a firm's level of cash under competition. I construct one primary and one secondary measure of external financing dependent (EFD). Since I use accounting data to construct these measures, to some extent they are endogenous to choices made by firms. However, my measures are constructed from historical accounting data, making the issue relatively less important. Specifically, I identify internal financing dependent (IFD) firms as those firms who have been consistently self-funded for the 3 years prior to the current year, and non-internal financing dependent firms are classified as EFD. Identities follow Byoun and Xu (2016).

$$IF_1 = \frac{Operating\ cashflow - Capital\ expenditure - Acquisition\ expenses}{Total\ assets} \quad (4a)$$

$$IF_2 = \frac{Operating\ cashflow - Capital\ expenditure}{Capital\ expenditure} \quad (4b)$$

These measures reflect the level to which a firm can support its investments by internally generated funds. I now run the extended tobit regressions model (5):

$$Cashta_{ijct} = \alpha + \beta Comp_{jct} + \delta Comp_{jct} * EFD_{ijct} + \mu\, EFD_{ijct} + \gamma Control_{ijct} + \theta C_i + \upsilon T_i + \varepsilon_{ijct} \quad (5)$$

The results are presented in Table IV Panel A. Models (5-6) and (11-12) show that the average impact of competition on cash is comparable between two subgroups of EFD and IFD firms, suggesting no fundamental differences in firm-level characteristics. Interactive model (4) and (10), however, report that competition positively affects the amount of cash firms decide to hold, but EFD firms are more constrained to do so. Ignoring competition, EFD firms on average hold 2.7% less cash (model 2); ignoring EFD, changing from least to most competitive industries can lead to an increase of 13.3% cash holdings (model 3). If I separate EFD firms from IFD firms, model (4) can be interpreted as the most

competitive IFD firms hold 15.4% more assets in cash than the least competitive IFD firms; and that cash range among EFD firms become significantly smaller at 11.1% (0.154 – 0.009 – 0.34).

In Table IV Panel B, I look at a different angle of limited financial strength at firm-level, the Kaplan – Zingales (1997) measure of financial constraint.

$$KZ1997_{it} = \frac{[-1.0019\ CF_{it} + 3.1392 LTDebt_{it} - 39.3678 Div_{it} - 13.3148\ Cash_{it} + 0.2826\ TobinQ_{it}]}{Total\ assets_{it-1}} \quad (6)$$

Models (1-4) tells a consistent story with the finding in Panel A, that by being financially constrained, all firms pooled together hold 6.3% less cash than unconstrained firms (model 2), regardless of competition intensity; but when I interact competition with constraint, an average unconstrained firm, when switching from least to most competitive industry, hoards 14.6% more of total assets in liquid holdings, while an average constrained firms under the same situation barely holds 3.3% (0.146 – 0.011 – 0.102). Financial constraint lessens cash holdings under competition for both EFD and IFD firms (models 5-6), suggesting that EFD and financial constraints are separate channels that both limit firms' ability to accumulate cash for competition.

I conduct another split sample test, separating firms into constrained and unconstrained firms, to see the impact of EFD / IFD on competition – cash relationship. Models (1) and (3) are consistent with Panel A that constrained firms are more limited in raising cash under competition. Models (2) and (4) report a significantly negative moderation of EFD on competitive cash holdings, but only for group of unconstrained firms, suggesting that EFD and financial constraints are substitutes.

4.4. Access to external financing

In this subsection, I examine how financial market development affects the competitive holdings of cash through two separate channels: the equity market and the credit market (Rajan and Zingales, 1998). Data comes from World Development Index (WDI), provided by World Bank, and is time-variant. Proxies for equity market development and credit market development are respectively constructed as:

$$EquityDev_{ct} = \frac{Stock\_market\_capitalization_{ct}}{GDP_{ct}} \quad (7a)$$

$$CreditDev_{ct} = \frac{Total\_bank\_credit_{ct}}{GDP_{ct}} \quad (7b)$$

The extended regression model is:

$$Cashta_{ijct} = \alpha + \beta Comp_{jct} + \delta Comp_{jct} * FinDev_c + \mu\, FinDev_c + \gamma Control_{ijct} + \theta C_i + \upsilon T_i + \varepsilon_{ijct} \quad (8)$$

As reported in Table V Panel A and Panel B, both equity market development and credit market development by themselves enhance level of corporate cash holdings (models 2 and 6), however, they have opposite influence on the relationship between competition and cash. The positive impact of competition on cash holdings is strengthened in more developed equity markets, but weakened in more developed credit markets (models 4 and 8). Specifically, when stock market increases by about GDP value, most competitive firms would increase their cash holdings by 4.8% compared to an increase of 0.7% in least competitive firms, thus widening the cash gap between them by 4.1% (0.048 – 0.007). Contrarily, when credit market increases by about GDP value, most competitive firms would decrease their cash holdings by 7.9% compared to an increase of 5.4% in the least competitive firms, thus tightening the cash gap between them by 2.5% (0.054 – 0.079). The results stay strong when I use binary variables to sort firms into country-years above and below medians of market developments. In more developed market, high comp firms on average hold 5.2% higher of cash, while in less developed equity market, their peers on average hold only 2.0% higher (model 4). In more developed credit market, high competition firms on average hold 4.5% higher of cash, while in less developed credit market, their peers hold 3.3% higher (model 8).

One possible explanation is that, although both equity market and credit market development promote efficient resource allocation and reduce cost of external capital in general, they could play different roles in determining financing cost in competitive conditions and hence, corporate liquidity holding decisions. Equity financing may have several advantages over debt financing for more competitive industries: first,

there are no collateral requirements, equity investors share upside returns, and additional equity financing does not increase probability of financial distress (Brown, Fazzari and Petersen, 2009); and second, as Hsu et al. (2014) suggest, equity markets facilitate feedback effects of market security prices, reduce information noises and asymmetry, and allow for valuable information about firms' investment opportunities and managerial decisions. In contrast, credit markets may be less likely to provide financing in highly competitive industries for three reasons: first, compared to equity markets, credit markets are more sensitive to distress risks, therefore bank-based debt issuers have an inherent bias toward more conservative investments (Morck and Nakamura, 1999); second, powerful banks in developed credit markets may favor exit or set barriers on new entrants so as to support oligopolistic industries and more established firms (Beck and Levine, 2002); and third, since competition is a source of volatility, firms in competitive industries may have more unstable and limited amount of internally generated cash flows to service debts (Brown et al., 2009).

Table V Panel C reports similar results when I create interaction terms for both equity and credit markets. Significance and directions remain unchanged. In Table V Panel D, I tabulate two sets of coefficients for the amount of competitive cash holdings: one table corresponds to re-centered values of equity market development and credit market development at one standard deviation below and one standard deviation above their means; and one table corresponds to 5x4 different values of equity market development and credit market development. For example, for a market-based financial system such as U.S. with equity market capital / GDP of 2.5 and credit market capital / GDP of 0.5, the beta coefficient for competition score is 21.6%; and for a bank-based financial system such as Japan with equity market/GDP of 0.5 and credit market/GDP of 2.0, the beta coefficient for competition score is 2.6%.

4.5. Country-level investor protection

In this subsection, I examine the legal aspect of development at country level. Specifically, I test if investor protection affects the competitive holding of cash. I compute Investor Protection Index (IPI) as

the product of shareholder right protection (ADRI) and the quality of rule of law (RL), scaled by 1/10. Technically, IPI can range within [0.00-0.60], in my sample, IPI ranges from 0.168 (Thailand) to 0.5 (Singapore)[29]. The extended model is in equation (9).

$$Cashta_{ijct} = \alpha + \beta Comp_{jct} + \delta Comp_{jct} * IPI_{ct} + \mu\, IPI_{ct} + \gamma Control_{ijct} + \theta C_i + \upsilon T_i + \varepsilon_{ijct} \qquad (9)$$

As presented in Table VI, when standalone, both product market competition and investor protection index have positive impact on cash holdings in models (1-3), and when interacted, they have negative marginal effect on each other. Specifically, from model (4), when IPI increases by 0.10, cash holdings in the most competitive industries reduce on average by 0.66% (0.10*(0.237 – 0.303)). In the most competitive industries, firms in country with IPI of 0.50 such as Singapore compare to firms in country with IPI of 0.168 such as Thailand on average hold 2.19% less of assets in cash ((0.50 – 0.168)*(0.237 – 0.303)). The gap is much higher at 7.87% when comparing firms in non-competitive industries ((0.50 – 0.168)*0.237). Literature suggests that product market competition can be a substitute external mechanism for corporate governance, due to its managerial disciplinary effect (Giroud and Mueller, 2007), and strong legal protection can as well serve as an external governance mechanism (La Porta et al., 2000).

My finding also suggests a substitution effect between product market competition and investor protection. However, the empirical result reveals a higher level of corporate cash holdings in countries with better protection, which is consistent with Huang, Elkinawy and Jain (2013), but inconsistent with Dittmar et al. (2003) and Ferreira and Vilela (2004) who state that firms in countries with superior investor protection hold up less cash than firms in countries with weak protection. In explanation for opposite signs, there are three arguments: first, I use the revised version of ADRI by Djankov, La Porta, Lopez-de-Silanes and Shleifer (2008) which is substantially different from the original ADRI by La Porta

[29] IPI captures both de jure and de facto aspects of regulation (Durnev and Kim, 2005; and Rossi and Volpin, 2004). Using ADRI alone may not bring reliable result because India has the highest ADRI (5) but not the best rule of law (0.67) in my sample. Also, although IPI is relatively sticky, it does capture significant changes over time, for example, degrading of US Rule of Law in 2003, or upgrading Taiwanese Rule of Law in 2005.

et al. (1997) because it reflects the law in force in May 2003 rather than before 1998 (Spamann, 2010); second, I combine ADRI with RL to capture both de jure and de factor aspects of regulation; and third, investors have become more aware of the importance of investor protection on cash holdings and created a better link between cash valuation and investor protection, especially for my sample period.

4.6. Robustness check

In Table VII, I perform a number of robustness checks on my findings and my baseline finding stays statistically and economically significant. Panel A reports results for both continuous and binary variable of competition under different fixed effects and standard error clustering settings. In Panel B, I rerun the main test with subgroups to exclude potential dominating effects from U.S. firms, R&D-intensive firms, or cash-rich firms. Panel C controls for the impact of post-crisis periods and exclude financial crisis as a deterministic factor. Other tests, untabulated, use different variations of cash ratios, alternative industry classifications, and panel data regressions. The results are enhanced when I reduce number of countries to different sample sizes.

One may argue that competition does not lead to an increase in cash holdings, but rather cash-rich firms choose to register under competitive SIC industries. First, I run tests with 3-digit and 2-digit SIC industry classifications to smooth out this effect and find qualitatively similar results. Second, at 4-digit SIC level, I investigate firms that have reportedly changed their registered SIC codes and find that both cash-rich and cash-poor firms proportionally switch to more and less competitive industries, thus for other reasons rather than as a consequence of their liquidity strength (weakness).

It is common in Economics literature lately that R&D expenditure or advertisement expenditure can be used as proxy for threat from potential entrants, especially in R&D-intensive industries. However, due to different accounting practice across countries, R&D data is limited for international samples.

5. Conclusions

This paper presents cross-country evidence on how the intensity of competition on product market affects corporate cash holdings, and how that effect varies under the influence of corporate financial strength, financial market development, and national legal protection. Using a large data set that includes 14 developed and emerging countries between 1999 and 2015 and several identification methods, I report a positive correlation between industry competition and corporate cash-to-assets ratio, therefore supporting the precautionary motive of cash holdings. Further tests show that firms that are dependent on external financing or financially constrained are more restricted in their ability increasing their cash holdings under competitive condition. In addition, I find that equity markets and credit markets have distinctive moderating impacts on how much industry competition induces the precautionary holding of cash. My study also documents a substitution effect between product market competition at industry level and investor protection at country level. I conduct a number of robustness checks and show that the main findings are consistent to alternative model specifications and proxies. Overall, my work extends HPP (2014) and provides global evidence on the deterministic role of product market competition on corporate cash holdings.

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7. Figures and tables

Figure 1. Trend of cash, debts, and total assets

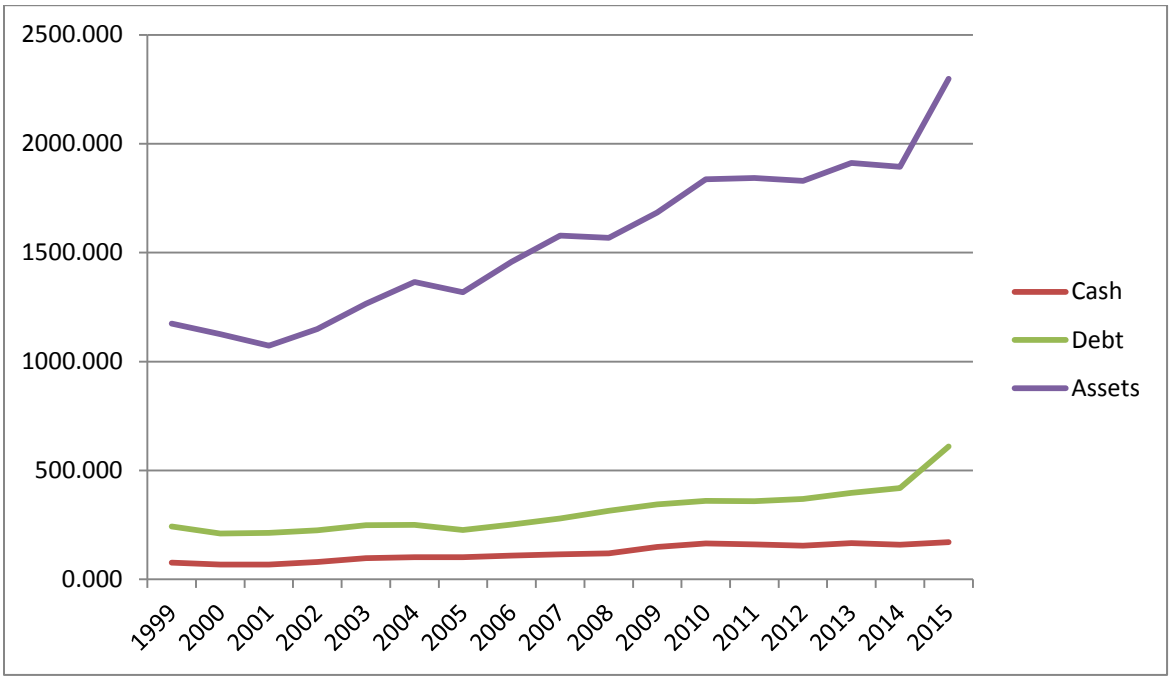

Figure 2. Cash / Assets versus Debt / Assets

Table I. Descriptive statistics at firm level

Table I. Panel A. Sample size and cash-to-assets ratio

Country	ISO	Sample size				Secular trend of mean cash / assets				1999-2015 cash / assets ratio statistics						
		# firms	% firms	# obs	% obs	2000	2005	2010	2015	mean	stdev	p10	p25	p50	p75	p90
U.S.A.	USA	9094	0.3096	66370	0.2857	0.1445	0.1617	0.1773	0.1722	0.1625	0.1870	0.0096	0.0305	0.0934	0.2226	0.4203
Japan	JPN	3930	0.1338	45525	0.1960	0.1206	0.1518	0.1751	0.2047	0.1600	0.1244	0.0418	0.0736	0.1259	0.2090	0.3231
India	IND	2724	0.0927	19340	0.0832	0.0358	0.0726	0.0681	0.0564	0.0597	0.0920	0.0039	0.0100	0.0264	0.0665	0.1532
U.K.	GBR	2384	0.0812	17100	0.0736	0.1495	0.1743	0.1587	0.1646	0.1542	0.1843	0.0105	0.0316	0.0839	0.2032	0.3984
Australia	AUS	1944	0.0662	14251	0.0613	0.1337	0.2515	0.2609	0.2496	0.2416	0.2603	0.0147	0.0456	0.1350	0.3556	0.6725
Taiwan	TWN	1865	0.0635	15260	0.0657	0.0587	0.1228	0.1887	0.2047	0.1643	0.1413	0.0283	0.0619	0.1258	0.2230	0.3517
South Korea	KOR	1650	0.0562	10984	0.0473	0.0388	0.0710	0.0721	0.1037	0.0762	0.0736	0.0109	0.0258	0.0554	0.1028	0.1668
Canada	CAN	1527	0.0520	6069	0.0261	0.1254	0.1518	0.1890	0.1466	0.1479	0.1854	0.0057	0.0235	0.0737	0.1988	0.4081
Malaysia	MYS	949	0.0323	9999	0.0430	0.0223	0.0523	0.1031	0.1170	0.0817	0.1072	0.0056	0.0161	0.0428	0.1037	0.2087
France	FRA	849	0.0289	7127	0.0307	0.0690	0.1193	0.1411	0.1813	0.1166	0.1328	0.0160	0.0355	0.0729	0.1440	0.2691
Germany	DEU	848	0.0289	6898	0.0297	0.1442	0.1655	0.1725	0.1631	0.1528	0.1665	0.0146	0.0370	0.0943	0.2064	0.3770
Singapore	SGP	611	0.0208	5499	0.0237	0.0613	0.1237	0.1976	0.1671	0.1476	0.1420	0.0213	0.0487	0.1022	0.1992	0.3348
Sweden	SWE	523	0.0178	3454	0.0149	0.1440	0.1527	0.1513	0.2025	0.1615	0.1751	0.0154	0.0383	0.0986	0.2166	0.4213
Thailand	THA	479	0.0163	4449	0.0191	0.0424	0.0657	0.0819	0.0813	0.0715	0.0836	0.0055	0.0162	0.0429	0.0980	0.1747
Whole sample	14	29377	1	232325	1	0.1261	0.1484	0.1588	0.1607	0.1461	0.1663	0.0114	0.0339	0.0894	0.1931	0.3561

This table shows the number of firm observations and firm-year observations for each country that is included in the main regression (model 3) and the extended regressions (models 5, 7, 8, and 9). Data is sorted in the descending order of country with the largest number of all-time firms to country with the smallest number of all-time firms in the sample period (1999-2015). The table also presents the level and trend of corporate cash holdings for each country and the whole sample, where cash holdings is the ratio of cash and cash equivalents to value of total assets.

Table I. Panel B. Multi-dimensional measure of product market competition

Country	N	Threat from existing rivals *(measured by HHI index where lower concentration means higher competition)*			Threat from potential entrants *(measured by ln(PPE/TA) where lower entry cost means higher competition)*			Threat from substitutability *(measured by ln(sale/cost) where higher margin means higher competition)*			Competition score *(average percentile ranking of 3 dimensions (1-HHI), -ln(PPE/TA), and ln(price/cost))*			
		Mean	Median	St dev	Mean	Median	St dev	Mean	Median	St dev	P10	Median	P90	St dev
Australia	14251	4109	3491	2507	1.4527	0.9600	0.9751	0.3406	0.2889	0.3446	0.3040	0.5056	0.6843	0.1490
Canada	6069	4491	4056	2811	1.3422	0.8206	1.1031	0.2482	0.1647	0.3304	0.3337	0.5017	0.6595	0.1254
France	7127	5339	5132	2558	2.2890	2.2227	0.8756	0.1688	0.1397	0.1983	0.2557	0.4858	0.7482	0.1942
Germany	6898	4938	4844	2523	2.0718	1.9011	0.9126	0.1889	0.1612	0.1727	0.2581	0.5128	0.7024	0.1777
India	19340	2664	1885	2261	1.3018	1.1423	0.6915	0.2022	0.1678	0.1708	0.3031	0.4998	0.7265	0.1548
Japan	45525	2610	2067	1871	1.4861	1.3651	0.5792	0.1061	0.0933	0.0744	0.3039	0.4880	0.7145	0.1674
Malaysia	9999	3664	3075	2116	1.3570	1.1045	0.7498	0.1657	0.1362	0.1672	0.2861	0.4994	0.7035	0.1652
Singapore	5499	4826	4755	2326	1.7560	1.6349	0.8606	0.1613	0.1185	0.1728	0.2736	0.5042	0.7066	0.1667
South Korea	10984	3651	3261	2202	1.3258	1.1624	0.6838	0.1375	0.1046	0.1797	0.2883	0.4869	0.7321	0.1679
Sweden	3454	5524	5517	2594	2.6578	2.7527	1.1832	0.1535	0.1070	0.2233	0.2741	0.4949	0.7399	0.1775
Taiwan	15260	2680	1973	2037	1.4778	1.3394	0.6593	0.1777	0.1476	0.1235	0.2753	0.5014	0.7278	0.1712
Thailand	4449	4660	4308	2155	1.1964	1.0033	0.7429	0.1494	0.1094	0.1686	0.3090	0.5111	0.6845	0.1477
United Kingdom	17100	4217	3675	2483	1.9068	1.8542	1.0013	0.2341	0.1570	0.2694	0.2604	0.4943	0.7445	0.1810
United States	66370	2708	2004	1973	1.7375	1.7275	0.7261	0.2311	0.1783	0.1800	0.2680	0.4917	0.7198	0.1791
Whole sample	232325	3289	2720	2146	1.6143	1.4868	0.7549	0.1933	0.1528	0.1755	0.2839	0.4948	0.7174	0.1695

This table shows the number of firm-year observations, and descriptive statistics for each of three competition dimensions; and the composite score, including mean, median, standard deviation, and 10% and 90% percentiles. Countries are sorted in alphabetical order of country names. All measures for main tests are constructed at product market level, applying 4-digit SIC codes industry classification. The three horizontal dimensions of product market competition (Porter, 1979) include: threat from existing rivals is measured by reversed Hirschman-Herfindahl Index of market concentration; threat of potential entrants is measured by industry market-share weighted average of individual firms' ln(PPE/TA); and threat of product substitutes is measured by industry market share-weighted average of individual firms' ln(price/cost).

Table I. Panel C. Firm characteristics

Country	1999-2015 average value (all non-ratio, non-binary variables are converted to US$ million value)																	
	Cash to assets	Cash & cash equivalent	Total assets	Sale	Market to book	Cash flow to assets	Net working capital to assets	Capital expen. to assets	Leverage	Dividend payer	RD to sale	Acquisition to assets	R&D-intensity percentage	Manu firms percentage	MNC percentage	US cross-list percentage	Industry cash flow volatility	Industry sale growth
Australia	0.242	23.614	310.628	256.669	2.308	-0.324	-0.165	0.104	0.162	0.247	0.796	0.017	0.139	0.045	0.082	0.073	0.096	1.457
Canada	0.148	79.147	1510.335	899.174	4.157	-0.371	-0.409	0.100	0.515	0.267	1.175	0.019	0.232	0.066	0.081	0.741	0.040	0.147
France	0.117	266.469	3460.985	2554.292	1.868	0.031	0.060	0.047	0.214	0.230	0.212	0.012	0.304	0.104	0.086	0.094	0.026	0.063
Germany	0.153	179.681	3078.621	2329.377	2.169	-0.014	0.086	0.050	0.187	0.330	0.227	0.013	0.337	0.189	0.077	0.078	0.041	0.081
India	0.060	25.346	386.265	287.632	1.568	0.041	0.071	0.069	0.322	0.552	0.013	0.003	0.106	0.270	0.013	0.015	0.025	0.075
Japan	0.160	165.203	1612.325	1609.153	1.176	0.045	0.029	0.033	0.212	0.853	0.019	0.000	0.127	0.214	0.046	0.045	0.024	0.030
Malaysia	0.082	19.110	266.234	169.989	1.185	0.022	0.098	0.043	0.223	0.479	0.007	0.005	0.107	0.256	0.002	0.002	0.033	0.092
Singapore	0.148	68.027	597.001	472.027	2.260	0.014	0.067	0.050	0.202	0.505	0.007	0.018	0.103	0.190	0.040	0.051	0.040	0.259
South Korea	0.076	76.582	1335.322	1210.027	1.229	0.032	0.046	0.052	0.267	0.579	0.016	0.000	0.163	0.252	0.014	0.017	0.022	0.059
Sweden	0.162	50.656	812.918	701.910	2.259	-0.079	0.040	0.034	0.154	0.398	0.416	0.019	0.401	0.103	0.076	0.074	0.041	0.200
Taiwan	0.164	61.575	506.795	420.558	1.415	0.048	0.100	0.046	0.200	0.131	0.068	0.001	0.279	0.183	0.010	0.015	0.038	0.065
Thailand	0.072	28.755	416.494	366.577	1.434	0.045	0.067	0.058	0.259	0.276	0.000	0.003	0.054	0.248	0.015	0.015	0.033	0.086
U.K.	0.154	105.311	1546.210	1234.774	2.119	-0.040	-0.019	0.050	0.196	0.470	0.638	0.017	0.235	0.084	0.105	0.114	0.041	0.359
U.S.A.	0.163	144.020	1838.724	1711.619	5.005	-0.353	-0.461	0.053	0.488	0.326	2.047	0.022	0.286	0.118	0.056	0.000	0.070	0.180
Whole sample	0.146	111.804	1385.345	1226.648	2.635	-0.115	-0.121	0.053	0.305	0.459	0.741	0.011	0.207	0.163	0.050	0.052	0.046	0.209

This table provides summary of firm characteristics for the data employed in the analysis. Data is from 1999 to 2015. The variables are: ratio of cash to assets (Cash and cash equivalents / Total assets), cash (Cash and cash equivalents), assets (Total assets), sales (Sale), market-to-book ratio (Market value / Total assets), ratio of cash flow to assets (Cash Flow / Total assets), ratio of net working capital to assets (Net working capital / Total assets), ratio of capital expenditures to assets (Capital expenditures / Total assets), leverage (Book value of equity + Market value of assets / Total assets), a binary identifier for dividend payers (Dividend > 0), ratio of R&D to sale (R&D expenditures to Sales), ratio of acquisition to assets (Acquisition expenditures / Total assets), a binary identifier for R&D-intensive industries (R&D-intensive), a binary identifier for manufacturing firms (Manu), a binary identifier for multinational corporations (MNC), a binary identifier for US-crosslisted firms (US-crosslisting), industry average of 5-year cash flow volatility (Cash flow volatility), and industry average of 5-year sales growth (Sales growth). All non-ratio, non-binary variables are converted to US$ millions.

Table I. Panel D. Correlation matrices

(Pearson in lower triangular and Spearman's rank in upper triangular)

		(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)	(R)	(S)	(T)
(A)	cashta	1	0.22	-0.22	-0.07	-0.01	-0.13	-0.45	-0.04	0.29	-0.11	0.01	-0.01	-0.07	0.22	0.21	0.10	0.08	0.22	0.12	0.23
(B)	mtb	0.02	1	-0.07	0.07	-0.10	0.08	-0.10	-0.12	0.20	-0.14	0.11	0.08	0.13	0.20	0.14	0.13	0.00	0.11	0.15	0.15
(C)	sizerank	-0.27	-0.04	1	0.32	0.01	0.19	0.19	0.28	-0.04	0.05	0.23	0.18	0.24	-0.16	-0.08	-0.01	-0.05	-0.16	-0.00	-0.12
(D)	cfassets	-0.05	-0.24	0.09	1	0.18	0.28	-0.04	0.24	-0.07	0.06	0.05	0.01	0.13	-0.04	-0.08	-0.03	-0.02	-0.10	0.08	-0.04
(E)	nwc	-0.01	-0.25	0.03	0.60	1	-0.08	-0.35	0.06	0.14	0.10	-0.05	-0.06	0.01	0.03	-0.00	-0.04	-0.04	0.15	-0.05	0.01
(F)	capat	-0.04	0.01	0.02	-0.12	-0.08	1	0.10	0.07	-0.10	0.03	0.06	0.07	0.02	-0.10	-0.14	0.01	-0.00	-0.36	0.09	-0.13
(G)	lev	-0.01	0.22	-0.02	-0.53	-0.79	0.01	1	0.02	-0.17	0.09	0.01	-0.00	0.03	-0.18	-0.14	-0.09	-0.02	-0.20	-0.08	-0.19
(H)	dpayer	-0.12	-0.02	0.28	0.05	0.01	-0.03	-0.01	1	-0.05	0.10	0.04	0.02	-0.00	-0.17	-0.12	-0.09	-0.00	-0.06	-0.03	-0.09
(I)	rdsales	0.05	0.01	-0.02	-0.03	-0.01	-0.00	0.01	-0.02	1	0.04	0.08	0.04	-0.01	0.31	0.16	0.03	0.12	0.18	0.18	0.21
(J)	manu	-0.12	-0.01	0.05	0.02	0.00	-0.03	0.01	0.10	-0.01	1	-0.03	-0.04	-0.04	-0.22	-0.08	-0.08	-0.15	-0.15	-0.07	-0.24
(K)	mnc	0.00	-0.00	0.23	0.01	0.00	0.02	-0.00	0.04	0.00	-0.03	1	0.62	0.08	0.02	0.01	0.03	-0.05	-0.05	0.08	-0.00
(L)	uscrosslist	-0.00	0.00	0.18	-0.00	-0.00	0.05	0.00	0.02	0.00	-0.04	0.62	1	0.05	0.01	-0.05	-0.00	-0.10	-0.03	0.06	-0.00
(M)	acqui	-0.03	0.05	0.04	0.00	0.00	-0.01	0.00	-0.02	-0.00	-0.02	0.00	0.01	1	0.08	0.06	0.09	-0.07	0.08	-0.00	0.02
(N)	rdintensic	0.20	0.02	-0.16	-0.02	-0.00	-0.06	-0.00	-0.17	-0.07	-0.22	0.02	0.01	0.03	1	0.17	0.07	0.18	0.34	0.15	0.37
(O)	indvol	0.13	0.03	-0.07	-0.08	-0.06	0.00	0.05	-0.10	0.02	-0.07	0.02	-0.01	0.01	0.12	1	0.54	0.11	0.23	0.16	0.29
(P)	indgsale	0.09	0.01	-0.02	-0.02	-0.00	0.05	-0.00	-0.08	0.02	-0.05	0.04	0.03	0.06	-0.03	0.14	1	0.08	0.08	0.26	0.27
(Q)	rivals	0.07	0.00	-0.04	-0.01	-0.00	0.02	-0.00	0.00	0.09	-0.12	-0.07	-0.12	-0.01	0.15	0.04	-0.01	1	0.05	0.13	0.61
(R)	entrants	0.19	0.01	-0.16	-0.02	-0.00	-0.20	-0.00	-0.06	0.01	-0.15	-0.05	-0.03	0.03	0.34	0.10	-0.04	0.05	1	-0.12	0.50
(S)	substitutes	0.13	0.01	-0.00	-0.02	-0.01	0.09	0.00	-0.03	0.02	-0.07	0.08	0.06	0.01	0.15	0.07	0.10	0.11	-0.12	1	0.56
(T)	compscore	0.22	0.01	-0.12	-0.02	-0.00	-0.03	-0.00	-0.08	0.02	-0.23	-0.00	-0.00	0.02	0.39	0.13	0.05	0.57	0.52	0.58	1

All non-zero coefficients indicates significance at 0.05 or higher

This table provides correlation coefficients and significant levels for pairwise Pearson correlation test (in lower triangular) and Spearman's rank test (in upper triangular). Variables from (A) through (P) include cash/assets, market-to-book, country-year percentile ranking of firm size, cash flow/assets, net working capital/assets, capital expenditures / assets, leverage, dividend payer identifier, R&D / sales, manufacturing identifier, US-crosslisted firm identifier, acquisition / assets, R&D-intensive industry identifier, industry average of 5-year cash flow volatility, industry average of 5-year sales growth. Variables (Q) through (T) are my main interest: threat from existing rivals, threat from potential entrants, threat of product substitutes, and overall threat of industry competition.

Table I. Panel E. Country factors

Country	Fin market development		De jure law		De facto law		Both	Other factors		
	Stock cap/ GDP	Bank credit/ GDP	ADRI (DLLS)	*	Rule of law (ICRG)	=	Investor Protection Index (scale / 10)	Legal system	Legal origin	Primary religion
Australia	1.0793	1.0838	4.0		0.9413		0.3765	Common	English	Protestant
Canada	1.1893	1.0995	4.0		0.9613		0.3845	Common	English	Catholic
France	0.7632	0.8538	3.5		0.8207		0.2872	Civil	French	Catholic
Germany	0.4629	1.0002	3.5		0.8491		0.2972	Civil	German	Protestant
India	0.6891	0.4364	5.0		0.6700		0.3350	Common	English	Buddhist
Japan	0.7600	1.1713	4.5		0.8477		0.3815	Civil	German	Buddhist
Malaysia	1.3354	1.0924	5.0		0.6365		0.3182	Common	English	Muslim
Singapore	2.0615	0.9942	5.0		0.8610		0.4305	Common	English	Buddhist
South Korea	0.7826	0.9504	4.5		0.8117		0.3652	Civil	German	Protestant
Sweden	1.0017	1.0619	3.5		1.0000		0.3500	Civil	Scandinavian	Protestant
Taiwan	.	.	3.0		0.8077		0.2423	Civil	German	Buddhist
Thailand	0.6499	1.0103	4.0		0.4930		0.1972	Common	English	Buddhist
United Kingdom	1.2743	1.5021	5.0		0.9309		0.4654	Common	English	Protestant
United States	1.2496	0.5132	3.0		0.8797		0.2639	Common	English	Protestant
Whole sample	1.0253	0.8817	4.0		0.8385		0.3317			

This table presents country-level variables varying from financial market development to legal system development. The first two columns covers 1999-2015 average of stock market development (Stock market capitalization / Gross domestic product) and credit market development (Total bank credit / Gross domestic product). The next three columns show quality of shareholder right protection (ADRI), rule of law (RL), and a combination of both (IPI). The ADRI index measures the protection of shareholder rights, and the RL index measures the quality of institutions that support the right of investors. The last three columns classify countries into groups of different legal system, legal origins, and primary regions. A dot (.) indicates that the value is not available (the case of Taiwan).

Table II. Uni-variate test of competition on cash holdings

Table II. Panel A. Deciles of threat from existing rivals

Country	Average cash / assets										Decile 10 – 1		Quintile 5 - 1	
	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	D10-D1	t-stat	Q5-Q1	t-stat
Australia	0.2611	0.1889	0.1681	0.2316	0.2374	0.2273	0.2578	0.2916	0.3005	0.2548	-0.0063	-0.643	0.0514****	7.339
Canada	0.1673	0.1470	0.1535	0.1456	0.1456	0.1888	0.1498	0.1298	0.1530	0.1002	-0.0672***	-6.521	-0.0305***	-4.141
France	0.1077	0.1226	0.1052	0.1021	0.1118	0.1235	0.0986	0.1076	0.1462	0.1400	0.0324***	4.644	0.0280***	5.565
Germany	0.1116	0.1215	0.1409	0.1500	0.1365	0.1532	0.1578	0.1669	0.1952	0.1945	0.0830***	9.749	0.0783***	12.526
India	0.0623	0.0706	0.0685	0.0658	0.0598	0.0657	0.0566	0.0470	0.0555	0.0453	-0.0169***	-5.911	-0.0160***	-7.460
Japan	0.1611	0.1563	0.1702	0.1523	0.1466	0.1493	0.1445	0.1524	0.1853	0.1821	0.0211***	7.553	0.0250***	12.515
Malaysia	0.0808	0.0871	0.0800	0.0882	0.0827	0.0919	0.0858	0.0724	0.0797	0.0689	-0.0119***	-2.583	-0.0097***	-2.832
Singapore	0.1498	0.1352	0.1462	0.1572	0.1186	0.1464	0.1593	0.1509	0.1603	0.1521	0.0023	0.266	0.0137*	2.261
S. Korea	0.0690	0.0749	0.0804	0.0627	0.0766	0.0726	0.0757	0.0764	0.0797	0.0938	0.0248***	7.653	0.0149***	6.420
Sweden	0.1612	0.1651	0.1408	0.1573	0.1634	0.1332	0.1593	0.1837	0.1925	0.1582	-0.0030	-0.234	0.0125*	1.368
Taiwan	0.1364	0.1344	0.1516	0.1552	0.1705	0.1699	0.1895	0.1580	0.1901	0.1874	0.0510***	9.917	0.0534***	14.865
Thailand	0.0837	0.0705	0.0730	0.0752	0.0702	0.0808	0.0743	0.0581	0.0652	0.0646	-0.0191***	-3.336	-0.0122***	-3.144
U.K.	0.1378	0.1212	0.1285	0.1338	0.1672	0.1469	0.1516	0.1786	0.1868	0.1895	0.0517***	8.006	0.0587***	13.304
U.S.A.	0.1213	0.1234	0.1242	0.1294	0.1533	0.1971	0.2070	0.2073	0.1979	0.1637	0.0424***	14.100	0.0588***	27.198
Whole sample	0.1318	0.1266	0.1299	0.1322	0.1406	0.1546	0.1580	0.1602	0.1715	0.1554	0.0236***	6.6685	0.0343***	12.637

Country	Average cash / assets										Decile 10 – 1		Quintile 5 - 1	
	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	D10-D1	t-stat	Q5-Q1	t-stat
Australia	0.2555	0.2319	0.2794	0.2480	0.3080	0.1883	0.2496	0.2065	0.2336	0.2336	-0.0219*	-2.302	-0.0167***	-2.502
Canada	0.0780	0.0859	0.1362	0.1060	0.1090	0.1039	0.1228	0.2210	0.2745	0.2745	0.1965***	17.348	0.1778***	23.103
France	0.0764	0.0871	0.1253	0.1033	0.1192	0.1111	0.1233	0.1160	0.1639	0.1639	0.0875***	13.068	0.0704***	15.778
Germany	0.0709	0.0968	0.0988	0.1221	0.1381	0.1655	0.1990	0.2080	0.2075	0.2075	0.1366***	16.385	0.1306***	21.373
India	0.0416	0.0388	0.0405	0.0438	0.0550	0.0636	0.0775	0.0738	0.0786	0.0786	0.0370***	12.929	0.0412***	20.063
Japan	0.1014	0.1088	0.1156	0.1454	0.1534	0.1647	0.1725	0.1854	0.2390	0.2390	0.1375***	49.366	0.1213***	63.391
Malaysia	0.0516	0.0568	0.0632	0.0824	0.0790	0.0867	0.0848	0.0896	0.1205	0.1205	0.0688***	12.189	0.0575***	15.890
Singapore	0.0965	0.1332	0.1376	0.1332	0.1481	0.1511	0.1561	0.1837	0.1752	0.1752	0.0787***	9.297	0.0536***	8.990
South Korea	0.0437	0.0604	0.0709	0.0679	0.0765	0.0781	0.0810	0.0844	0.1099	0.1099	0.0663***	19.629	0.0474***	21.078
Sweden	0.0799	0.0897	0.1414	0.1618	0.1721	0.1592	0.1996	0.2112	0.1790	0.1790	0.0991***	9.150	0.1149***	13.426
Taiwan	0.0925	0.1114	0.1523	0.1680	0.1708	0.1823	0.1810	0.1957	0.2142	0.2142	0.1218***	24.723	0.0928***	27.732
Thailand	0.0490	0.0576	0.0616	0.0627	0.0694	0.0677	0.0763	0.0868	0.0919	0.0919	0.0430***	7.807	0.0390***	9.970
U.K.	0.0784	0.1294	0.1186	0.1319	0.1481	0.1909	0.1968	0.2027	0.1447	0.1447	0.0663***	13.316	0.0682***	16.757
U.S.A.	0.0841	0.0850	0.1263	0.1709	0.1698	0.1980	0.1800	0.2099	0.1778	0.1778	0.0937***	34.069	0.1160***	58.383
Whole sample	0.0901	0.0986	0.1209	0.1400	0.1492	0.1574	0.1619	0.1754	0.1805	0.1805	0.0905***	26.244	0.0896***	37.678

Table II. Panel C. Deciles of threat of product substitutes

Country	Average cash / assets										Decile 10 – 1		Quintile 5 - 1	
	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	D10-D1	t-stat	Q5-Q1	t-stat
Australia	0.1867	0.1990	0.1831	0.1885	0.2533	0.2658	0.2794	0.3116	0.2715	0.2768	0.0901***	9.616	0.0814***	12.054
Canada	0.2158	0.1425	0.1347	0.1316	0.1344	0.1695	0.1464	0.1669	0.1267	0.1113	-0.1045***	-9.223	-0.0606***	-7.780
France	0.1725	0.0655	0.1053	0.1133	0.1166	0.1203	0.1148	0.1468	0.1152	0.1627	-0.0099	-0.787	0.0545***	10.630
Germany	0.1119	0.1454	0.1510	0.1423	0.1883	0.1537	0.1292	0.1486	0.1562	0.2098	0.0979***	10.944	0.0592***	9.082
India	0.0520	0.0513	0.0458	0.0473	0.0488	0.0580	0.0667	0.0780	0.0681	0.0816	0.0296***	8.987	0.0232***	10.463
Japan	0.1461	0.1420	0.1515	0.1419	0.1468	0.1484	0.1498	0.1722	0.2024	0.1988	0.0527***	18.839	0.0566***	28.996
Malaysia	0.0557	0.0609	0.0708	0.0761	0.0873	0.0827	0.0897	0.0938	0.0981	0.1024	0.0467***	9.361	0.0420***	12.144
Singapore	0.1174	0.1322	0.1552	0.1561	0.1513	0.1652	0.1462	0.1719	0.1310	0.1501	0.0327***	3.688	0.0157***	2.684
South Korea	0.0793	0.0804	0.0769	0.0668	0.0665	0.0769	0.0692	0.0742	0.0838	0.0875	0.0082**	2.330	0.0058***	2.386
Sweden	0.1671	0.1464	0.1470	0.1342	0.1411	0.1414	0.1506	0.1819	0.2122	0.1912	0.0241*	1.621	0.0438***	4.181
Taiwan	0.1374	0.1600	0.1550	0.1493	0.1647	0.1639	0.1604	0.1488	0.2073	0.1961	0.0587***	10.707	0.0530***	13.727
Thailand	0.0601	0.0608	0.0725	0.0737	0.0780	0.0762	0.0712	0.0652	0.0719	0.0859	0.0258***	4.264	0.0185***	4.710
U.K.	0.1595	0.1294	0.1376	0.1420	0.1487	0.1582	0.1563	0.1519	0.1753	0.1829	0.0235***	3.368	0.0347***	7.395
U.S.A.	0.1127	0.1322	0.1360	0.1342	0.1453	0.1456	0.1525	0.1765	0.2559	0.2346	0.1219***	35.445	0.1228***	50.527
Whole sample	0.1242	0.1250	0.1291	0.1266	0.1384	0.1416	0.1430	0.1596	0.1889	0.1868	0.0626***	16.873	0.0644	24.416

Country	Average cash / assets										Decile 10 – 1		Quintile 5 - 1	
	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	D10-D1	t-stat	Q5-Q1	t-stat
Australia	0.1670	0.2254	0.2355	0.2090	0.2502	0.2399	0.2948	0.2853	0.2436	0.2352	0.0681***	7.682	0.0416***	6.210
Canada	0.1080	0.1224	0.1414	0.1564	0.1286	0.1330	0.1481	0.1436	0.1497	0.2682	0.1602***	12.916	0.0818***	10.416
France	0.0933	0.0965	0.1069	0.1243	0.1174	0.1206	0.1117	0.1220	0.1187	0.1567	0.0634***	8.941	0.0410***	8.857
Germany	0.0922	0.0932	0.1121	0.1147	0.1340	0.1529	0.1767	0.2053	0.2235	0.2254	0.1331***	14.827	0.1318***	20.878
India	0.0420	0.0520	0.0565	0.0565	0.0525	0.0483	0.0555	0.0567	0.0895	0.0884	0.0465***	14.724	0.0419***	18.560
Japan	0.1219	0.1332	0.1376	0.1443	0.1483	0.1574	0.1641	0.1595	0.1788	0.2544	0.1325***	45.271	0.0899***	46.836
Malaysia	0.0657	0.0732	0.0846	0.0800	0.0804	0.0762	0.0855	0.0823	0.0937	0.0962	0.0306***	5.924	0.0255***	7.021
Singapore	0.1248	0.1419	0.1465	0.1417	0.1376	0.1445	0.1689	0.1597	0.1497	0.1611	0.0362***	4.563	0.0219***	3.768
South Korea	0.0647	0.0647	0.0714	0.0659	0.0690	0.0767	0.0834	0.0834	0.0859	0.0966	0.0319***	9.651	0.0265***	11.721
Sweden	0.1374	0.1234	0.1211	0.1256	0.1213	0.1893	0.2047	0.1948	0.1945	0.2035	0.0661***	4.836	0.0685***	7.215
Taiwan	0.1062	0.1214	0.1404	0.1659	0.1703	0.1728	0.1795	0.1809	0.1945	0.2081	0.1019***	21.355	0.0895***	25.787
Thailand	0.0564	0.0612	0.0672	0.0693	0.0713	0.0758	0.0721	0.0739	0.0743	0.0945	0.0382***	6.378	0.0252***	6.114
U.K.	0.1123	0.1203	0.1442	0.1420	0.1145	0.1388	0.1773	0.1591	0.1961	0.2347	0.1225***	19.035	0.0985***	21.752
U.S.A.	0.0858	0.1018	0.1116	0.1294	0.1410	0.1578	0.1934	0.2137	0.2275	0.2652	0.1794***	58.160	0.1517***	68.251
Whole sample	0.0977	0.1117	0.1217	0.1285	0.1328	0.1425	0.1635	0.1673	0.1798	0.2142	0.1165***	32.052	0.0918***	36.230

Table III. Cross-country regressions of cash holdings on competition score

Table III. Panel A. Individual dimensions and competition score

Cash /Assets	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
mtb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
sizerank	-0.143***	-0.143***	-0.137***	-0.144***	-0.136***	-0.138***	-0.142***	-0.142***	-0.137***	-0.143***	-0.137***	-0.138***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
cfasset	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.001***	-0.002***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
nwc	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
capat	-0.072***	-0.074***	-0.040***	-0.088***	-0.053***	-0.069***	-0.074***	-0.077***	-0.043***	-0.091***	-0.059***	-0.072***
	(0.011)	(0.011)	(0.008)	(0.013)	(0.010)	(0.011)	(0.011)	(0.012)	(0.008)	(0.014)	(0.010)	(0.011)
lev	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
dpayer	-0.003***	-0.004***	-0.004***	-0.004***	-0.005***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.003***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000***	0.000***	0.000***	0.000**	0.000**	0.000**	0.000***	0.000***	0.000***	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
manu	-0.031***	-0.029***	-0.027***	-0.029***	-0.024***	-0.022***	-0.021***	-0.019***	-0.017***	-0.019***	-0.013***	-0.011***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
mnc	0.035***	0.034***	0.037***	0.030***	0.032***	0.035***	0.022***	0.023***	0.024***	0.018***	0.020***	0.021***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
uscrosslist	0.007***	0.011***	0.006***	0.006***	0.008***	0.007***	0.011***	0.012***	0.012***	0.009***	0.010***	0.012***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
acqui	-0.067***	-0.066***	-0.071***	-0.067***	-0.071***	-0.068***	-0.077**	-0.077**	-0.081**	-0.077**	-0.082**	-0.079**
	(0.024)	(0.023)	(0.026)	(0.024)	(0.026)	(0.025)	(0.031)	(0.031)	(0.033)	(0.031)	(0.033)	(0.032)
rdinten	0.056***	0.054***	0.044***	0.050***	0.033***	0.037***	0.056***	0.054***	0.044***	0.050***	0.033***	0.036***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
indvol	0.108***	0.107***	0.099***	0.101***	0.087***	0.093***	0.053***	0.052***	0.048***	0.051***	0.042***	0.043***
	(0.011)	(0.011)	(0.010)	(0.010)	(0.009)	(0.010)	(0.007)	(0.007)	(0.006)	(0.007)	(0.006)	(0.006)
indgsale	0.009***	0.009***	0.010***	0.008***	0.008***	0.008***	0.004***	0.004***	0.005***	0.003***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
rivals		0.026***			0.020***			0.025***			0.019***	
		(0.001)			(0.001)			(0.002)			(0.001)	
entrants			0.058***		0.071***				0.054***		0.068***	
			(0.001)		(0.001)				(0.001)		(0.001)	
substitutes				0.056***	0.066***					0.052***	0.064***	
				(0.001)	(0.001)					(0.001)	(0.001)	
compscore						0.136***						0.135***
						(0.002)						(0.002)
Constant	0.209***	0.191***	0.178***	0.184***	0.129***	0.142***	0.199***	0.181***	0.174***	0.179***	0.131***	0.140***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	224,304	224,304	224,304	224,304	224,304	224,304	224,304	224,304	224,304	224,304	224,304	224,304
Year and country f.e.	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes

This table provides tobit regression results of three competition dimensions (threat from rivals, entrants, and substitutes) and competition score on cash holdings.

Table III. Panel B. Competition score and cash holdings in individual countries

Cash / Assets	(1) Australia	(2) Canada	(3) France	(4) Germany	(5) India	(6) Japan	(7) Malaysia	(8) Singapore	(9) S. Korea	(10) Sweden	(11) Taiwan	(12) Thailand	(13) U.K.	(14) U.S.A.
mtb	0.017***	0.000	0.000	0.007***	0.004***	0.018***	0.018***	0.000*	0.005**	0.014***	0.012***	0.011***	0.003	-0.000
	(0.003)	(0.000)	(0.000)	(0.003)	(0.001)	(0.003)	(0.002)	(0.000)	(0.002)	(0.005)	(0.003)	(0.003)	(0.002)	(0.000)
sizerank	-0.338***	-0.189***	-0.058***	-0.133***	0.001	-0.118***	-0.037***	-0.119***	-0.030***	-0.105***	-0.060***	-0.010**	-0.140***	-0.145***
	(0.013)	(0.010)	(0.007)	(0.008)	(0.003)	(0.002)	(0.004)	(0.007)	(0.003)	(0.013)	(0.004)	(0.005)	(0.010)	(0.003)
cfasset	0.002	-0.000	-0.033*	-0.002***	0.012	0.088***	0.032	0.003	0.064***	-0.014	0.134***	0.001***	-0.043***	-0.001**
	(0.002)	(0.001)	(0.019)	(0.001)	(0.016)	(0.017)	(0.020)	(0.007)	(0.011)	(0.010)	(0.019)	(0.000)	(0.013)	(0.000)
nwc	-0.020	0.001	-0.111***	-0.143***	-0.064***	-0.175***	-0.091***	-0.100***	-0.047***	-0.110***	-0.199***	-0.053***	-0.063***	-0.000
	(0.019)	(0.002)	(0.010)	(0.011)	(0.007)	(0.004)	(0.012)	(0.020)	(0.005)	(0.018)	(0.007)	(0.007)	(0.013)	(0.000)
capat	-0.057***	-0.041*	-0.103***	-0.229***	-0.080***	-0.388***	-0.088***	-0.076***	-0.061***	-0.232***	-0.061	-0.073***	-0.107***	-0.192***
	(0.016)	(0.023)	(0.024)	(0.031)	(0.010)	(0.015)	(0.017)	(0.025)	(0.012)	(0.057)	(0.043)	(0.020)	(0.019)	(0.002)
lev	-0.075*	0.001	-0.146***	-0.199***	-0.086***	-0.255***	-0.162***	-0.252***	-0.136***	-0.353***	-0.377***	-0.159***	-0.176***	-0.000***
	(0.039)	(0.001)	(0.023)	(0.023)	(0.011)	(0.004)	(0.012)	(0.020)	(0.006)	(0.023)	(0.007)	(0.009)	(0.024)	(0.000)
dpayer	-0.012***	-0.011**	0.004	0.009**	0.021***	-0.002	0.028***	0.024***	0.001	0.003	0.003	0.002	-0.027***	-0.016***
	(0.004)	(0.005)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)	(0.006)	(0.003)	(0.003)	(0.003)	(0.001)
rdsales	0.000***	0.000	0.011***	0.003***	-0.001***	0.144***	-0.017	-0.062*	0.029	0.002	0.009**	-0.015	0.001	0.000**
	(0.000)	(0.000)	(0.002)	(0.001)	(0.000)	(0.023)	(0.014)	(0.037)	(0.020)	(0.001)	(0.004)	(0.057)	(0.001)	(0.000)
manu	-0.030***	-0.013**	-0.011***	-0.001	0.000	-0.003***	0.001	0.002	-0.006***	-0.022***	-0.007***	-0.008***	0.005	-0.011***
	(0.007)	(0.007)	(0.004)	(0.004)	(0.001)	(0.001)	(0.002)	(0.004)	(0.001)	(0.006)	(0.002)	(0.003)	(0.004)	(0.002)
mnc	0.111***	0.014*	-0.016	-0.074	-0.060**	0.114***	-0.020*	-0.089***	0.066***	-0.015	-0.033**	-0.003	-0.003	0.031***
	(0.021)	(0.008)	(0.018)	(0.081)	(0.025)	(0.018)	(0.012)	(0.021)	(0.009)	(0.041)	(0.015)	(0.010)	(0.011)	(0.003)
uscrosslist	-0.059***	0.039***	0.030*	0.097	0.049**	-0.104***	-0.000	0.134***	-0.086***	0.026	-0.013		0.046***	
	(0.021)	(0.006)	(0.017)	(0.081)	(0.024)	(0.018)	(0.009)	(0.020)	(0.008)	(0.043)	(0.014)		(0.010)	
acqui	-0.187***	-0.186***	-0.080***	-0.170***	-0.001	-4.648**	-0.035	-0.006***	0.188	-0.219***	-0.137**	0.085**	-0.230***	-0.242***
	(0.028)	(0.020)	(0.026)	(0.032)	(0.031)	(2.365)	(0.032)	(0.002)	(2.322)	(0.033)	(0.062)	(0.035)	(0.016)	(0.019)
rdinten	-0.035***	0.076***	0.022***	0.019***	0.037***	0.045***	0.034***	0.027***	0.018***	-0.018***	0.031***	0.012*	0.039***	0.023***
	(0.006)	(0.007)	(0.004)	(0.005)	(0.003)	(0.002)	(0.004)	(0.007)	(0.002)	(0.007)	(0.003)	(0.006)	(0.004)	(0.002)
indvol	-0.017	0.005	-0.073	-0.011	0.095***	0.640***	0.109*	0.009	0.107***	0.147*	0.071**	0.110**	0.151***	0.058***
	(0.011)	(0.005)	(0.061)	(0.041)	(0.026)	(0.046)	(0.056)	(0.027)	(0.037)	(0.080)	(0.035)	(0.044)	(0.029)	(0.006)
indgsale	0.003***	-0.002	0.086***	0.032**	0.003	0.027	0.006	-0.004***	-0.000	0.002	-0.019***	-0.001	-0.000	0.005***
	(0.001)	(0.004)	(0.027)	(0.014)	(0.002)	(0.018)	(0.007)	(0.001)	(0.003)	(0.002)	(0.006)	(0.002)	(0.001)	(0.001)
compscore	0.102***	0.149***	0.001	0.102***	0.065***	0.074***	0.019***	0.050***	0.015***	0.010	0.076***	0.017*	0.058***	0.220***
	(0.015)	(0.020)	(0.010)	(0.014)	(0.006)	(0.004)	(0.007)	(0.011)	(0.005)	(0.019)	(0.006)	(0.009)	(0.008)	(0.005)
Constant	0.221***	0.109***	0.148***	0.212***	0.032***	0.204***	0.047***	0.169***	0.099***	0.229***	0.169***	0.094***	0.206***	0.129***
	(0.025)	(0.014)	(0.010)	(0.015)	(0.009)	(0.005)	(0.006)	(0.012)	(0.006)	(0.021)	(0.012)	(0.008)	(0.011)	(0.004)
Observations	13,462	5,958	6,710	6,435	16,555	44,967	9,895	5,449	10,696	3,143	15,168	4,406	16,684	64,776
Country	Australia	Canada	France	Germany	India	Japan	Malaysia	Singapore	S. Korea	Sweden	Taiwan	Thailand	U.K.	U.S.A.
Year f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results on the impact of competition score on corporate cash holdings in individual countries. Control variables are similar to Table III Panel A.

Table III. Panel C. Competition dimensions and cash holdings in individual countries (3 dimensions)

Cash / Assets	(1) Australia	(2) Canada	(3) France	(4) Germany	(5) India	(6) Japan	(7) Malaysia	(8) Singapore	(9) Sweden	(10) S. Korea	(11) Taiwan	(12) Thailand	(13) U.K.	(14) U.S.A.
mtb1	0.022***	0.001	0.014***	0.002*	0.002***	0.018***	0.013***	0.000	0.019***	0.008***	0.011***	0.009***	0.013***	0.002***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.000)	(0.002)	(0.001)	(0.003)	(0.002)	(0.003)	(0.001)
sizerank	-0.234***	-0.116***	-0.046***	-0.120***	0.012***	-0.114***	-0.035***	-0.114***	-0.098***	-0.027***	-0.004	-0.093***	-0.059***	-0.112***
	(0.010)	(0.011)	(0.007)	(0.008)	(0.003)	(0.002)	(0.004)	(0.007)	(0.012)	(0.003)	(0.005)	(0.007)	(0.004)	(0.004)
cfassets1	-0.031***	-0.025***	-0.050**	-0.002***	-0.012	0.066***	0.081***	0.005	-0.017*	0.081***	0.001***	-0.102***	0.141***	-0.004
	(0.005)	(0.008)	(0.022)	(0.000)	(0.016)	(0.014)	(0.014)	(0.029)	(0.010)	(0.012)	(0.000)	(0.015)	(0.020)	(0.005)
nwc	-0.195***	-0.155***	-0.174***	-0.179***	-0.082***	-0.202***	-0.126***	-0.190***	-0.167***	-0.051***	-0.071***	-0.143***	-0.215***	-0.222***
	(0.010)	(0.013)	(0.009)	(0.010)	(0.005)	(0.004)	(0.007)	(0.010)	(0.017)	(0.005)	(0.008)	(0.006)	(0.007)	(0.004)
capat	-0.138***	-0.117***	-0.135***	-0.175***	-0.052***	-0.320***	-0.075***	-0.071***	-0.242***	-0.048***	-0.046**	-0.117***	-0.055	-0.368***
	(0.022)	(0.021)	(0.034)	(0.031)	(0.009)	(0.015)	(0.018)	(0.025)	(0.060)	(0.012)	(0.019)	(0.020)	(0.037)	(0.012)
lev	-0.427***	-0.314***	-0.248***	-0.382***	-0.145***	-0.259***	-0.219***	-0.345***	-0.370***	-0.149***	-0.181***	-0.352***	-0.373***	-0.328***
	(0.012)	(0.015)	(0.011)	(0.013)	(0.005)	(0.004)	(0.008)	(0.012)	(0.021)	(0.006)	(0.007)	(0.009)	(0.007)	(0.004)
dpayer	-0.009**	-0.009*	0.003	0.002	0.017***	-0.000	0.025***	0.026***	0.008	0.000	0.003	-0.023***	0.003	-0.022***
	(0.004)	(0.005)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)	(0.003)	(0.005)	(0.002)	(0.003)	(0.003)	(0.003)	(0.001)
rdsales	0.000***	0.000	0.009***	0.003***	-0.001***	0.130***	0.009	-0.042	0.001	0.026	0.004	0.001	0.008**	0.000**
	(0.000)	(0.000)	(0.002)	(0.001)	(0.000)	(0.023)	(0.013)	(0.033)	(0.001)	(0.019)	(0.055)	(0.001)	(0.004)	(0.000)
manu	-0.021***	-0.018***	0.001	0.003	-0.001	-0.007***	0.004*	0.002	-0.024***	-0.004***	0.000	0.012***	-0.005**	-0.008***
	(0.007)	(0.006)	(0.004)	(0.004)	(0.001)	(0.001)	(0.002)	(0.004)	(0.007)	(0.001)	(0.003)	(0.004)	(0.002)	(0.001)
mnc	0.097***	0.011	-0.063***	-0.071	-0.056**	0.095***	-0.028**	-0.088***	-0.052	0.070***	-0.012	-0.022**	-0.028*	0.008***
	(0.019)	(0.007)	(0.018)	(0.088)	(0.024)	(0.017)	(0.012)	(0.021)	(0.033)	(0.010)	(0.010)	(0.010)	(0.015)	(0.003)
uscrosslist	-0.063***	0.031***	0.058***	0.097	0.040*	-0.091***	-0.011	0.139***	0.052	-0.086***		0.057***	-0.007	
	(0.020)	(0.006)	(0.018)	(0.088)	(0.023)	(0.017)	(0.009)	(0.020)	(0.033)	(0.009)		(0.010)	(0.014)	
acqui	-0.189***	-0.205***	-0.089***	-0.150***	-0.016	-5.345**	-0.047	-0.005**	-0.231***	-2.740	0.065	-0.220***	-0.154**	-0.234***
	(0.023)	(0.022)	(0.026)	(0.029)	(0.030)	(2.181)	(0.033)	(0.002)	(0.034)	(2.296)	(0.042)	(0.016)	(0.064)	(0.008)
rdintensic4	-0.036***	0.020***	0.016***	0.009*	0.023***	0.029***	0.027***	0.020***	-0.014**	0.014***	-0.003	0.032***	0.029***	0.014***
	(0.006)	(0.008)	(0.004)	(0.005)	(0.003)	(0.002)	(0.004)	(0.007)	(0.007)	(0.002)	(0.007)	(0.004)	(0.003)	(0.002)
ind4vol	-0.010	0.011**	-0.091	-0.025	0.065***	0.559***	0.116**	-0.008	-0.027	0.147***	0.203***	0.123***	0.039	0.053***
	(0.008)	(0.006)	(0.065)	(0.040)	(0.025)	(0.047)	(0.055)	(0.026)	(0.081)	(0.037)	(0.048)	(0.027)	(0.032)	(0.007)
ind4gsale	0.002***	-0.004	0.079***	0.023*	0.002	0.001	0.002	-0.004***	0.001	-0.001	-0.001	-0.000	-0.028***	0.006***
	(0.001)	(0.004)	(0.025)	(0.012)	(0.002)	(0.017)	(0.007)	(0.001)	(0.002)	(0.003)	(0.002)	(0.001)	(0.007)	(0.001)
rivals	-0.017**	0.013	-0.014**	0.011	0.001	-0.025***	-0.013***	0.026***	-0.034***	-0.001	-0.021***	0.009*	0.020***	0.043***
	(0.008)	(0.010)	(0.006)	(0.007)	(0.003)	(0.003)	(0.004)	(0.008)	(0.012)	(0.003)	(0.005)	(0.005)	(0.005)	(0.003)
entrants	0.045***	0.167***	0.003	0.044***	0.037***	0.072***	0.048***	0.040***	0.016	0.022***	0.043***	0.016***	0.072***	0.040***
	(0.008)	(0.013)	(0.006)	(0.008)	(0.003)	(0.002)	(0.004)	(0.007)	(0.013)	(0.003)	(0.005)	(0.005)	(0.004)	(0.003)
substitute	0.061***	0.046***	0.007	0.011	0.030***	0.048***	-0.002	-0.011	0.027**	-0.007***	0.021***	0.024***	0.025***	0.078***
	(0.008)	(0.011)	(0.007)	(0.008)	(0.003)	(0.002)	(0.004)	(0.007)	(0.011)	(0.003)	(0.005)	(0.005)	(0.004)	(0.003)
Constant	0.248***	0.143***	0.146***	0.271***	0.054***	0.203***	0.063***	0.181***	0.225***	0.099***	0.079***	0.204***	0.140***	0.245***
	(0.026)	(0.016)	(0.010)	(0.013)	(0.008)	(0.004)	(0.006)	(0.011)	(0.018)	(0.006)	(0.008)	(0.010)	(0.011)	(0.005)
Observations	13,072	5,401	6,436	6,227	16,063	44,732	9,698	5,336	3,098	10,569	4,324	15,920	15,132	57,269
R-squared	0.386	0.320	0.333	0.326	0.186	0.411	0.296	0.340	0.360	0.212	0.247	0.324	0.402	0.343
Country	Australia	Canada	France	Germany	India	Japan	Malaysia	Singapore	Sweden	S. Korea	Taiwan	Thailand	U.K.	U.S.A.
Year f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

Table IV. Competition, cash holdings, and financial strength

Table IV. Panel A. Competition and external financing dependence at firm level

		EFD measure 1					EFD measure 2				
Cash / Assets	(1) Comp	(2) EFD	(3) Both	(4) Interact	(5) EFD only	(6) IFD only	(8) EFD	(9) Both	(10) Interact	(11) EFD only	(12) IFD only
mtb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
sizerank	-0.138***	-0.143***	-0.139***	-0.139***	-0.140***	-0.136***	-0.144***	-0.140***	-0.140***	-0.129***	-0.144***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
cfasset	-0.001***	-0.002***	-0.002***	-0.002***	-0.002***	-0.004***	-0.002***	-0.001***	-0.001***	-0.001**	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
nwc	-0.000	-0.000	-0.000	-0.000	-0.000	-0.001	-0.000	-0.000	-0.000	0.000***	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
capat	-0.072***	-0.072***	-0.071***	-0.070***	-0.079***	-0.054***	-0.070***	-0.069***	-0.069***	-0.091***	-0.048***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.012)	(0.020)	(0.011)	(0.011)	(0.011)	(0.013)	(0.017)
lev	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.021***	-0.001***	-0.001***	-0.001***	-0.001***	-0.009***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.005)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)
dpayer	-0.003***	-0.008***	-0.007***	-0.007***	-0.008***	-0.006***	-0.007***	-0.006***	-0.006***	-0.004***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000**	0.000***	0.000**	0.000**	0.000**	0.001***	0.000***	0.000**	0.000**	0.000**	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
manu	-0.011***	-0.020***	-0.011***	-0.011***	-0.008***	-0.014***	-0.020***	-0.011***	-0.011***	-0.008***	-0.014***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
mnc	0.021***	0.019***	0.018***	0.018***	0.033***	0.003	0.021***	0.020***	0.020***	0.036***	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.004)	(0.003)
uscrosslist	0.012***	0.012***	0.013***	0.013***	0.017***	0.007*	0.011***	0.012***	0.012***	0.016***	0.006*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
acqui	-0.079**	-0.079**	-0.081**	-0.081**	-0.083*	-0.076*	-0.081**	-0.083**	-0.083**	-0.210***	-0.059**
	(0.032)	(0.031)	(0.033)	(0.033)	(0.045)	(0.045)	(0.032)	(0.034)	(0.034)	(0.021)	(0.027)
rdinten	0.036***	0.056***	0.036***	0.035***	0.026***	0.048***	0.056***	0.035***	0.035***	0.027***	0.045***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
indvol	0.043***	0.057***	0.046***	0.047***	0.055***	0.029***	0.056***	0.045***	0.046***	0.051***	0.026***
	(0.006)	(0.007)	(0.006)	(0.006)	(0.008)	(0.009)	(0.007)	(0.006)	(0.006)	(0.008)	(0.008)
indgsale	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
compscore	0.135***		0.133***	0.154***	0.131***	0.130***		0.134***	0.145***	0.136***	0.125***
	(0.002)		(0.002)	(0.003)	(0.003)	(0.003)		(0.002)	(0.003)	(0.003)	(0.003)
efd_dum		-0.027***	-0.026***	-0.009***			-0.017***	-0.016***	-0.006***		
		(0.001)	(0.001)	(0.002)			(0.001)	(0.001)	(0.002)		
compscore#efd_dum				-0.034***					-0.021***		
				(0.004)					(0.004)		
Constant	0.140***	0.202***	0.144***	0.135***	0.169***	0.144***	0.201***	0.143***	0.138***	0.171***	0.142***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Observations	224,304	224,304	224,304	224,304	134,992	89,312	224,304	224,304	224,304	122,902	101,402
Year and country f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This panel presents empirical results of competition and cash holdings in interaction with external financing dependent (efd_dum) and financially constrained (constrained).

Table IV. Panel B. Competition and financial constraints at firm level

	Kaplan Zingales (1997) binary					
Cash / Assets	(1) Competition	(2) KZ (1997)	(3) Both terms	(4) Interaction	(5) EFD only	(6) IFD only
mtb	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
sizerank	-0.138***	-0.132***	-0.129***	-0.129***	-0.133***	-0.124***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
cfasset	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
nwc	-0.000	-0.000	-0.000	-0.000	-0.000	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
capat	-0.069***	-0.067***	-0.066***	-0.066***	-0.069***	-0.056***
	(0.011)	(0.010)	(0.010)	(0.010)	(0.011)	(0.020)
lev	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.019***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)
dpayer	-0.003***	0.020***	0.020***	0.020***	0.020***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000**	0.000***	0.000**	0.000**	0.000**	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
manu	-0.011***	-0.020***	-0.011***	-0.011***	-0.008***	-0.014***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
mnc	0.021***	0.022***	0.021***	0.021***	0.033***	0.007**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
uscrosslist	0.012***	0.013***	0.013***	0.013***	0.018***	0.007**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
acqui	-0.079**	-0.078**	-0.080**	-0.080**	-0.084*	-0.077*
	(0.032)	(0.031)	(0.033)	(0.033)	(0.046)	(0.046)
rdinten	0.036***	0.054***	0.035***	0.033***	0.024***	0.045***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
indvol	0.043***	0.053***	0.043***	0.043***	0.056***	0.026***
	(0.006)	(0.007)	(0.006)	(0.006)	(0.008)	(0.009)
indgsale	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
compscore	0.135***		0.126***	0.146***	0.146***	0.138***
	(0.002)		(0.002)	(0.003)	(0.003)	(0.004)
constrained		-0.063***	-0.059***	-0.011***	-0.008***	-0.008***
		(0.001)	(0.001)	(0.002)	(0.002)	(0.003)
compscore#constrained				-0.102***	-0.091***	-0.114***
				(0.003)	(0.004)	(0.005)
Constant	0.140***	0.182***	0.128***	0.120***	0.159***	0.128***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Observations	224,305	224,305	224,305	224,305	134,993	89,312
R-squared	0.196	0.197	0.210	0.212	0.209	0.239
Year & country f.e.	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table presents empirical results of competition and cash holdings in interaction with financially constrained identifier (constrained) where a firm is considered. Constrained firms are those with above country-year median of constraint score (highkz1997). Control variables include market-to-book ratio, country-year percentile ranking of firm size as value of total assets, ratio of cash flow to assets, ratio of net working capital to assets, ratio of capital expenditures to assets, leverage, dividend payer identifier, ratio of R&D expenditures to sales, manufacturing firm identifier, multinational corporation identifier, U.S.-crosslisted firm identifier, ratio of acquisition expenditures to assets, R&D-intensive industry identifier, industry average of 5-year cash flow volatility, industry average of 5-year sales growth. Variable of interest is competition score which is the average of country-year percentile ranking of each competition dimension (compscore). Dependent variable is the ratio of cash and cash equivalents to total assets (cash / assets). All of the non-dummy non-ratio variables are scaled by total assets. CONSTRAINED is a binary variable that takes value of 1 if firm's financial constraint measure is above country-year median, and zero otherwise where financial constraint follows Kaplan and Zingales (1997).

Table IV. Panel C. Competition and external financing dependence at firm level

Cash / Assets	(1) High KZ1997	(3) High KZ1997	(5) Low KZ1997	(7) Low KZ1997
mtb	0.002**	0.002**	0.000	0.000
	(0.001)	(0.001)	(0.000)	(0.000)
sizerank	-0.064***	-0.065***	-0.142***	-0.143***
	(0.002)	(0.002)	(0.002)	(0.002)
cfassets	-0.004*	-0.004*	-0.001***	-0.001***
	(0.002)	(0.002)	(0.000)	(0.000)
nwc	0.002	0.002	-0.000	-0.000
	(0.002)	(0.002)	(0.000)	(0.000)
capat	-0.054***	-0.052***	-0.077***	-0.077***
	(0.006)	(0.006)	(0.013)	(0.013)
lev	-0.008**	-0.008**	-0.001***	-0.001***
	(0.004)	(0.004)	(0.000)	(0.000)
dpayer			0.023***	0.017***
			(0.001)	(0.001)
rdsales	0.001***	0.001***	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
manu	-0.001	-0.001	-0.015***	-0.015***
	(0.001)	(0.001)	(0.001)	(0.001)
mnc	0.008***	0.008**	0.026***	0.025***
	(0.003)	(0.003)	(0.003)	(0.003)
uscrosslist	0.004	0.004	0.017***	0.017***
	(0.003)	(0.003)	(0.003)	(0.003)
acqui	-0.094***	-0.094***	-0.080**	-0.082**
	(0.013)	(0.013)	(0.034)	(0.035)
rdintensic4	0.023***	0.023***	0.034***	0.034***
	(0.002)	(0.002)	(0.001)	(0.001)
indvol	0.000	0.000	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
indgsale	0.001	0.001	0.004***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
compscore	0.053***	0.050***	0.142***	0.159***
	(0.003)	(0.004)	(0.003)	(0.004)
efd_dum		-0.005**		-0.008***
		(0.002)		(0.002)
c.compscore#c.efd_dum		0.005		-0.029***
		(0.005)		(0.005)
Constant	0.108***	0.112***	0.131***	0.127***
	(0.003)	(0.004)	(0.002)	(0.002)
Observations	46,132	46,132	178,172	178,172
Year and country f.e.	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table presents empirical results of competition and cash holdings in two-way interaction with external financing dependent identifier (efd_dum) and financially constrained identifier (constrained). Internal financing independent firms are firms that can self-fund investment activities in all 3 previous years, and external financing dependent firms are the rest. Constrained firms are those with above country-median score of financial constraints (highkz1997). Control variables include market-to-book ratio, country-year percentile ranking of firm size as value of total assets, ratio of cash flow to assets, ratio of net working capital to assets, ratio of capital expenditures to assets, leverage, dividend payer identifier, ratio of R&D expenditures to sales, manufacturing firm identifier, multinational corporation identifier, U.S.-crosslisted firm identifier, ratio of acquisition expenditures to assets, R&D-intensive industry identifier, industry average of 5-year cash flow volatility, industry average of 5-year sales growth. Variable of interest is competition score which is the average of country-year percentile ranking of each competition dimension (compscore). Dependent variable is the ratio of cash and cash equivalents to total assets (cash / assets). All of the non-dummy non-ratio variables are scaled by total assets.

Table V. Competition, cash holdings, and financial market development

Table V. Panel A. Competition and access to external financing from equity market

	Continuous measures (stmkt_gdp)				Binary measures (highstmkt)			
Cash / Assets	(1) Competition score	(2) Stock market	(3) Both Terms	(4) Interact	(5) High competition	(6) Stock market	(7) Both terms	(8) Interact
mtb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
sizerank	-0.139***	-0.151***	-0.146***	-0.146***	-0.140***	-0.145***	-0.142***	-0.142***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
cfasset	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
nwc	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
capat	-0.065***	-0.069***	-0.066***	-0.066***	-0.069***	-0.071***	-0.073***	-0.073***
	(0.010)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
lev	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
dpayer	-0.005***	0.000	0.000	0.000	-0.004***	-0.001	-0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000**	0.000***	0.000**	0.000**	0.000**	0.000***	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
manu	-0.022***	-0.030***	-0.021***	-0.021***	-0.024***	-0.029***	-0.022***	-0.022***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
mnc	0.036***	0.039***	0.038***	0.038***	0.036***	0.035***	0.035***	0.035***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
uscrosslist	0.006***	0.008***	0.009***	0.009***	0.006***	0.004**	0.005**	0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
acqui	-0.067***	-0.068***	-0.068***	-0.068***	-0.066***	-0.074***	-0.074***	-0.074***
	(0.025)	(0.024)	(0.025)	(0.025)	(0.024)	(0.027)	(0.028)	(0.028)
rdinten	0.038***	0.053***	0.034***	0.034***	0.048***	0.057***	0.048***	0.047***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
indvol	0.083***	0.086***	0.078***	0.077***	0.087***	0.081***	0.076***	0.074***
	(0.009)	(0.010)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)
indgsale	0.008***	0.009***	0.009***	0.009***	0.008***	0.008***	0.008***	0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
compscore	0.129***		0.133***	0.083***	0.030***		0.031***	0.020***
	(0.002)		(0.002)	(0.006)	(0.001)		(0.001)	(0.001)
stockmkt		0.029***	0.030***	0.007**		0.019***	0.021***	0.009***
		(0.001)	(0.001)	(0.003)		(0.001)	(0.001)	(0.001)
compscore #stockmkt				0.048***				0.023***
				(0.005)				(0.001)
Constant	0.136***	0.177***	0.116***	0.148***	0.177***	0.192***	0.175***	0.181***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	224,305	197,798	197,798	197,798	224,305	224,305	224,305	224,305
R-squared	0.146	0.135	0.150	0.150	0.140	0.135	0.143	0.144
Year f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table presents empirical results of competition and cash holdings in interaction with equity market development (Total stock capitalization / GDP). Control variables include market-to-book ratio, country-year percentile ranking of firm size as value of total assets, ratio of cash flow to assets, ratio of net working capital to assets, ratio of capital expenditures to assets, leverage, dividend payer identifier, ratio of R&D expenditures to sales, manufacturing firm identifier, multinational corporation identifier, U.S.-crosslisted firm identifier, ratio of acquisition expenditures to assets, R&D-intensive industry identifier, industry average of 5-year cash flow volatility, industry average of 5-year sales growth. Variable of interest is competition score which is the average of country-year percentile ranking of each competition dimension (compscore). Dependent variable is the ratio of cash and cash equivalents to total assets (cash / assets). All of the non-dummy non-ratio variables are scaled by total assets.

Table V. Panel B. Competition and access to external financing from Bank credit market

	Continuous measures (bkcredit_gdp)				Binary measures (highbkcredit)			
Cash / Assets	(1) Competition score	(2) Bank credit	(3) Both terms	(4) Interact	(5) High competition	(6) Bank credit	(7) Both terms	(8) Interact
mtb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
sizerank	-0.139***	-0.147***	-0.143***	-0.143***	-0.140***	-0.141***	-0.139***	-0.139***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
cfasset	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
nwc	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
capat	-0.065***	-0.064***	-0.061***	-0.060***	-0.069***	-0.066***	-0.067***	-0.067***
	(0.010)	(0.011)	(0.010)	(0.010)	(0.011)	(0.010)	(0.010)	(0.010)
lev	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
dpayer	-0.005***	-0.006***	-0.005***	-0.005***	-0.004***	-0.007***	-0.007***	-0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000**	0.000***	0.000**	0.000**	0.000**	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
manu	-0.022***	-0.031***	-0.023***	-0.023***	-0.024***	-0.030***	-0.024***	-0.024***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
mnc	0.036***	0.043***	0.041***	0.041***	0.036***	0.038***	0.037***	0.037***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
uscrosslist	0.006***	-0.000	0.002	0.003	0.006***	0.002	0.002	0.002
	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
acqui	-0.067***	-0.060***	-0.061***	-0.060***	-0.066***	-0.065***	-0.064***	-0.064***
	(0.025)	(0.021)	(0.022)	(0.022)	(0.024)	(0.023)	(0.023)	(0.023)
rdinten	0.038***	0.054***	0.034***	0.034***	0.048***	0.058***	0.049***	0.049***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
indvol	0.083***	0.096***	0.087***	0.085***	0.087***	0.093***	0.089***	0.088***
	(0.009)	(0.011)	(0.010)	(0.010)	(0.009)	(0.010)	(0.010)	(0.010)
indgsale	0.008***	0.008***	0.008***	0.008***	0.008***	0.008***	0.008***	0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
compscore	0.129***		0.131***	0.200***	0.030***		0.030***	0.033***
	(0.002)		(0.002)	(0.006)	(0.001)		(0.001)	(0.001)
bankcredit		0.018***	0.015***	0.054***		0.017***	0.016***	0.021***
		(0.001)	(0.001)	(0.003)		(0.001)	(0.001)	(0.001)
compscore #bkcredit				-0.079***				-0.009***
				(0.006)				(0.001)
Constant	0.136***	0.183***	0.127***	0.111***	0.177***	0.193***	0.177***	0.175***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	224,305	196,585	196,585	196,585	224,305	224,305	224,305	224,305
R-squared	0.146	0.133	0.147	0.148	0.140	0.135	0.142	0.142
Year f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table presents empirical results of competition and cash holdings in interaction with credit market development (Total bank credit / GDP). Control variables include market-to-book ratio, country-year percentile ranking of firm size as value of total assets, ratio of cash flow to assets, ratio of net working capital to assets, ratio of capital expenditures to assets, leverage, dividend payer identifier, ratio of R&D expenditures to sales, manufacturing firm identifier, multinational corporation identifier, U.S.-crosslisted firm identifier, ratio of acquisition expenditures to assets, R&D-intensive industry identifier, industry average of 5-year cash flow volatility, industry average of 5-year sales growth. Variable of interest is competition score which is the average of country-year percentile ranking of each competition dimension (compscore). Dependent variable is the ratio of cash and cash equivalents to total assets (cash / assets). All of the non-dummy non-ratio variables are scaled by total assets.

Table V. Panel C. Competition and access to external financing from equity market

	3 continuous variables				3 binary variables			
Cash / Assets	(1) Main effects	(3) First interact	(5) Second interact	(7) Both interacts	(9) Main effects	(11) First interact	(13) Second interact	(15) Both interacts
mtb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
sizerank	-0.144***	-0.144***	-0.144***	-0.144***	-0.141***	-0.141***	-0.141***	-0.141***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
cfassets	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
nwc	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
capat	-0.066***	-0.066***	-0.066***	-0.066***	-0.075***	-0.076***	-0.075***	-0.076***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
lev	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
dpayer	-0.002***	-0.002***	-0.002***	-0.002***	-0.004***	-0.003***	-0.004***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000**	0.000**	0.000**	0.000**	0.000***	0.000**	0.000***	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
manu	-0.022***	-0.022***	-0.021***	-0.021***	-0.022***	-0.022***	-0.022***	-0.022***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
mnc	0.042***	0.042***	0.042***	0.042***	0.039***	0.039***	0.039***	0.039***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
uscrosslist	0.004	0.005*	0.005*	0.005*	-0.001	-0.000	-0.001	-0.000
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
acqui	-0.069***	-0.069***	-0.069***	-0.069***	-0.076***	-0.076***	-0.076***	-0.076***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.027)	(0.027)	(0.027)	(0.027)
rdintensic4	0.036***	0.036***	0.035***	0.036***	0.050***	0.050***	0.050***	0.050***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
indvol	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
indgsale	0.011***	0.011***	0.011***	0.011***	0.010***	0.010***	0.010***	0.010***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
compscore	0.135***	0.085***	0.210***	0.168***	0.031***	0.020***	0.036***	0.024***
	(0.002)	(0.006)	(0.006)	(0.008)	(0.001)	(0.001)	(0.001)	(0.001)
stmkt_gdp	0.032***	0.008***	0.032***	0.014***	0.022***	0.010***	0.022***	0.011***
	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)
bkcred_gdp	0.019***	0.019***	0.061***	0.059***	0.018***	0.018***	0.023***	0.022***
	(0.001)	(0.001)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)
c.compscore#c.stmkt_gdp		0.048***		0.035***		0.024***		0.023***
		(0.006)		(0.006)		(0.001)		(0.001)
c.compscore#c.bkcred_gdp			-0.085***	-0.080***			-0.011***	-0.009***
			(0.006)	(0.006)			(0.001)	(0.001)
Constant	0.117***	0.142***	0.080***	0.100***	0.176***	0.181***	0.174***	0.179***
	(0.003)	(0.004)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	194,456	194,456	194,456	194,456	224,304	224,304	224,304	224,304
Year f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table presents empirical results of competition and cash holdings under simultaneous interactions with equity market development (Total stock capitalization/GDP) and credit market development (Total bank credit/GDP). Control variables include market-to-book ratio, country-year percentile ranking of firm size as value of total assets, ratios to assets of cash flow, net working capital, and capital expenditures, leverage, dividend payer identifier, ratio of R&D expenditures to sales, identifiers for manufacturing firms, multinational corporations, U.S.-crosslisted firms, and R&D-intensive industry, ratio of acquisition expenditures to assets, industry average of 5-year cash flow volatility and 5-year sales growth. Variable of interest is competition score which is the average of country-year percentile ranking of each competition dimension (compscore). Dependent variable is the ratio of cash and cash equivalents to total assets (cash/assets). All non-dummy non-ratio variables are scaled by total assets.

Table V. Panel D. Interpretation of competition and external financing from both markets

Interaction terms	(1)	(2)
Year fixed effects	No	Yes
compscore	0.169***	0.168***
	(0.008)	(0.008)
stmkt_gdp	0.008***	0.014***
	(0.003)	(0.003)
c.compscore#c.stmkt_gdp	0.038***	0.035***
	(0.006)	(0.006)
bkcred_gdp	0.053***	0.059***
	(0.003)	(0.003)
c.compscore#c.bkcred_gdp	-0.074***	-0.080***
	(0.006)	(0.006)
Recentered moderator	(1)	(2)
Recentered (low stmkt_gdp and low bkcred_gdp)		
compscore	0.158***	0.152***
	(0.004)	(0.004)
Recentered (high stmkt_gdp and high bkcred_gdp)		
compscore	0.129***	0.115***
	(0.004)	(0.004)
Constant	0.091***	0.100***
	(0.004)	(0.004)
Observations	194,456	194,456
Year f.e.	No	Yes

Slope estimates for compscore	bkcred_gdp at:							
	(1) Without year fixed effect				(2) With year fixed effect			
	0.5	1.0	1.5	2.0	0.5	1.0	1.5	2.0
stmkt_gdp at:								
0.5	0.151***	0.114***	0.077***	0.041***	0.146***	0.106***	0.066***	0.026***
	(0.004)	(0.003)	(0.005)	(0.007)	(0.004)	(0.003)	(0.004)	(0.007)
1.0	0.177***	0.134***	0.097***	0.060***	0.163***	0.123***	0.083***	0.043***
	(0.003)	(0.002)	(0.004)	(0.007)	(0.003)	(0.002)	(0.004)	(0.007)
1.5	0.190***	0.153***	0.116***	0.079***	0.181***	0.141***	0.101***	0.061***
	(0.004)	(0.004)	(0.005)	(0.007)	(0.004)	(0.004)	(0.005)	(0.007)
2.0	0.209***	0.172***	0.135***	0.098***	0.199***	0.159***	0.119***	0.079***
	(0.006)	(0.006)	(0.007)	(0.009)	(0.006)	(0.006)	(0.007)	(0.009)
2.5	0.228***	0.191***	0.154***	0.117***	0.216***	0.176***	0.136***	0.096***
	(0.009)	(0.009)	(0.010)	(0.011)	(0.009)	(0.009)	(0.010)	(0.011)
Observations	194,456	194,456	194,456	194,456	194,456	194,456	194,456	194,456
Year f.e.	No	No	No	No	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table exhibits coefficient estimates of competition on cash in different scenario values of moderators. Two moderators of interest are equity market development (Total stock capitalization / GDP) and credit market development (Total bank credit / GDP). Control variables include market-to-book ratio, country-year percentile ranking of firm size as value of total assets, ratio of cash flow to assets, ratio of net working capital to assets, ratio of capital expenditures to assets, leverage, dividend payer identifier, ratio of R&D expenditures to sales, manufacturing firm identifier, multinational corporation identifier, U.S.-crosslisted firm identifier, ratio of acquisition expenditures to assets, R&D-intensive industry identifier, industry average of 5-year cash flow volatility, industry average of 5-year sales growth. Variable of interest is competition score which is the average of country-year percentile ranking of each competition dimension (compscore). Dependent variable is the ratio of cash and cash equivalents to total assets (cash / assets). All of the non-dummy non-ratio variables are scaled by total assets.

Table VI. Competition, cash holdings, and investor protection

	IPI measure 1			
Cash / Assets	(1) Comp	(2) IPI1	(3) Both	(4) Interact
mtb	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
sizerank	-0.139***	-0.140***	-0.136***	-0.136***
	(0.001)	(0.001)	(0.001)	(0.001)
cfasset	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
nwc	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
capat	-0.065***	-0.065***	-0.063***	-0.062***
	(0.010)	(0.010)	(0.010)	(0.010)
lev	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
dpayer	-0.005***	-0.008***	-0.008***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000**	0.000***	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
manu	-0.022***	-0.031***	-0.022***	-0.022***
	(0.001)	(0.001)	(0.001)	(0.001)
mnc	0.036***	0.042***	0.041***	0.041***
	(0.002)	(0.002)	(0.002)	(0.002)
uscrosslist	0.006***	-0.006***	-0.004*	-0.004*
	(0.002)	(0.002)	(0.002)	(0.002)
acqui	-0.067***	-0.060***	-0.061***	-0.061***
	(0.025)	(0.021)	(0.022)	(0.022)
rdinten	0.038***	0.058***	0.039***	0.039***
	(0.001)	(0.001)	(0.001)	(0.001)
indvol	0.083***	0.103***	0.094***	0.090***
	(0.009)	(0.011)	(0.010)	(0.010)
indgsale	0.008***	0.008***	0.008***	0.008***
	(0.001)	(0.001)	(0.001)	(0.001)
compscore	0.129***		0.127***	0.220***
	(0.002)		(0.002)	(0.007)
ipi		0.093***	0.088***	0.237***
		(0.004)	(0.004)	(0.009)
compscore#ipi				-0.303***
				(0.020)
Constant	0.136***	0.164***	0.110***	0.063***
	(0.002)	(0.002)	(0.002)	(0.004)
Observations	224,305	224,305	224,305	224,305
R-squared	0.146	0.135	0.149	0.150
Year f.e.	Yes	Yes	Yes	Yes
Country f.e.	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table presents empirical results of competition and cash holdings under interaction with investor protection index. Investor Protection Index (IPI) = (Shareholder right protection * Rule of Law) / 10 wherer shareholder right protection is to capture "de jure" aspect and Rule of law is to capture "de facto" aspect of regulation. Control variables include market-to-book ratio, country-year percentile ranking of firm size as value of total assets, ratio of cash flow to assets, ratio of net working capital to assets, ratio of capital expenditures to assets, leverage, dividend payer identifier, ratio of R&D expenditures to sales, manufacturing firm identifier, multinational corporation identifier, U.S.-crosslisted firm identifier, ratio of acquisition expenditures to assets, R&D-intensive industry identifier, industry average of 5-year cash flow volatility, industry average of 5-year sales growth. Variable of interest is competition score which is the average of country-year percentile ranking of each competition dimension (compscore). Dependent variable is the ratio of cash and cash equivalents to total assets (cash / assets). All of the non-dummy non-ratio variables are scaled by total assets.

Table VII. Robustness check

Table VII. Panel A. Different regressions of cash holdings on competition

Cash / Assets	(1) Fixed effects	(2) Fixed effects	(3) S.e clustered	(4) S.e clustered	(5) S.e. clustered	(6) S.e clustered
mtb	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
sizerank	-0.138***	-0.140***	-0.138***	-0.140***	-0.138***	-0.140***
	(0.001)	(0.001)	(0.020)	(0.020)	(0.023)	(0.023)
cfasset	-0.001***	-0.001***	-0.002*	-0.002*	-0.002***	-0.002***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
nwc	-0.000	-0.000	-0.000	-0.000	-0.000*	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
capat	-0.072***	-0.076***	-0.069	-0.073	-0.069	-0.073
	(0.011)	(0.012)	(0.053)	(0.054)	(0.043)	(0.045)
lev	-0.001***	-0.001***	-0.001*	-0.001*	-0.001***	-0.001***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
dpayer	-0.003***	-0.003***	-0.004	-0.003	-0.004	-0.003
	(0.001)	(0.001)	(0.013)	(0.014)	(0.008)	(0.008)
rdsales	0.000**	0.000**	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
manu	-0.011***	-0.013***	-0.022***	-0.024***	-0.022**	-0.024***
	(0.001)	(0.001)	(0.005)	(0.005)	(0.008)	(0.009)
mnc	0.021***	0.021***	0.035***	0.034***	0.035***	0.034***
	(0.002)	(0.002)	(0.009)	(0.009)	(0.009)	(0.009)
uscrosslist	0.012***	0.012***	0.007	0.008	0.007	0.008
	(0.003)	(0.003)	(0.006)	(0.006)	(0.011)	(0.010)
acqui	-0.079**	-0.078**	-0.068	-0.067	-0.068	-0.067
	(0.032)	(0.032)	(0.047)	(0.045)	(0.042)	(0.041)
rdinten	0.036***	0.046***	0.037***	0.047***	0.037***	0.047***
	(0.001)	(0.001)	(0.009)	(0.009)	(0.013)	(0.015)
indvol	0.043***	0.046***	0.093***	0.104***	0.093**	0.104**
	(0.006)	(0.006)	(0.025)	(0.027)	(0.037)	(0.041)
indgsale	0.004***	0.004***	0.008***	0.009***	0.008***	0.009***
	(0.000)	(0.000)	(0.002)	(0.002)	(0.002)	(0.002)
compscore	0.135***		0.136***		0.136***	
	(0.002)		(0.027)		(0.018)	
highcomp		0.033***		0.030***		0.030***
		(0.001)		(0.009)		(0.006)
Constant	0.140***	0.182***	0.142***	0.194***	0.142***	0.194***
	(0.002)	(0.002)	(0.018)	(0.021)	(0.019)	(0.021)
Observations	224,304	224,304	224,304	224,304	224,304	224,304
Year & country f.e.	Yes	Yes				
Cluster by			Country	Country	Industry	Industry

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results for fixed effects and standard error clustering methods. Models (1)-(2) use fixed effects. Model (3)-(4) cluster standard errors at country level. Models (5)-(6) cluster standard errors at industry level. Control variables include market-to-book ratio, country-year percentile ranking of firm size as value of total assets, ratio of cash flow to assets, ratio of net working capital to assets, ratio of capital expenditures to assets, leverage, dividend payer identifier, ratio of R&D expenditures to sales, manufacturing firm identifier, multinational corporation identifier, U.S.-crosslisted firm identifier, ratio of acquisition expenditures to assets, R&D-intensive industry identifier, industry average of 5-year cash flow volatility, industry average of 5-year sales growth. Alternatives of variable of interest are competition score which is the average of country-year percentile ranking of each competition dimension (compscore), and a binary variable that takes value of one for industries with above country-year median competition score, and zero otherwise (highcomp). Dependent variable is the ratio of cash and cash equivalents to total assets (cash / assets). All of the non-dummy non-ratio variables are scaled by total assets.

Table VII. Panel B. Robustness using subsamples

Cash / Assets	(1) Only US	(2) W/o US	(3) Only R&D	(4) W/o R&D	(5) W/o cashpoor	(6) Only cashrich	(7) W/o cashrich	(8) Only cashpoor
mtb	-0.000	0.002***	0.000**	-0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
sizerank	-0.145***	-0.130***	-0.138***	-0.134***	-0.149***	-0.139***	-0.013***	-0.000
	(0.003)	(0.002)	(0.001)	(0.003)	(0.002)	(0.002)	(0.000)	(0.000)
cfasset	-0.001**	-0.005**	-0.002***	-0.001*	-0.002***	-0.002***	0.000	-0.000***
	(0.000)	(0.002)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
nwc	-0.000	0.000	-0.000	-0.001	-0.000	-0.000	-0.000*	-0.000
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
capat	-0.192***	-0.050***	-0.062***	-0.141***	-0.077***	-0.088***	0.004**	-0.001
	(0.033)	(0.010)	(0.011)	(0.023)	(0.014)	(0.017)	(0.002)	(0.001)
lev	-0.000***	-0.006**	-0.001***	-0.008***	-0.002***	-0.001***	-0.000**	-0.000
	(0.000)	(0.003)	(0.000)	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)
dpayer	-0.016***	0.005***	-0.001*	-0.007***	-0.008***	-0.011***	0.002***	0.001***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)
rdsales	0.000**	0.001***	0.000**	0.002***	0.000**	0.000***	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
manu	-0.011***	-0.011***	-0.011***	-0.019	-0.017***	-0.025***	0.001***	0.001***
	(0.002)	(0.001)	(0.001)	(0.017)	(0.001)	(0.002)	(0.000)	(0.000)
mnc	0.031***	0.012***	0.024***	0.010**	0.005*	0.012***	0.011***	0.004***
	(0.003)	(0.004)	(0.003)	(0.005)	(0.003)	(0.004)	(0.001)	(0.000)
uscrosslist		0.014***	0.008***	0.027***	0.024***	0.024***	-0.008***	-0.001***
		(0.004)	(0.003)	(0.005)	(0.003)	(0.005)	(0.001)	(0.000)
acqui	-0.242***	-0.093***	-0.063***	-0.246***	-0.244***	-0.340***	-0.006**	0.002***
	(0.019)	(0.025)	(0.024)	(0.034)	(0.021)	(0.025)	(0.003)	(0.000)
rdinten	0.023***	0.039***			0.018***	-0.002	0.013***	0.002***
	(0.002)	(0.001)			(0.001)	(0.002)	(0.000)	(0.000)
indvol	0.058***	0.014*	0.060***	0.006	0.031***	0.014*	0.008***	-0.001
	(0.006)	(0.007)	(0.010)	(0.007)	(0.006)	(0.007)	(0.002)	(0.001)
indgsale	0.005***	0.003***	0.004***	-0.007***	0.003***	0.003***	0.000	-0.000
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
compscore	0.220***	0.091***	0.137***	0.124***	0.123***	0.100***	0.029***	0.004***
	(0.005)	(0.002)	(0.002)	(0.005)	(0.003)	(0.004)	(0.001)	(0.000)
Constant	0.129***	0.138***	0.127***	0.225***	0.207***	0.358***	0.036***	0.008***
	(0.004)	(0.003)	(0.002)	(0.006)	(0.003)	(0.004)	(0.001)	(0.000)
Observations	64,776	159,529	177,590	46,715	157,703	67,409	156,896	66,602
R-squared	0.181	0.220	0.187	0.128	0.235	0.359	0.252	0.516
Year and country f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results for different sample splits to control for potential dominant effects from a small group of firms. Models (1)-(2) split between U.S.-sample and out-of-US sample. Model (3)-(4) split between R&D-intensive and non-R&D-intensive firms. Models (5) through (8) split sample on liquidity strength/ weakness. Cash-rich firms are firms in top tercile of cash / assets ratio within each country-year. Cash-poor firms are firms in bottom tercile of cash / assets ratio within each country-year. Control variables include market-to-book ratio, country-year percentile ranking of firm size as value of total assets, ratio of cash flow to assets, ratio of net working capital to assets, ratio of capital expenditures to assets, leverage, dividend payer identifier, ratio of R&D expenditures to sales, manufacturing firm identifier, multinational corporation identifier, U.S.-crosslisted firm identifier, ratio of acquisition expenditures to assets, R&D-intensive industry identifier, industry average of 5-year cash flow volatility, industry average of 5-year sales growth. Variable of interest is competition score which is the average of country-year percentile ranking of each competition dimension (compscore). Dependent variable is the ratio of cash and cash equivalents to total assets (cash / assets). All of the non-dummy non-ratio variables are scaled by total assets.

Table VII. Panel C. Robustness using sub-periods

Cash / Assets	(1) 1999 - 2005	(2) 2006 - 2009	(3) 2010 - 2015	(4) 1999 - 2005	(5) 2006 - 2009	(6) 2010 - 2015
mtb	0.001**	0.001***	-0.000	0.001**	0.001***	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
sizerank	-0.118***	-0.144***	-0.145***	-0.118***	-0.144***	-0.145***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)
cfasset	-0.002	-0.002	-0.001***	-0.002	-0.002	-0.001***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)
nwc	-0.010***	0.000***	-0.000**	-0.010***	0.000***	-0.000**
	(0.003)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)
capat	-0.063***	-0.080***	-0.074***	-0.063***	-0.078***	-0.074***
	(0.020)	(0.021)	(0.015)	(0.020)	(0.021)	(0.015)
lev	-0.029***	-0.003**	-0.001***	-0.029***	-0.003**	-0.001***
	(0.005)	(0.001)	(0.000)	(0.005)	(0.001)	(0.000)
dpayer	-0.011***	-0.008***	0.008***	-0.011***	-0.007***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.001***	0.000*	0.000***	0.001***	0.000*	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
manu	-0.012***	-0.013***	-0.008***	-0.012***	-0.013***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
mnc	0.023***	0.025***	0.013***	0.023***	0.025***	0.013***
	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)
uscrosslist	0.008**	0.014***	0.014***	0.008**	0.014***	0.014***
	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)
acqui	-0.186***	-0.063***	-0.230***	-0.187***	-0.062***	-0.231***
	(0.013)	(0.019)	(0.029)	(0.013)	(0.019)	(0.029)
rdinten	0.050***	0.020***	0.029***	0.050***	0.021***	0.029***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
indvol	0.037***	0.093***	0.055***	0.028***	0.090***	0.053***
	(0.010)	(0.016)	(0.008)	(0.009)	(0.016)	(0.008)
indgsale	0.030***	0.002***	0.005***	0.024***	0.002***	0.005***
	(0.005)	(0.001)	(0.001)	(0.005)	(0.001)	(0.001)
compscore	0.131***	0.129***	0.143***	0.128***	0.130***	0.142***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Constant	0.143***	0.162***	0.165***	0.140***	0.159***	0.166***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
Observations	81,103	55,929	87,273	81,103	55,929	87,273
R-squared	0.204	0.200	0.215	0.204	0.201	0.215
Country f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Year f.e.	No	No	No	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results for three subperiods of 1999-2005, 2006-2009, and 2010-2015 as approximate control for pre-, during-, and post-financial crisis, without year fixed effect in models (1) through (3) and with year fixed effects in models (4) through (6). Control variables include market-to-book ratio, country-year percentile ranking of firm size as value of total assets, ratio of cash flow to assets, ratio of net working capital to assets, ratio of capital expenditures to assets, leverage, dividend payer identifier, ratio of R&D expenditures to sales, manufacturing firm identifier, multinational corporation identifier, U.S.-crosslisted firm identifier, ratio of acquisition expenditures to assets, R&D-intensive industry identifier, industry average of 5-year cash flow volatility, industry average of 5-year sales growth. Variable of interest is competition score which is the average of country-year percentile ranking of each competition dimension (compscore). Dependent variable is the ratio of cash and cash equivalents to total assets (cash / assets). All of the non-dummy non-ratio variables are scaled by total assets.

Table VII. Panel D. Robustness using alternative measures of cash holdings

	Cash / Net assets				Cash / Sales			
Cash holdings	(1) Compscore	(2) High comp	(3) Decilescore	(4) Decile ave	(5) Compscore	(6) High comp	(7) Decilescore	(8) Decile ave
mtb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
sizerank	-0.947***	-0.950***	-0.947***	-0.948***	-1.087**	-1.109**	-1.091**	-1.084**
	(0.113)	(0.111)	(0.112)	(0.114)	(0.543)	(0.548)	(0.541)	(0.543)
cfasset	-0.013***	-0.014***	-0.013***	-0.014***	0.301*	0.300*	0.301*	0.301*
	(0.005)	(0.005)	(0.005)	(0.005)	(0.159)	(0.159)	(0.159)	(0.159)
nwc	-0.001	-0.001	-0.001	-0.001	-0.013	-0.013	-0.013	-0.013
	(0.001)	(0.001)	(0.001)	(0.001)	(0.014)	(0.014)	(0.014)	(0.014)
capat	-1.105***	-1.119***	-1.111***	-1.106***	1.680	1.621	1.654	1.679
	(0.185)	(0.184)	(0.185)	(0.185)	(1.604)	(1.620)	(1.610)	(1.604)
lev	-0.006***	-0.006***	-0.006***	-0.006***	-0.001	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.024)	(0.024)	(0.024)	(0.024)
dpayer	-0.139***	-0.140***	-0.140***	-0.139***	-2.004***	-2.009***	-2.009***	-2.003***
	(0.041)	(0.040)	(0.040)	(0.041)	(0.172)	(0.172)	(0.172)	(0.171)
rdsales	0.003**	0.003**	0.003**	0.003**	0.958***	0.958***	0.958***	0.958***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.335)	(0.335)	(0.335)	(0.335)
manu	-0.123***	-0.125***	-0.120***	-0.125***	-0.410***	-0.438***	-0.405***	-0.404***
	(0.038)	(0.034)	(0.037)	(0.040)	(0.143)	(0.149)	(0.136)	(0.143)
mnc	0.080*	0.079*	0.080*	0.080*	1.593**	1.594**	1.595**	1.591**
	(0.045)	(0.044)	(0.044)	(0.045)	(0.688)	(0.690)	(0.689)	(0.688)
uscrosslist	0.188**	0.186**	0.185**	0.188**	0.404	0.396	0.392	0.407
	(0.077)	(0.076)	(0.076)	(0.077)	(1.073)	(1.073)	(1.074)	(1.073)
acqui	-0.575**	-0.571**	-0.573**	-0.575**	-3.058**	-3.035**	-3.044**	-3.059**
	(0.229)	(0.227)	(0.228)	(0.229)	(1.344)	(1.329)	(1.337)	(1.344)
rdinten	-0.138***	-0.109**	-0.129***	-0.133***	-1.682***	-1.505***	-1.616***	-1.695***
	(0.044)	(0.055)	(0.049)	(0.042)	(0.548)	(0.492)	(0.543)	(0.550)
indvol	0.760	0.768	0.759	0.762	5.075	5.135	5.082	5.064
	(0.487)	(0.485)	(0.486)	(0.487)	(3.941)	(3.936)	(3.935)	(3.939)
indgsale	0.050***	0.052***	0.051***	0.051***	0.272**	0.281**	0.277**	0.272**
	(0.013)	(0.013)	(0.013)	(0.012)	(0.120)	(0.123)	(0.122)	(0.120)
compscore	0.471**				2.375**			
	(0.216)				(1.192)			
highcomp		0.136***				0.597		
		(0.050)				(0.400)		
dcomp			0.027**				0.127*	
			(0.011)				(0.076)	
compdecile				0.044*				0.248**
				(0.025)				(0.120)
Constant	0.808***	0.944***	0.868***	0.799***	1.112**	1.842***	1.458***	0.945**
	(0.145)	(0.085)	(0.112)	(0.170)	(0.440)	(0.675)	(0.515)	(0.409)
Observations	224,298	224,298	224,298	224,298	224,305	224,305	224,305	224,305
R-squared	0.002	0.002	0.002	0.002	0.260	0.260	0.260	0.260
Yr and ctry f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results when alternative measures of cash holdings are used. The first measure in models (1) through (4) is the ratio of cash to net assets, calculated as Cash and cash equivalents to the value of Total assets minus Cash and cash equivalents. The second measure in models (5) through (8) is the ratio of cash to sales, calculated as Cash and cash equivalents to Sales. Control variables include market-to-book ratio, country-year percentile ranking of firm size as value of total assets, ratios to total assets of cash flow, net working capital, and capital expenditures, leverage, ratio of R&D expenditures to sales, identifiers for dividend payers, manufacturing firms, multinational corporations, U.S.-crosslisted firms, and R&D-intensive industries, ratio of acquisition expenditures to assets, industry average of 5-year cash flow volatility and sales growth. Alternative variables of interest include competition score which is the average of country-year percentile ranking of each competition dimension (compscore), an identifier for firms with above median competition score (highcomp), country-year decile ranking of competition score (dcomp), and average decile ranking of three competition dimensions (compdecile).

Table VII. Panel E. Robustness using 3-digit and 2-digit SIC industry classifications

	Continuous comp measure			Binary comp measure		
Cash / Assets	(1)	(2)	(3)	(4)	(5)	(6)
	4-digit SIC	3-digit SIC	2-digit SIC	4-digit SIC	3-digit SIC	2-digit SIC
mtb	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
sizerank	-0.138***	-0.136***	-0.137***	-0.139***	-0.138***	-0.138***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
cfasset	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
nwc	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
capat	-0.069***	-0.066***	-0.063***	-0.072***	-0.072***	-0.064***
	(0.011)	(0.010)	(0.010)	(0.011)	(0.011)	(0.010)
lev	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
dpayer	-0.003***	-0.002***	-0.004***	-0.003***	-0.003***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
manu	-0.011***	-0.011***	-0.016***	-0.013***	-0.013***	-0.018***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
mnc	0.021***	0.020***	0.021***	0.021***	0.021***	0.021***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
uscrosslist	0.012***	0.011***	0.011***	0.012***	0.010***	0.011***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
acqui	-0.079**	-0.080**	-0.079**	-0.078**	-0.078**	-0.077**
	(0.032)	(0.033)	(0.032)	(0.032)	(0.032)	(0.031)
rdinten	0.036***	0.029***	0.040***	0.046***	0.042***	0.044***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
indvol	0.043***	0.040***	0.042***	0.047***	0.044***	0.045***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
indgsale	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
compscore	0.135***	0.136***	0.102***			
	(0.002)	(0.002)	(0.002)			
highcomp				0.033***	0.035***	0.034***
				(0.001)	(0.001)	(0.001)
Constant	0.140***	0.141***	0.155***	0.182***	0.181***	0.182***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	224,305	224,305	224,305	224,305	224,305	224,305
R-squared	0.196	0.197	0.191	0.190	0.191	0.190
Year and country f.e.	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results when firms are classified into different product markets based on 3-digit and 2-digit SIC codes rather than 4-digit SIC codes. By hierarchy structure of standard industry code system, using broader classification results in most likely more firms within each industry, thus lower industry concentration and higher industry competition. Control variables include market-to-book ratio, country-year percentile ranking of firm size as value of total assets, ratio of cash flow to assets, ratio of net working capital to assets, ratio of capital expenditures to assets, leverage, dividend payer identifier, ratio of R&D expenditures to sales, manufacturing firm identifier, multinational corporation identifier, U.S.-crosslisted firm identifier, ratio of acquisition expenditures to assets, R&D-intensive industry identifier, industry average of 5-year cash flow volatility, industry average of 5-year sales growth. Alternative variables of interest include competition score which is the average of country-year percentile ranking of each competition dimension (compscore), and an identifier for firms with above median competition score (highcomp). Dependent variable is the ratio of cash and cash equivalents to total assets (cash / assets). All of the non-dummy non-ratio variables are scaled by total assets.

Table VII. Panel F. Robustness using panel data regressions

Cash / Assets	(1) Comp score	(2) High comp	(3) High all	(4) Decile score	(5) Decile average	(6) External dependence	(7) Financial constraints	(8) Stock market	(9) Credit market
compscore	0.070***					0.098***	0.075***	0.072***	0.081***
	(0.004)					(0.005)	(0.004)	(0.004)	(0.004)
highcomp		0.009***							
		(0.001)							
highall			0.009***						
			(0.002)						
ccomp				0.003***					
				(0.000)					
compdecile					0.007***				
					(0.000)				
efd_dum						0.003*			
						(0.002)			
compscore #efd_dum						-0.049***			
						(0.004)			
constrained							-0.012***		
							(0.002)		
compscore #constrained							-0.037***		
							(0.004)		
highstmkt								0.019***	
								(0.003)	
compscore #highstmkt								-0.005	
								(0.006)	
highpriv									0.014***
									(0.003)
compscore #highpriv									-0.029***
									(0.005)
Constant	0.177***	0.202***	0.206***	0.191***	0.175***	0.163***	0.167***	0.171***	0.172***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Observations	224,305	224,305	224,305	224,305	224,305	224,305	224,305	224,305	224,305
R-sq	0.1839	0.1758	0.1732	0.1804	0.1836	0.1887	0.1959	0.1843	0.1844
Yr & ctry f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table shows empirical results using panel data regression method. Model (1) uses competition score where competition score is the average of threat from rivals, threat from entrants, and threat of substitutes, model (2) uses binary variable that takes value of 1 for firms with competition score above country-year median and zero otherwise, model (3) is a more conservative binary variable that takes value of 1 for firms with all competitive dimensions above country-year median and zero otherwise, model (4) uses decile ranking of competition score, model (5) uses average of three decile rankings for each individual dimension. The rest of models repeats the subsection extended tests to examine moderating role of firm-level and country-level factors, where model (6) looks at firm dependence on external financing, model (7) looks at firm's financial constraints, model (8) looks at development of equity market and model (9) looks at development of credit market. Control variables (untabulated) include market-to-book ratio, country-year percentile ranking of firm size as value of total assets, ratio of cash flow to assets, ratio of net working capital to assets, ratio of capital expenditures to assets, leverage, dividend payer identifier, ratio of R&D expenditures to sales, manufacturing firm identifier, multinational corporation identifier, US-crosslisted firm identifier, ratio of acquisition expenditures to assets, R&D-intensive industry identifier, industry average of 5-year cash flow volatility, industry average of 5-year sales growth. Dependent variable is the ratio of cash and cash equivalents to total assets (cash / assets). All of the non-dummy non-ratio variables are scaled by total assets.

Table VII. Panel G. Robustness interacting country dummies with year dummies

Cash / Assets	(1)	(2)	(3)	(4)	(5)	(6)
mtb1	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
sizerank	-0.106***	-0.106***	-0.103***	-0.106***	-0.103***	-0.104***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
cfassets1	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
nwc	-0.184***	-0.183***	-0.190***	-0.181***	-0.188***	-0.183***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
capat	-0.129***	-0.131***	-0.100***	-0.147***	-0.116***	-0.129***
	(0.017)	(0.017)	(0.014)	(0.019)	(0.016)	(0.017)
lev	-0.321***	-0.320***	-0.315***	-0.317***	-0.308***	-0.311***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
dpayer	-0.013***	-0.013***	-0.013***	-0.013***	-0.012***	-0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
manu	-0.010***	-0.009***	-0.007***	-0.009***	-0.005***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
mnc	0.007***	0.007***	0.008***	0.004*	0.005**	0.006***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
uscrosslist	0.018***	0.018***	0.018***	0.015***	0.016***	0.018***
	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)
acqui	-0.133***	-0.133***	-0.137***	-0.132***	-0.137***	-0.135***
	(0.027)	(0.027)	(0.028)	(0.027)	(0.028)	(0.028)
rdintensic4	0.039***	0.038***	0.030***	0.034***	0.021***	0.025***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ind4vol	0.056***	0.055***	0.051***	0.054***	0.047***	0.048***
	(0.009)	(0.009)	(0.008)	(0.009)	(0.008)	(0.008)
ind4gsale	0.004***	0.004***	0.005***	0.004***	0.004***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
rivals		0.011***			0.006***	
		(0.001)			(0.001)	
entrants			0.042***		0.054***	
			(0.002)		(0.002)	
substitutes				0.040***	0.051***	
				(0.001)	(0.001)	
compscore4						0.096***
						(0.002)
Constant	0.213***	0.209***	0.193***	0.211***	0.183***	0.189***
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
Observations	213,277	213,277	213,277	213,277	213,277	213,277
R-squared	0.325	0.325	0.329	0.329	0.335	0.332
Year and country f.e.	No	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results with country-year fixed effects. Control variables include market-to-book ratio, country-year percentile ranking of firm size as value of total assets, ratio of cash flow to assets, ratio of net working capital to assets, ratio of capital expenditures to assets, leverage, dividend payer identifier, ratio of R&D expenditures to sales, manufacturing firm identifier, multinational corporation identifier, U.S.-crosslisted firm identifier, ratio of acquisition expenditures to assets, R&D-intensive industry identifier, industry average of 5-year cash flow volatility, industry average of 5-year sales growth. Alternatives of variable of interest are competition score which is the average of country-year percentile ranking of each competition dimension (compscore), and a binary variable that takes value of one for industries with above country-year median competition score, and zero otherwise (highcomp). Dependent variable is the ratio of cash and cash equivalents to total assets (cash / assets). All of the non-dummy non-ratio variables are scaled by total assets.

Table VII. Panel H. Robustness check using between effects

Cash / Assets	(1)	(2)	(3)	(4)	(5)	(6)
mtb1	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
sizerank	-0.101***	-0.101***	-0.098***	-0.102***	-0.098***	-0.099***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
cfassets1	-0.010***	-0.010***	-0.010***	-0.011***	-0.010***	-0.010***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
nwc	-0.194***	-0.193***	-0.199***	-0.191***	-0.196***	-0.192***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
capat	-0.129***	-0.132***	-0.100***	-0.145***	-0.114***	-0.127***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
lev	-0.346***	-0.346***	-0.339***	-0.342***	-0.333***	-0.337***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
dpayer	-0.012***	-0.012***	-0.012***	-0.012***	-0.013***	-0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
manu	-0.014***	-0.012***	-0.011***	-0.013***	-0.009***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
mnc	0.024***	0.024***	0.026***	0.021***	0.023***	0.025***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
uscrosslist	-0.007***	-0.004**	-0.007***	-0.008***	-0.006***	-0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
acqui	-0.123***	-0.122***	-0.127***	-0.122***	-0.125***	-0.124***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
rdintensic4	0.039***	0.037***	0.031***	0.035***	0.022***	0.026***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ind4vol	0.081***	0.080***	0.074***	0.076***	0.066***	0.071***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
ind4gsale	0.006***	0.006***	0.006***	0.005***	0.005***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
rivals		0.026***			0.021***	
		(0.001)			(0.001)	
entrants			0.043***		0.053***	
			(0.001)		(0.001)	
substitutes				0.042***	0.049***	
				(0.001)	(0.001)	
compscore4						0.094***
						(0.002)
Constant	0.279***	0.262***	0.255***	0.260***	0.214***	0.232***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	213,277	213,277	213,277	213,277	213,277	213,277
R-squared	0.287	0.288	0.291	0.292	0.299	0.294
Year and country f.e.	No	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results using between effects. Control variables include market-to-book ratio, country-year percentile ranking of firm size as value of total assets, ratio of cash flow to assets, ratio of net working capital to assets, ratio of capital expenditures to assets, leverage, dividend payer identifier, ratio of R&D expenditures to sales, manufacturing firm identifier, multinational corporation identifier, U.S.-crosslisted firm identifier, ratio of acquisition expenditures to assets, R&D-intensive industry identifier, industry average of 5-year cash flow volatility, industry average of 5-year sales growth. Alternatives of variable of interest are competition score which is the average of country-year percentile ranking of each competition dimension (compscore), and a binary variable that takes value of one for industries with above country-year median competition score, and zero otherwise (highcomp). Dependent variable is the ratio of cash and cash equivalents to total assets (cash / assets). All of the non-dummy non-ratio variables are scaled by total assets.

8. Appendices

Appendix A. Predictions of liquidity models

Determinants from sources of cash and alternative uses of cash	Trade-off model	Hierarchy model	Agency cost model	Haushalter et al. (2007)	Hoberg et al. (2014)	My results
Dividend payment	(−)			(−)		(−)
Investment opportunity set	(+)	(+)	(−)	(+)	(+)	(+)
Liquid asset substitutes	(−)			(−)	(−)	(−)
Leverage	(?)	(−)	(+)	(−)		(−)
Size	(−)	(+)	(+)	(−)	(−)	(−)
Cash flow	(−)	(+)			(−)	(−)
Cash flow uncertainty	(+)				(+)	(+)
Product market competition	(?)	(?)	(−)	(−)	(+)	(+)

This table presents the signs of correlations between firm-level characteristics and corporate cash holdings. The bottom row is an elaboration of existing literature regarding the predicted impact of competition on cash. Three columns to the left shows predictions of three theoretical models of liquidity and capital structure: the trade-off model, hierarchy model (pecking order theory), and agency cost model (free cash flow theory). Three columns to the right shows empirical findings of two previous studies by Haushalter et al. (2007) and Hoberg et al. (2014) and the empirical results from this paper.

Appendix B. Sample construction

After	# of countries	# of firms	# of observations
Original sample (24,032 NA firms and 42,491 Global firms)	127	65,633	689,264
Excluding unconsolidated, non-industrial format, non-domestic	124	58,082	581,293
Excluding countries without ADRI	49	51,458	510,917
Excluding Hong Kong	48	50,121	494,832
Excluding China-based firms	48	49,992	493,460
Excluding missing SIC	48	49,981	493,348
Excluding financial firms	48	42,871	436,476
Excluding utilities firms	48	41,656	422,093
Excluding (quasi-)governmental firms	48	41,271	416,931
Excluding missing sale data	48	41,205	410,986
Excluding missing stock market data	48	38,115	325,031
Excluding accounting duplicates	48	38,115	319,057
Excluding missing exchange rates	45	37,626	314,429
Excluding missing accounting data	44	36,383	298,234
Excluding countries with less than 300 firms	14	29,964	241,115

This table presents step-by-step data cleaning and sample construction procedure that was also explained in the paper. After excluding countries without shareholder protection data, Hongkongese and Chinese firms, firms without industry classification information, financial and utilities and quasi-governmental firms, firms without sales or stock market data, duplicate accounting restatement observations, countries without exchange rate data, firms with missing data to compute control variables, and countries with less than 300 all-time observations, my final sample consists of 241,115 observations from 29,964 firms in 14 countries.

Appendix C. Examples of firms with high product market competition

SIC	Industry name	Countries	Companies
Panel A. High threats from rivals, high threats from entrants, high threats from substitutes, overall high competition			
7372	Prepackaged software	USA, UK, Japan, France	Microsoft, Adobe, Oracle, Symantec (US)
7373	Computer integrated systems	Germany	
7812	Motion picture & video tape production	Japan, France, Germany	
8711	Engineering Services	Singapore	
Panel B. Low threats from rivals, high threats from entrants, high threats from substitutes, overall high competition			
2731	Books: publishing (& printing)	Germany, India, UK	
2834	Pharmaceutical preparations	Canada, Germany, Malaysia, Taiwan	Valeant, Polydex, Concordia Intl (Canada)
3572	Computer storage devices	USA	Quantum, Western Digital, Sandisk
3827	Optical instruments and lenses	USA	Prophotonix
3861	Photographic equipment and supplies	Japan	Konica Minolta, Ricoh, Fujifilm
4833	Television broadcasting stations	USA, Australia, Thailand	
7372	Prepackaged software	Germany, South Korea	
Panel C. High threats from rivals, low threats from entrants, high threats from substitutes, overall high competition			
1040	Gold and silver ores	Canada, Sweden, UK	
1311	Crude petroleum and natural gas	USA, Canada, Singapore, Sweden, UK	Chesapeake, Texas Vanguard Oil (US), Alberta Energy (Canada)
1382	Oil and gas field exploration services	Singapore	Universal Resources and Service, CH Offshore
2834	Pharmaceutical preparations	USA	Abbott, Johnson & Johnson, Pfizer, Lilly (Eli)
2836	Biological products, except diagnostic substances	Sweden	
8062	General medical and surgical hospitals	Thailand	Aikchol Hospital, Ramkamhaeng Hospital
Panel D. High threats from rivals, high threats from entrants, low threats from substitutes, overall high competition			
1531	Operative builders	USA	A V Homes, Toll Brothers, LGI Homes
1600	Heavy construction other than bldgs	India, Japan, South Korea	
2834	Pharmaceutical preparations	Australia	Novogen, Vita Life Sciences, Phosphagenics
2836	Biological products, except diagnostic substances	Canada	Avivagen, Xenon, IBEX Technologies
3661	Telephone & telegraph apparatus	USA	Zoom Tech, ADC Telecommunications
5065	Electronic parts and equipment NEC	Thailand, Japan	
5961	Catalog and mail-order Houses	USA	Amazon.com, Egghead.com, Overstock.com
7361	Employment agencies	UK	RTC, Norman Broadbent, Empresaria
Panel E. Medium threats from rivals, medium threats from entrants, high threats from substitutes, overall high competition			
1311	Crude petroleum and natural gas	Australia, India, Japan, UK	
2040	Grain mill products	Malaysia	
2060	Sugar & confectionery products	South Korea	
Panel F. Medium threats from rivals, high threats from entrants, medium threats from substitutes, overall high competition			
2060	Sugar & confectionery products	India, Malaysia	
7812	Motion picture & video tape production	USA	Dreamworks, Discovery, Family Room
Panel G. Medium threats from rivals, medium threats from entrants, medium threats from substitutes, overall high competition			
3714	Motor vehicle parts & accessories	South Korea	
4833	Television broadcasting stations	Sweden	

Appendix D. Definition of variables

Dependent	Predict	Definitions of variables
cash/ total assets		Cash and cash equivalents / Total assets
cash/ net assets		Cash and cash equivalents / (Total assets – Cash and cash equivalents)
cash/ sale		Cash and cash equivalents / Sales
Country-industry competition		
rivals	(?)	1-HHI for top 50 firms in each 4-digit SIC country-industry in terms of sales
entrants	(?)	Industry weighted average of (-) log of net value of property, plant and equipment
substitutes	(?)	Industry weighted average of log of price-cost margin
compscore	(?)	Average percentile rankings of threats from rivals, entrants, and substitutes
highcomp	(?)	Binary variable that takes value of 1 if firms have above country-year median of compscore, 0 otherwise
lowcomp	(?)	Binary variable that takes value of 1 if firms have below country-year median of compscore, 0 otherwise
Firm level characteristics (following OPSW, 1999, Dittmar & Mahrt-Smith, 2007, and BKS, 2009)		
mtb	(+)	Market to book value to proxy for investment opportunities
sizerank	(−)	Percentile ranking of firm size within each country-industry-year to proxy for life cycle
cfassets	(+)	Earnings after interest, dividends, taxes but before depreciation to total assets to proxy for profitability
nwc	(−)	Net working capital scaled by total assets to proxy for liquidity demand and substitute for cash
capat	(+)	The ratio of capital expenditures to total assets to proxy for productivity and temporary investment requirements and financial distress costs
lev	(?)	Sum of long-term debt and debt in current liabilities, divided by assets to proxy for financial distress
divdum	(?)	Binary variable that takes value of 1 in years a firm pays common dividend and 0 otherwise to proxy for payout policy and accessibility to financial markets
rdsales	(+)	R&D spending over sales where firms that do not report R&D expenses are treated as having no R&D expenses to proxy for growth opportunities
acqui	(−)	Acquisition expenditures divided by total assets to proxy for investment policy via acquisition activities
mnc	(+)	Binary variable that takes 1 for multinational corporation to proxy for tax motive
uscrosslist	(−)	Binary variable that takes value of 1 in years that a foreign firm is cross-listed on US stock exchanges, including ADRs and US OTC exchanges to proxy for signaling effect of cross-listing.
Industry level control variables		
manu	(?)	Binary variable that takes 1 for manufacturing industries and 0 otherwise to proxy for transaction costs
rdintense	(+)	Binary variable that takes 1 for R&D-intensive industries and 0 otherwise to proxy for risk
indvol	(+)	Industry average of firms' 5-year standard deviations of cash flow to assets to proxy for cash flow risk
indgsale	(+)	Industry average of firms' 5-year sales growth to proxy for investment opportunities
Country level factors (Rajan & Zingales, 1998; Durnev & Kim, 2005)		
stmkt_gdp	(?)	Total stock market capitalization / GDP
bkcred_gdp	(?)	Total Bank credit / GDP
adri_dlls	(?)	Anti-directorship right index, edited version (DLLS, 2005)
prs_rl	(?)	Rule of law quality (by International Country Risk Guide)

Appendix E. Construction of variables

Competition

Threat from existing rivals

$$\text{RIVALS}_{jct} = 10000 - \text{HHI}_{jct} = 10000 - \sum_{i=1}^{N}\left(\text{MKTSHARE}_{ijct}\right)^2 \quad \text{where} \quad \text{MKTSHARE}_{ijct} = \frac{\text{SALE}_{ijct}}{\sum_{i=1}^{N}\text{SALE}_{ijct}}$$

Threat from potential entrants

$$\text{ENTRANTS}_{jct} = \frac{\sum_{i=1}^{N}(\text{MKTSHARE}_{ijct} * (-\ln(\text{PPENT}_{ijct}/\text{ASSETS}_{ijct})))}{\sum_{i=1}^{N}\text{MKTSHARE}_{ijct}}$$

Threat of product substitutes

$$\text{SUBSTITUTES}_{jct} = \frac{\sum_{i=1}^{N}(\text{MKTSHARE}_{ijct} * \ln(\text{SALE}_{ijct}/(\text{COGS}_{ijct}+\text{XSGA}_{ijct})))}{\sum_{i=1}^{N}\text{MKTSHARE}_{ijct}}$$

Dependent variables

Cash / Assets = cash and cash equivalents (ch) / total assets (at)

Cash / Net assets = cash and cash equivalents (ch) / [total assets (at) – cash and cash equivalents (ch)]

Cash / Sales = cash and cash equivalents (ch) / sales (sale)

Cash holdings control variables

Market to book (mtb) = [total assets (at) – common equity (ceq) + price (prcc) * shares outstanding (csho)] / assets (at)

Sizerank = country-year percentile ranking of size where size = ln [total assets (at)]

Cash flow to assets (cfassets) = [earnings (oibdp) – interest (xint) – dividends (dvc) – taxes (txt)] / assets (at)

Net working capital to assets (nwc) = [working capital (wcap) – cash and cash equivalents (ch)] / assets (at)

Capital expenditure to assets (capat) = capital expenditure (capx) / assets (at)

Leverage = [long-term debt (dltt) + short-term debt (dlc)] / assets (at)

Dividend = cash dividend (dvc)

R&D to sales = R&D expenditure (xrd) / sales (sale)

Acquisition to assets = acquisition expenditures (aqc) / assets (at)

Internal financing deficit / surplus variables

EFD_DOS = [capital expenditures (capx) – funds from operations (fopt)] / capital expenditure (capx)

Where: Funds from operations (fopt) = income before extraordinary items (ibc) + depreciation amortization (dpc) + deferred taxes (txdc) + equity in net loss (esubc) + sale of PP&E and investments (sppiv) + funds from operations others (fopo)

EFD_HTX = [capital expenditures (capx) + R&D expense (xrd) – net cash flow (ncf)] / [capital expenditures (capx) + R&D expense (xrd)]

Where: Net cash flow (ncf) = income before extraordinary items (ibc) + depreciation amortization (dpc) + extraordinary items and discontinued operations (xidoc) + deferred taxes (txdc) + equity in net loss (esubc) + sale of PP&E and investments – gain (sppiv) + exchange rate effect (exre)

IFD_RZ = [operating cash flow (oancf) – capital expenditures (capx)] / capital expenditures (capx)

IFD_BX1 = [operating cash flow (oancf) – capital expenditures (capx) – acquisitions (aqc)] / assets (at)

IFD_BX2 = operating cash flow (oancf) / [capital expenditures (capx) + acquisitions (aqc)]

Equity dependence (equitydep) = [sale of stocks (sstk) – purchase of stocks (prstkc)] / capital expenditure (capx)

Credit dependence (creditdep) = external financing dependence (efd_dos) – equity dependence (equitydep)

Financial constrained and financial distressed measures

KZ1997 = [–1.001909 cashflow (ncf) + 3.139193 long-term debt (dltt) – 39.36780 dividend (dvc) – 13.314759 cash and cash equivalents (ch) + 0.2826389 Tobin's Q] / assets (t-1) (at)

WW2006 = [– 0.091 cash flow (ncf) / assets – 0.062 * dividend payer + 0.021 long-term debt (dltt) / assets (at) – 0.044 size (ln(at)) + 0.102 industry sales growth – 0.035 firm sales growth

Altman zscore = 0.012 working capital (wcap) / assets (at) + 0.014 retained earnings (re) / assets (at) + 0.033 earnings before interest and taxes (ebit) / assets (at) + 0.006 share price (prcc) * shares outstanding (csho) / book value equity (ceq) + 0.999 sales (sale) / assets (at)

CHAPTER 3

Industry Takeover Threat and Corporate Cash Holdings

A Cross-Country Analysis

Abstract

I conduct a study on whether the theory of predation and risk management (Froot, Scharfstein & Stein, 1993) explains the relationship between industry takeover threat and corporate cash holdings, using a sample of firms from 10 developed and emerging countries for a period from 1999 through 2016.

I propose using merger & acquisition (M&A) activities to proxy for takeover threats. My baseline findings suggest that cash level is positively correlated to the number of all industry takeover deals (on average, 1% increase in number of deals will result in 0.4% increase in cash-to- assets ratio) and aggregated dollar volume of all industry takeover deals (on average, 1% increase in volume of deals will result in 0.3% increase in cash-to-assets ratio). My empirical evidence confirms the U.S.-focused finding by Haushalter, Klasa, and Maxwell (2007) and finds similar pattern internationally. The impact is more economically significant for number of deals (M&A activity) than dollar volume of deals (M&A density).

I also examine how the relationship between takeover threat and corporate cash holdings varies across countries. The positive impact of M&A activity and M&A density on cash policy is moderated by some country-level factors such as the development of credit market, the level of economic freedom, the quality of accounting standard, and investor protection strength. Overall, my work suggests that the extent of using cash as a strategic risk management tool depends on external financing capability of firms.

JEL classifications: G15, G31, G34

Keywords: cash holdings, merger and acquisition, corporate control, takeover threat, predation risk

1. Introduction

"The key to making acquisitions is being ready

because you really never know when the right big one is going to come along."

– James McNerney (Chairman of The Boeing Company) –

Why do firms choose to maintain large amount of cash? One among the most important motivations for firms to hold cash is the financial flexibility that allows for transferring liquidity across time, thus (1) to avoid missing investment opportunities and (2) to buffer against unexpected negative shocks in the future[30]. Bates, Kahle, and Stulz (2009) summarize four motives of cash holdings: transaction, tax, precautionary, and agency motives; and any amount of cash in excess of what is needed that is not paid to the firm's shareholders could be subject to agency problem (Jensen and Meckling, 1976).

Literature suggests that the takeover market can be an ideal external mechanism for **monitoring** the agency problems of corporate free cash flow. If top managers compete for productive assets, the market for corporate control should expect to see bids among them for cash-rich firms (Jensen, 1983). Hence, excessive cash holdings, if symbolizing agency conflicts, may make firms *more* likely takeover targets[31]. A classic example is the attempt to takeover Chrysler Corporation by activist Kirk Kerkorian, in which he requested Chrysler to increase shareholder's value by paying out most of Chrysler's $7.5 billion of cash while maintaining only $2.5 billion in cash and getting $2.5 billion in lines of credit[32]. Recently, many European's biggest companies hoard large cash stockpiles as a precautionary action against future uncertainty, signaling them as attractive targets to U.S. companies which tend to take advantage of low financing costs to boost acquisitions[33].

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[30] See, for example, Opler et al. (1999), Harford (1999), Ozkan & Ozkan (2004), Denis (2011). Hoberg et al. (2014), Bonaimé et al. (2014). More contemporaneous papers suggest a strategic dimension of corporate cash holding policy.

[31] See Pinkowitz (2002, p. 5-6) for some highlights of industry publications on the same matter.

[32] Chrysler's Cash (The Washington Post, April 18, 1995) (https://www.washingtonpost.com/archive/opinions/1995/04/18/chryslers-cash/6c5a820c-59fe-4e21-9083-d9f65057ed56/?utm_term=.dbcf0283ac3b).

[33] In 2012, Western European companies announced $50 billion of acquisitions, shrinking to almost half of year-on-year period, while U.S. companies have almost doubled their purchases to $184 billion (Bloomberg Technology, February 24, 2013).

Takeover market also **disciplines** managers. Jensen (1986, p. 328) asserts that the free cash flow theory predicts that "value-increasing takeovers occur in response to breakdowns of internal control processes in firms with substantial free cash flow". Yun (2009) suggests that an exogenous removal of threat such as change in takeover law at state-level leads to higher cash and lower lines of credit in poorly governed firms. According to Servaes and Tamayo (2014), in U.S., when another firm in industry is the subject of a hostile takeover attempt, industry peers respond by *reducing* their cash holdings and increasing their payouts to shareholders, and adopt more takeover defenses. These results imply industry spillover effects and support disciplinary effects of takeover threat (Bris, Brisley, and Cabolis, 2008).

Recent empirical evidence, however, argue that the monitoring role/ disciplinary effect of takeover market is not always the case. Since financial flexibility of corporate liquidity is so unique, there are several reasons why excess cash reserves may make firms *less* likely to be targeted. For examples, as part of defensive strategies against unwanted takeover bids, Dayton Hudson offered to repurchase 15% of its stocks in 1987; Polaroid buys back $1.1 billion in 1989; and Sears started buybacks amid takeover rumors in 1988 (Bagwell, 1991). Harford (1999) examines the relationship between market for corporate control and cash holdings and reports that higher excess cash balance is *negatively* related to probability of the firm being a hostile target, while *positively* related to probability of the firm being a bidder. Pinkowitz (2002) conducts a similar test and has similar implications that higher excess cash is associated with *lower* probability of receiving a hostile bid. Faleye (2004) focuses on the takeover **deterrence** effect of corporate liquidity and finds that the probability of a proxy fight contest is significantly and *positively* correlated with excess cash holdings. Thus, these papers suggest that holding excess cash may serve as a deterrent tool[34] to would-be bidders.

(https://www.bloomberg.com/news/articles/2013-02-25/european-companies-stockpile-475-billion-as-outlook-dims).

[34] Excess cash also enhances some other takeover defenses such as stock repurchases, acquiring a competitor of bidder, filing anti-trust litigation, or acquiring the suitor itself (Bagnoli et al., 1989; Bagwell, 1991; Sinha, 1991; Stulz, 1988; Dann and DeAngelo, 1988).

In this study, I focus on the takeover-deterrence effect of excess cash, and investigate the relationship between market of control and cash holdings from an industry-level approach. I also extend the question to a global context, using a sample of 10 countries. I propose that takeover threat aggregated at industry level can be a potential driver of corporate cash policy. Haushalter, Klasa, and Maxwell (HKM, 2007) examine the effects of product market dynamics on corporate liquidity and conclude that more predatory behaviors from industry rivals leads to *larger* size of cash holdings. Compared to their analysis, mine differs in three ways. First, HKM use Hirschman – Herfindahl Index (HHI)[35] as a proxy for predation risk where I use acquisitiveness at industry level to directly measure takeover threat. Second, HKM focus on U.S. manufacturing firms while I extend this relationship to an international context for all non-financial non-utilities firms. And third, while HHI is geographically bound, my takeover threat measures can account for cross-border predation threats from foreign rivals.

There are several avenues by which the activity and density of industry mergers and acquisitions (M&A) can affect corporate cash holdings: (1) the monitoring role of takeover market over agency holding of cash suggests a *negative* relationship; (2) the disciplinary effect of takeover market suggests a *negative* relationship; (3) the precautionary motive (preparedness) of cash holdings from likely bidders suggests a *positive* relationship; and (4) the deterrent effect of cash holding from likely targets also suggests a *positive* relationship.

To test my hypotheses, I use an international sample of firms from 10 different countries, ranging from developed to emerging economies. The M&A data from SDC Platinum at deal-level is aggregated to industry-level for every country-year group. I quantify takeover threat of each Fama-Frency 48-industry group with two size measures of acquisitiveness: M&A activity (number of takeover deals), and M&A density (total dollar volume of takeover deals). I find that, on average, an increase in M&A activity at industry level induces firms to hold *more* cash as a percentage of total assets. This can be explained by behaviors of both would-be targets and would-be acquirers: likely targets may hold more cash to attract

[35] HHI is commonly used to measure industry concentration and firm's power in product pricing competition.

acquirers or to conduct anti-takeover defense; while potential acquirers may hold more cash to avoid external financing costs associated with potential acquisition opportunities. My empirical findings are not sensitive to different measures of takeover threats and alternative explanations.

I also examine the strategic dimension of cash holdings by looking at subsequent defensive and/ or predatory behavior of firms following industry takeover threat, and find empirical support for increases in both share repurchases and acquisition expenses in the following year, especially among cash-rich firms.

The contributions of this work are three folds. First, it enhances our understanding of the external role of takeover market in containing excess cash holding problem by providing an empirical evidence across countries. Second, it examines the relationship in a global context under the moderating impact of several country-level factors. And third, it proposes using merger and acquisition-based proxies for product market predation risk that can be constructed for international samples.

The remainder of the paper is as follows. In the next section, I review the literature, motivation, and testable hypotheses. In section 2, I describe my measure of cash holdings and takeover threats. Section 3 presents sample selection process. The empirical results are discussed in section 4. Section 5 containes some further tests of the implications from section 4, and section 6 concludes.

2. Literature Review and Hypotheses Development

2.1. Literature on cash holdings and corporate control

2.1.1. Cash holdings

Liquidity literature postulates that cash reserves can be an important strategic tool for firms operating in imperfect capital markets as it provides sufficient funds for investment opportunities when alternative financing is limited or costly. The free cash flow hypothesis predicts that firms often hoard more cash than needed to meet financial requirements, while more recent studies show that firms use cash stockpiles

as buffers to protect themselves against future liquidity shocks. Trade-off theory is the most empirically supported theory of corporate liquidity and it has several important research implications. First, there is an operational motivation for holding excess cash other than agency motive. Second, this rationale is weakened for firms under external financing constraints. And third, it is important to investigate cash policy jointly with alternative liquidity strategies.

In U.S. market alone, collectively American firms are having $1.9 trillion in cash in 2016 and some companies are holding as much as a third of their value in cash (Apple) or nearly half (General Motors)[36], which is an economic *puzzle* because firms have traditional been borrowers, not savers. Outside of U.S., European Stoxx Europe 600 Index companies are also hoarding cash at $475 billion in 2012, more than three times the $136 billion level they held a decade back in 2002[37]. Besides having emergency funds for turbulence times or tax-efficiency purpose, another reason for holding excess cash is the increasingly intense competition for talent and acquisitions, especially in technology and pharmaceuticals. U.S. stock market perceives extra cash holdings differently across industries, where $1.00 of extra cash is worth about $0.40 for publishing or aircraft manufacturers industries, up to $1.50 for pharmaceutical industry, and more than $2 for software industry (Pinkowitz and Williamson, 2007[38]). I propose that there is potentially a connection between acquisition and the importance of cash at industry level, and therefore acquisitiveness might be a driver of corporate cash holdings.

2.1.2. Corporate control

Disciplining managers is an important role of takeover market. Usually, takeover targets perform poorly before and improve substantially after acquisitions due to managerial turnover. Jensen (1986), and

[36] Why Are Corporations Hoarding Trillions? (The New York Times Magazine, January 20, 2016) (https://www.nytimes.com/2016/01/24/magazine/why-are-corporations-hoarding-trillions.html?_r=0)

[37] European Companies Stockpile $475 Billion as Outlook Dim (Bloomberg Technology, February 24, 2013) (https://www.bloomberg.com/news/articles/2013-02-25/european-companies-stockpile-475-billion-as-outlook-dims)

[38] They also show evidence for the two alternative notions: (1) large cash hoard is a sign of unhealthy company, either due to poor general industry condition, or there are some agency motives from the executives, and (2) free market mechanism would not allow executives to hold all that cash purely for their own benefits anyway.

Shleifer and Vishny (1988) address that, agency costs of free cash flow in general affect an entire industry. Old evidence suggest that, the industry q ratio of hostile targeted firms is lower than the industry q of non-targeted firms in Fortune 500 group (Morck, Shleifer & Vishny, 1989). At the same time, firms that defeat takeover attempts successfully on average reduce investments and increase debt amount. Overall, the market for corporate control limit agency problems by either taking over underperforming firms, or forcing firms to clean up to avoid being taken over.

Acquisition is the quickest route for companies to expand their capabilities (conglomerates and diversification) or markets (geographically). The relatedness of activities is a factor likely to determine the extent of value creation in M&A transaction when forming synergies versus conglomerates (Lang, Stulz & Walkling, 1994). As the business world globalizes with accelerated rate due to technological advances, more and more firms are strategically using M&A to compete for growth.

Through several merger waves, what has changed significantly is the way acquisitions are being paid for. In U.S. market in 1988, 60% of value of larger deals with at least $100 million was paid for with all cash and less than 2% was paid for with stock. In 1998, 50% of value of larger deals was paid for with all stock and only 17% was paid for with all cash[39]. The trend makes it less clear than before who the acquirer is, who the target is, and how ownership is transferred. Exhibit "The Popularity of Paper" by Security Data Corporation (SDC) provides evidence that stock financing is particularly popular in larger deals. The shareholder's value added (SVA) in fact reacts more favorably for all-cash deals than all-stock deals for some acquirers, yet acquirers do not always have sufficient cash resources or debt capacity to make a cash offer. For targets, it is the opposite since SVA is larger in all-stock deals than all-cash deals. That raises the potential need to separate number and value of deals by different methods of payment[40].

[39] Stock or cash? The trade-offs for buyers and sellers in mergers and acquisitions (Harvard Business Review, Nov-Dec 1999) (https://hbr.org/1999/11/stock-or-cash-the-trade-offs-for-buyers-and-sellers-in-mergers-and-acquisitions).

[40] Keep in mind, however, that cash acquisitions are not necessarily done with cash in hand. It can rather be funded in multiple ways: using existing cash on balance sheet; raising additional cash via sales of liquid assets, long-term assets, or other holdings; special bank loans or bond issues; or repatriating cash from overseas accounts, etc.

2.1.3. Cross-country determinant of takeover-driven cash holdings

Rossi and Volpin (2004) study the cross-country determinants of mergers and acquisitions by focusing on the variation in legal systems and regulation around the world. They find that M&A volume is significantly and *positively* related to the quality of accounting standards and shareholder protection at country level. The probability of an all-cash bid is *lower* in countries with better shareholder protection, suggesting that the transaction plays a disciplinary role and improves governance within target firms.

M&A activities are not geographically bound. Not only domestic takeovers but cross-border takeovers as well help enforce improvement in corporate governance. Bris et al. (2008) provide evidence on *positive* impact of being acquired by foreign firms from countries with better shareholder protection and better accounting standards, using a sample of cross-border M&As, since target firms by law adopt the corporate governance system of acquirer firms.

Moeller and Schlingemann (2005) report that there are some target country characteristics that attract foreign bidders in cross-border M&As; and for U.S. acquirers specifically, the top four frequent target countries are U.K. (31%), Canada (21%), France (9%), and Germany (9%). While European companies are losing interest in buying local rivals and let their U.S. rivals boost acquisitions, some European companies are acquiring growth businesses in emerging markets[41]; and cash-rich Indian companies are also seeking for overseas acquisitions to get proximity to their targeted markets, especially European companies in drugs, energy, and chemicals[42]. Besides the common determinants shared with domestic M&As, some country-level factors that may affect foreign acquirers' choice of target country include economic freedom and development, shareholder right protection, liquidity in the takeover market, and ownership concentration (Moeller and Schlingemann, 2005); cultural identities, geographic distance, level of market development (Erel, Liao, and Weisbach, 2012).

[41] European companies stockpile $475 billion as outlook dims (Bloomberg Technology, February 24, 2013). (https://www.bloomberg.com/news/articles/2013-02-25/european-companies-stockpile-475-billion-as-outlook-dims)

[42] Cash-rich Indian Companies on Acquisition Trail in Europe (India Review, April 2006, p.5). (http://eoi.gov.in/kabul/?pdf0267?0)

2.2. Hypotheses development

Based on the above discussion, I expect that under higher takeover threat in terms of industry acquisitiveness, peer firms will take actions to either (i) reduce agency costs to avoid being targeted, or (ii) protect themselves from potential takeovers, otherwise they may be next. The peer response could consist of (a) *reducing* cash holdings and increasing payout to comply under monitoring/ disciplinary effect, or (b) *increasing* cash holdings so as to adopt takeover defenses or to take advantages of acquisition opportunities later. The monitoring role/ disciplinary effect of takeover market and the deterrence effect/ precautionary motive of corporate liquidity suggest *opposite* relationships between industry takeover threat and corporate cash holdings.

H1. The level of corporate cash holdings is higher (lower) in industries with higher takeover threat.

I also expect the effects to vary across countries. The second set of tests examines common country-level factors that are known to have impact on corporate governance, including credit market development, economic freedom, quality of accounting standards and investor protection strength.

H2a. The relationship in H1 is stronger (weaker) in countries with better credit market development.

H2b. The relationship in H1 is stronger (weaker) in countries with higher economic freedom.

H2c. The relationship in H1 is stronger (weaker) in countries with better accounting standards.

H2d. The relationship in H1 is stronger (weaker) in countries with better investor protection.

2.3. Measurements

2.3.1. Measure of takeover threat

I adopt two measures of M&A from Management literature (Haleblian, Kim and Rajagopalan, 2006; Schoenberg and Reeves, 1999). Both are industry-aggregated using Fama-French 48-industry groupings.

2.3.1.1. Industry merger and acquisition activity

The first measure is industry M&A activity, which is the total number of all takeover attempts for each country-industry-year group, being and log-transformed.

$$MAactivity_{jct} = log(Number\ of all\ \ industry\ M\&A\ attempts_{jct}) \quad (2a)$$

where subscripts *i, j, c, t* respectively refer to individual firm *i* of industry *j* in country *c* for year *t*.

I consider all acquisition attempts, including completed, pending, and withdrawn deals (Harford, 1999; Pinkowitz, 2002). I robustness check using alternative proxies, including successfully completed attempts[43], domestic versus cross-border attempts, public targets versus private targets attempts[44], intra-industry versus inter-industry attempts; and attempts in a two-year window; and also with completed transactions (Rossi and Volpin, 2004; Bris et al., 2008).

I also generate binary variables to classify firms into two groups of industries for each country-year: a high-activity group consisting of industries with above median acquisition levels, and a low-activity group consisting of industries with below median acquisition levels.

2.3.1.2. Industry merger and acquisition density

The second measure is industry M&A density which is the cumulative dollar value of all successful takeover deals for each country-industry-year group, also being log-transformed.

$$MAdensity_{jct} = log(\ Cumulative\ dollar\ value\ of\ \ all\ industry\ M\&A\ attempt_{jct}) \quad (2b)$$

where subscripts *i, j, c, t* respectively refer to individual firm *i* of industry *j* in country *c* for year *t*.

[43] There is no significant difference in the response of peers of targets involved in successful versus unsuccessful bids (Servaes & Tamayo, 2014).

[44] M&A total deal volume would not change significantly if I exclude non-public targets, since SDC does not report transaction values for a large proportion of M&A deals, especially those with target firms being private or subsidiaries of public firms. Missing deal values are usually treated as zero, causing underestimation of true median volume.

Previous studies state that this measure captures simultaneously the number of transactions within each industry and their relative importance in monetary terms (Schoenberg and Reeves, 1999).

Table I Panel A summarizes industry takeover threat activity and density across countries and for the whole sample. Both number of attempts and cumulative dollar value of deals vary over time and especially across countries. On average, the number of acquisition attempts remains less than 100 throughout all years for India, South Korea, and Sweden. U.S. experiences an extremely high frequency of more than 500 attempts most of the times. U.K. ranks second with mostly more than 200 attempts. Canada and Germany maintain a relatively consistent level, while Australia, France, and Japan show an upward trend. The average number of industry acquisitions attempts for the whole sample is ranging from around 250 to around 400, where large proportion of both the numbers and volumes comes from U.S. firms. Top three countries with largest average industry cumulative values are U.S., U.K., and Canada, where U.K. market is just about one eighth and Canada market is just about one twelveth of U.S. market. On the lower end, compared to India, Sweden has a higher number of attempts but lower cumulative values. Appendix A gives some detailed information on takeover threat and cash holdings in high M&A frequency industries across countries.

2.3.2. Measure of cash holdings

The main variable of interest for my study is corporate liquidity choice, specifically, cash-to-assets ratio. Throughout this paper, cash is defined as cash and cash equivalent (Compustat *item #1*).

$$Cashta_{ijct} = \frac{Cash\ and\ cash\ equivalents_{ijct}}{Total\ assets_{ijct}} \qquad (1)$$

where subscripts *i, j, c, t* respectively refer to individual firm *i* of industry *j* in country *c* for year *t*.

$Cashta_{ijct}$ is measured as the ratio of cash and cash equivalent to total assets (*item #6*) and can be interpreted as the percentage of corporate assets being held in liquid assets. I also create a binary variable

Cashrich$_{ijct}$ to identify cash-rich firms from top tercile of cash level and a binary variable *Cashpoor*$_{ijct}$ to identify cash-poor firms from bottom tercile of cash level on a country-year basis.

Table I Panel B summarizes my sample and provides information on the level and secular trend of cash holdings in public firms over time across countries. During the period of 1999-2015, the average corporate cash holdings varies from about 3% to almost 25% among more than 25,000 non-financial non-utilities firms across 10 different countries. U.S. corporate cash holdings varies the most, with top decile average ranking the third highest after Australia and Sweden, and bottom decile average ranking the third lowest after India and Canada. Japan has the lowest deviation with the highest average for all decile and quartile groups below median, compared to other countries. The large cross-country variation of cash-to-assets ratio may partially be due to Compustat Global's coverage. For example, for countries where data on small to medium firms or private firms are missing, there is a potential downward bias of cash level, since on average small firms tend to hold more cash than large firms, and private firms tend to hold more cash than public firms. To allow for cross-country comparison with minimized sample selection and large firm bias, my tests control for within-country variation using fixed effects and standard error clustering.

2.3.3. Models

I run two main models of empirical testing, employing two-sided tobit regression since my dependent variable is truncated at zero and one. I also use different fixed-effects and standard error clustering (Petersen, 2009).

First, model (4) examines the impact of industry takeover threat on corporate cash holdings, where (4a) uses alternative measures of M&A activity, and (4b) uses alternative measures of M&A density.

$$Cashta_{ijkt} = \alpha + \beta\ MA\ activity_{jct} + \gamma\ Control_{ijct} + \theta\ C_c + \upsilon\ T_t + \ \varepsilon_{ijct} \qquad (4a)$$

$$Cashta_{ijkt} = \alpha + \beta\ MA\ density_{jct} + \gamma\ Control_{ijct} + \theta\ C_c + \upsilon\ T_t + \ \varepsilon_{ijct} \qquad (4b)$$

where subscripts *i, j, c, t* respectively refer to individual firm *i* of industry *j* in country *c* for year *t*.

MA activity$_{jct}$ is a vector of number of industry deals; while *MA intensity*$_{jct}$ is a vector of value of industry deals. *Control*$_{ijct}$ is a vector of listed firm and industry characteristics. C_c is a vector of 9 country dummies and T_t is a vector of 16 year dummies to control for country and time fixed effects, respectively. I do not include firm fixed effects because the takeover threat is aggregated at industry level, thus not picking up idiosyncratic volatilities at firm level. Nevertheless, I use standard error clustering at both the country and industry levels.

Second, model (5) is the extended version in which I include two more terms, a country-level characteristic and its interaction with industry-level takeover threat.

$$Cashta_{ijkt} = \alpha + \beta\, MA_{jct} + \delta\, MA_{jct} * X_{ct} + \mu\, X_{ct} + \gamma\, Control_{ijct} + \theta\, C_c + \upsilon\, T_t + \varepsilon_{ijct} \qquad (5)$$

where subscripts *i, j, c, t* respectively refer to individual firm *i* of industry *j* in country *c* for year *t*.

MA_{jct} can be one out of two vectors of different industry takeover threat measures, namely *MAactivity*$_{jct}$, *and MAdensity*$_{jct}$. X_{ct} can be one of several country-specific measures of financial market development, economic freedom, accounting standards, or investor rights protection. Some factors are time-varying, and the others are sticky for each target country.

Table II Panel D summarizes cross-country values such as credit market development (*credit_gdp*) (Rajan and Zingales, 1998), economic freedom (*econ_free*) (from Heritage Foundation), accounting standard quality (LLSV, 1998), and investor protection index (*IPI*) (Rossi and Volpin, 2004).

2.3.4. Control variables

To account for the heterogenenity of firms' characteristics that influence motives of cash holdings, I control for the following nine variables: market-to-book ratio, size rank, cash flow to assets, net working capital to assets, capital expenditure to assets, leverage, dividend payout dummy, R&D to sales, and

acquisition to assets. Inside the brackets are expected correlation between these firm characteristics and corporate cash holdings, based on trade-off model of liquidity (Opler et al., 1999; Bates et al., 2009).

Market-to-book is measured as market value of assets divided by book value of assets and represents the firm's investment opportunities (+) (*(item #6 – item #60 + item #25 * item #24) / item #6)*). Size rank is measured as the percentile ranking of book value of assets for each country and year, and represents the firm's life cycle (–) (*ln(item #6)*). Cash flow to assets is measured as earnings after interest, dividends, and taxes but before depreciation, divided by book value of assets, and represents the firm's profitability (+) (*(item #13 – item #15 – item #16 – item #21) / item #6*). Net working capital to assets is measured as working capital subtracting cash to book value of assets (–) (*(item #179 – item #1) / item #6*). Capital expenditure to assets is measured as ratio of capital expenditure to book value of assets and represents the firm's productivity (?) (*item #128 / item #6*). Leverage is measured as total debts, or the sum of long-term debt and debt in current liabilities, divided by book value of assets and represents the firm's financial distress (?) (*(item #9 + item #34) / item #6*). Dividend payout dummy is a binary variable that takes value of one in years a firm pays common dividend, and zero otherwise and represents an alternative use of cash (–) (*item #21*). R&D to sales is measured as non-zero R&D spending divided by sales and represents the firm's growth opportunities (?) (*item #46 / item #12*). Acquisition to assets is measured as acquisition expenditure divided by book value of assets and represents the firm's investment policy (–) (*item #129 / item #6*). Appendix C describes the variables used in this paper and indicates their sources.

3. Data and Descriptive Statistics

3.1. Sample construction

I examine the number of M&A deals and dollar value of M&A deals to target firms in 10 different countries. My M&A data comes from Securities Data Corporation (SDC Platinum) and covers all M&A attempts and successfully completed deals over the period from January 1999 through December 2016. I

do not impose a size cutoff on deals to be included since a minimum deal size for U.S. market is considerably large for emerging economies and will result in a loss of many observations[45].

Previous studies commonly use hostile takeover bids when examining the disciplinary effect of takeover market, because there has been evidence indicating that friendly takeovers are more synergistic, and hostile takeovers are more related to agency problems in target firms (Morck et al., 1989). However, I do not separate hostile and friendly takeovers for two reasons: first, the number of hostile takeover bids outside of the U.S. is trivial[46], and second, more recent evidence suggests that hostile takeovers do not differ substantially from friendly takeovers as hostility is more related to bargaining than entrenchment (Schwert, 2000[47]). I further remove transactions if bids are on financial firms (SIC codes 6000 through 6799), utility firms (SIC codes 4900 through 4949), or quasi-public firms (SIC greater than 9000); and if the identity of acquirer is not disclosed or attribute to a specific entity (*"Investor Group"*) (Servaes and Tamayo, 2014). For the tests using M&A density, I only consider completed deals to strictly relate to monitoring role/ disciplinary effect of takeover market[48].

The sample for robustness check have much stricter criteria imposed: transactions are excluded if the target is not a listed firm[49]; a majority interest is not sought; the percentage of shares acquired is less than 50%; the percentage of shares owned before is more than 50% or the percentage of shares owned after is less than 50%; transaction value must exceed $1 million; the relative size of deal value by SDC exceeds the market value of the acquirer in previous fiscal year; bids that are not the first bid if there are multiple bids in the auction; transactions completed without disclosure on dollar value, announcement date, and

[45] Literature using U.S.-only acquirers typically uses $1 million (Moeller & Schlingemann, 2005)

[46] Rossi & Volpin (2004) report that the frequencies of hostile takeovers are absent in 21 out of 49 countries in their sample. Many are missing and when present, they are very small and the largest observed in U.S. is only 6.44%. The country-specific reasons could be: hostile takeovers are rare, they are not successfully recorded, or differences in regulations.

[47] Schwert (2000) proposes more comprehensive measures of hostility from multiple resources: Security Data Corporation, Wall Street Journal, and 13D statements but it is not applicable for deals in non-U.S. target countries.

[48] I exclude from the initial SDC sample leverage buy-outs, spin-offs, recapitalizations, self-tender and exchange offers, repurchases, acquisitions of minority stakes, and privatizations (Bris et al., 2008).

[49] I exclude non-public targets since their accounting data are not available. I include only public acquirers because SEC filings are mandatory for public acquirers but not for private acquirers and there is a high likelihood that some acquisitions by private acquirers are not recorded in SDC database.

completion date; or transactions completed whereas completion date is beyond one thousand days from the announcement date (Moeller and Schlingemann, 2005).

Accounting annual fundamental data comes from Compustat Global and stock market performance data comes from CRSP, both on WRDS interface. To be retained in my final sample, firms must have non-missing 4-digit SIC code; positive data on total asset, cash and cash equivalent, stock price, and number of shares outstanding; and book value of cash not exceeding book value of total assets. I winsorize all accounting data to 1st and 99th percentiles and convert them to U.S. Dollar values (ISO: USD), using monthly average exchange rate provided by The Pacific Exchange Rate Service[50].

I merge the firm-level accounting data Compustat Global and industry-level M&A data from SDC using Fama-French's 48-industry groupings. To have enough observations within each country-industry group for the whole sample period, I exclude firms with less than 500 firms at all times, and countries with less than an average 100 merger and acquisition transactions per year.

My final sample of almost 200,000 observations or over 25,000 firms spans across 10 developed and emerging countries.

3.2. Descriptive statistics

Table II Panel A reports the 1999-2015 average values of firm-level accounting data and Table II Panel B summarizes the 1999-2015 average values of firm-level control variables.

U.S. firms account for 34% of observations and 36% of firm count. India and Japan each contributes more than 10% of firm count. Sweden has the smallest percentage for both number of firms and number of observations. Average firm size in terms of total assets ranges from $300 million in Australia and Japan, to more than $3 billion in France and Germany. U.S. firms on average have highest market-to-book ratio and leverage. They also spend most for R&D and acquisition in relative terms as percentage of

[50] Prof. Werner Antweiler generously shares this data at http://fx.sauder.bc.ca.

sales and total assets, respectively. In absolute terms, U.S. firms rank only top 3 in R&D and acquisition expenditure after Germany and France. These two countries, together with Sweden and Japan, form a group of countries with high percentage of R&D-intensive firms and that explains why they rank top in terms of absolute dollar value of R&D investments. It could also be a consequence of large firm bias, which is partly reflected in absolute dollar value of acquisition and average dollar market value of firms. Asian countries including Japan, India, and South Korea have at least half of the firms paying dividend, with the highest of 85% in Japan. Sample selection bias may be an issue for comparability; therefore, I strictly control for country-year fixed effects and focus on within-country-year cross-industry variation in all tests. For robustness check, I also control for country-year fixed effects.

Table II Panel C provides two correlation matrices among all variables, with the Pearson correlation coefficients in the lower triangular corner and the Spearman's rank test coefficients in the upper triangular corner. The two takeover threat measures (and their lag terms) are highly correlated, as in bottom right corner. In general, I expect industries with high M&A activity to also have high M&A density, unless there is a distortion in industry size in terms of number of public firms or total market capitalization.

4. Main Empirical Analysis

4.1. Industry takeover threat and corporate cash holdings

Table III Panel A reports the regression results from model (4a) and (4b) using number of industry deals and total value of industry deals with both country and year fixed effects. I adopt various definitions of deals: all deals, deals from domestic acquirers versus foreign acquirers, deals within industries versus across industries, deals in attempt for full control of targets, among other untabulated classifications such as high-tech deals versus non-hightech deals and deals for full control versus deals for partial control of the targets. The results stay qualitatively significant for alternative definitions.

F-test statistics support that, compared to the base regression with only control variables in column (0), adding one measure of takeover frequency at a time enhances explanatory power of the model. Specifically, F (1, 174485) = 1156.96 for adding *MAactivity* in model (1), and F (1, 173583) = 1724.84 for adding *MAdensity* in model (6). All coefficients are consistently positive and significant at 1% level. The results suggest that industry frequency of takeover attempts induces corporate cash holdings. On average, if the number of attempts to industry targets increases by 1%, firms tend to increase cash/assets by 0.3%, and if the dollar value of attempts increases by 1%, cash/assets increases by 0.4%. Economically, for an average-sized U.S. firm with total assets of $1.836 billion, cash holdings would increase by $5.5-7.3 million. For a median-size U.S. firm of $174 million, the increase is $0.5-0.7 million. For a median Indian firm with assets of $73 million, the dollar value increase is $220K-290K, which is large compared to the median corporate cash level at about $1.937 million.

Since both M&A activity and M&A density are aggregated on calendar-year basis, it cannot fit perfectly with each firm's fiscal calendar. For example, mergers and acquisitions happening during the year 2000 are used for some accounting data ending in the latter half of 2000, and some accounting data ending in the first half of 2001. I postulate that takeover threats have somewhat long-lasting effects and run the tests with one-year lag of them in Table III Panel B. The impact of takeover threat gets weaker over time but stays statistically significant after one year. Specifically, in response to 1% change in number and volume of previous year's industry takeover threats, firms on average increases cash ratio by just 0.1% and 0.3%, compared to 0.3% and 0.4% previously. It seems like the influence of dollar volume is more economically significant and dissipates slower.

4.2. Takeover threat and cash holdings in each country

I proceed and run separate regressions on each individual country in the sample, using each measure of takeover threat at a time, namely *MAactivity* and *MAdensity*.

The results are respectively reported in Table IV Panel A and Panel B. Empirically, the corporate cash holdings behavior in response to takeover threats remains consistent for most countries, including Australia, Canada, France, Germany, India, Japan, South Korea, and U.S.A. The exception is for the group of Canada, France, Sweden, and U.K. Industry takeover threat in these countries has negative impact on cash holdings. One possible explanation is that, for these countries, the disciplinary effect of control market takes over the deterrence effect of holding cash, and firms cut down cash holdings to avoid being targets of potential U.S. acquirers.

Japan, on the other hand, shows the strongest impact on cash from both measures of takeover threats. Japanese firms increase cash holdings by 0.9% for every 1% increase in number of threats and by 0.4% for every 1% increase in dollar volume of threats, almost 4 times higher than the average increase among U.S. firms. There could also be some country-level factors regarding anti-takeover law and risk avoidance across countries that might explain this behavior.

4.3. Takeover threat and cash holdings with country-level factors

For international variation of the impact of industry-level takeover threat on firm-level cash holdings, I examine the moderating role of some country-level factors regarding credit market development, economic freedom, accounting standards, and investor protection.

4.3.1. Impact of credit market development

Based on the premise that firms efficiently combine cash and lines of credit to meet liquidity requirements, Yun (2009) states that lines of credit has limited discretion as they allow managers to conditional rights to use funds only when pre-specified covenants are met; while cash provides full discretion as it allows managers to access funds without shareholders' pre-approval.

The results suggest that, for firms in more developed credit markets, the positive impact of takeover activity and density are both weakened. That stays consistent with the disciplinary effect of credit market.

Ignoring the country fixed effects, compared between a low private credit / GDP country such as U.S.A. with a value of 0.5 and a high private credit / GDP country such as U.K. with a value of 1.5, the coefficient for 1% change in number of takeover deals is 0.35% for U.S.A. and 0.5% for U.K.; and the coefficient for 1% change in dollar value of takeover deals is 0.65% for U.S.A. and 0.15% for U.K.

4.3.2. Impact of economic freedom

I use two dimensions of business freedom from Heritage Foundation that are most relevant to M&A activities: investment freedom and business freedom. Investment freedom evaluates the level of constraints on the flow of investment capital on individuals and firms and it is more related to M&A across borders. Business freedom indicates the overall efficiency of a government regulating businesses, and is measured by ten different arrays referring to the difficulties for business to be opened, operated, and closed. The advantage of these measures is that they are time-variant.

In countries with higher investment or business freedom, the impact of takeover threat on cash is still positive but moderated under high level of freedom. When it is easier to do business because either there are few constraints on individuals and firms, or the government regulation is more efficient, the need for hoarding cash under high M&A activity and density is reduced.

4.3.3. Impact of accounting standard quality

I examine the relationship between takeover threat and cash holding under cross-country variation of accounting standard quality. Country-level time-invariant measure of accounting standards comes from La Porta et al. (1998) and it refers to the quality in 1990.

Regardless of its limitation (old-dated and sticky), accounting standard quality does have moderating impact on cash holding under takeover threat. However, the impact is more statistically significant only for M&A activity rather than M&A density.

4.3.4. Impact of investor rights protection

Grossman and Hart (1980) report that, despite the common thought that a public firm with high agency problem will be vulnerable to takeover bids, the shareholders can actually benefit from the improvement of the firm after the bid. In Table V Panel E, I reports the moderating role of two version of Investor Protection Index (IPI), measured as the product of two versions of anti-directorship right index (ADRI) and two versions of Rule of Law (RL). They both capture not only de jure but also de facto aspect of regulation.

Both versions of IPI suggest a moderating impact of country-level investor rights protection on the relationship between takeover threat and cash holdings. Firms in high M&A activity or high M&A density industries in countries with strong protection tend to hoard less cash than their peers in countries with weak protection. On the other hand, firms in high M&A intensity industries in countries with strong protection tend to cut down less cash than their peers in countries with weak protection. This support a substitute effect between strong investor protection and takeover market disciplines.

4.4. Cash holdings and the subsequent use of cash

I run a test to examine subsequent share repurchase and acquisitive behavior of public firms contingent on the previous year's industry takeover threat by tobit model.

4.4.1. Share repurchases

$$Repota_{ijct} = \alpha + \beta\, MA_{jc,t-1} + \delta\, MA_{jc,t-1} * Cashrich_{ijc,t-1} + \mu\, Cashrich_{ijc,t-1} + \gamma\, Control_{ijct} + \theta\, C_c + \upsilon\, T_t + \varepsilon_{ijct} \quad (6a)$$

where subscripts *i, j, c, t* respectively refer to individual firm *i* of industry *j* in country *c* for year *t*.

$Repota_{ijct}$ is the vector of firm-level data for the percentage of share repurchases expenditure to total assets for a given fiscal year. For share repurchases data from Compustat Global, I follow Grullon and Michaely (2002) to obtain the actual amount of cash distributed to shareholders by subtracting *item #56*

(sale of common and preferred stocks) from *item #115* (purchase of common and preferred stocks). If purchase of stock is reported and sale of stocks is missing, I replace the latter with zero. If sale is larger than purchase, I replace repurchase with zero. This procedure is documented as providing the most accurate estimate of actual repurchases, regardless of some errors (Banyi, Dyl, and Kahle, 2008)[51].

The first five control variables at firm-level are the same as in liquidity holding models, including market-to-book value, percentile ranking of firm size, cash flow-to-assets ratio, leverage, and a binary variable for dividend payers. The additional control variables include financial constraint measure, relative change in assets, and retained earnings scaled by total equity (Von Eije and Megginson, 2008).

The results are presented in Table VI Panel A. Firms in high takeover frequency subsequently increase their repurchase expenses relatively to assets, and the behavior is more pronounced for cash-rich firms. On average, cash-poor firms increase repurchases by 0.2% and cash-rich firms increase by 0.4%.

4.4.2. Acquisitions

The next test examines the subsequent acquisitive behavior of public firms contingent on the previous year's industry takeover threat, using a tobit model with the dependent variable as acquisition expenditure to total assets.

$$Acquita_{ijct} = \alpha + \beta\, MA_{jc,t-1} + \delta\, MA_{jc,t-1} * Cashrich_{ijc,t-1} + \mu\, Cashrich_{ijc,t-1} + \gamma\, Control_{ijct} + \theta\, C_c + \upsilon\, T_t + \varepsilon_{ijct} \quad (6b)$$

where subscripts *i, j, c, t* respectively refer to individual firm *i* of industry *j* in country *c* for year *t*.

$Acquita_{ijct}$ is the vector of firm-level data for the percentage of acquisition expenditure to total assets for a given fiscal year.

[51] Alternative sources of share repurchases include WSJ announcements (US only), SDC, and Worldscope. Worldscope, for instance, has an *item #04751* (common/ preferred, retired, converted, etc.), a cash-flow statement item that is equivalent to Compustat *item #115* but does not have an item that corresponds to Compustat *item #56*. SDC, on the other hand, may misstate the number of share repurchases programs due to the variety of program structure and the way SDC collects data. CRPS is a good alternative measure for Compustat share repurchase data.

Table VI Panel B shows the results. Subsequent to high takeover frequency, firms tend to spend more on acquisitions, and cash-rich firms have the resources to enhance acquisitive activities, while cash-poor firms do not. On average, cash-poor firms would increase acquisition expenditure by 0.1% while cash-rich firms increase by 0.2%.

4.5. Robustness check

I run a variety of robustness check tests and none of them replace my empirical findings. The results are robust for alternative measures of takeover threats (completed, public-to-public, first bid only, non-U.S.-acquirers, etc.), whole sample excluding U.S. firms, excluding "Business Service" firms (the top M&A activity industry), subsamples of cash terciles (driving impact of cash-rich firms), and subperiods (especially for post-crisis period).

5. Alternative Explanations

5.1. Impact of anti-takeover laws on corporate governance

I want to conduct a natural experiment of the passage of anti-takeover legislation to examine firms' preferences on cash level, using difference-in-difference method to account for the endogeneity problems that arises with the firms' internal choices of liquidity and corporate governance.

5.2. Impact of merger waves

I also explore if my test results are driven by periods of high M&A activities. Following Harford (2005), I identify periods of an industry merger wave as if the number of acquisitions over two years exceed the 95th percentile of the simulated probability distribution based on ten years of M&A activity.

I explore the effect of industry deregulation as a potential exogenous driver of industry acquisition activities. Schoenberg and Reeves (1999) state that the increasing takeover wave is concentrated in certain industry sectors, and outline three *significant* factors that may explain the variation in acquisition

rates, namely industry concentration, industry growth, and most importantly, industry deregulation. These three explanatory variables can be derived respectively for each industry by percentage of total industry sales accounted for by the top four companies in the industry sector, average annual percentage growth in sales revenue, and a proxy developed from financial press reports of deregulation. For example, Factiva or Hoover searching[52] using the terms 'industry', 'deregulation'for each of the selected country-industry sectors. Total number of articles cited for each sector represents the level of industry deregulation.

5.3. Impact of industry growth opportunities

I use market-to-book ratio of equity as an empirical proxy for growth opportunities. However, market-to-book ratio can also proxy for the degree of information asymmetry between external capital providers and managers in a given industry (Harford, 1999), or good management (Morck, Shleifer & Vishny, 1988). Using an industry-level value should mitigate this dual-proxy problem as the weighted average market-to-book value at industry level should be driven mainly growth opportunities and asset characteristics of the industry.

I revisit the relationship under different level of leverage, in order to assess the influence of corporate governance on firm's choice of cash level (Yun, 2009). High leverage removes free cash flow and agency problems, while low leverage increases free cash flow and also increases the chances of control challenges by potential bidders. In low leverage, managers will choose a higher level of cash versus credit lines to balance between private benefits and takeover risks and they would hold as much cash as possible as long as they can avoid being taken over.

Control for the agency motive of cash holdings suggests a *positive* relationship (i.e. shirking managers choose to perform in high M&A industries and hold more cash).

[52] Financial Times.

6. Summary and Conclusions

This paper provides insights into how industry acquisitiveness influences firms' choices of cash holdings. Both industry M&A activity and density, which tend to impose predation threats on firms, causes firms to increase their cash level, and the economic significance of M&A activity overall dominates the impact of M&A density. Further tests suggest that this impact is moderated in more developed credit market, economies with high investment and business freedom, better accounting standard and stronger investor protection, and also suggest that national culture can play moderating role as well. Overall, there is a strategic dimension of corporate cash holdings that may help firms in dealing with potential industry takeover threat. The next question I would like to know is how firms strategically use cash in either takeover defense or acquisitive behavior, how stock market would value that cash, and how it would affect corporate subsequent return.

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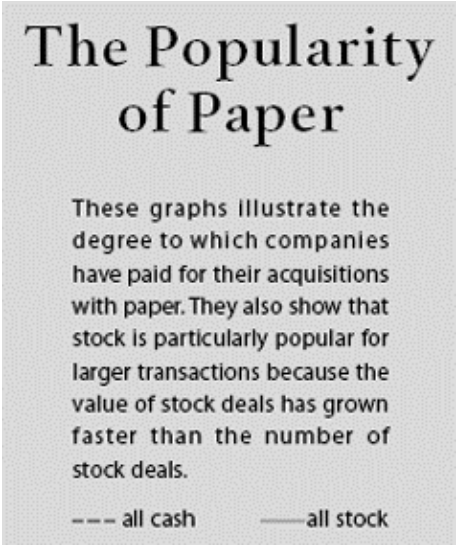
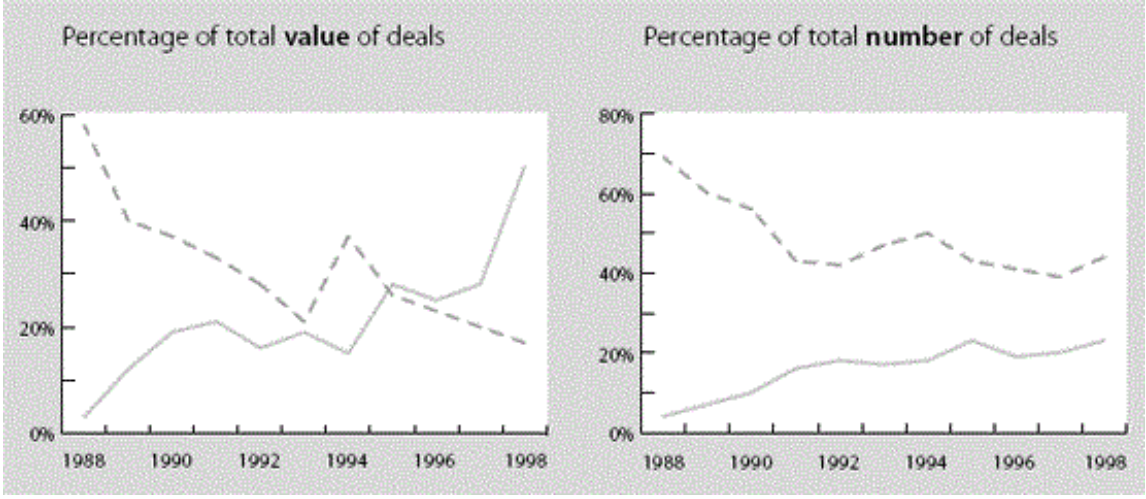
8. Figures and tables

Figure 3. The popularity of all-cash versus all-stock acquisitions





Source: HBR, Nov-Dec 1999.

Table I. Mergers and acquisitions activity and density across countries

Table I. Panel A. Total number and dollar volume of industry M&A attempts

Target country	Total number of industry M&A attempts																
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Australia	45	74	85	76	111	134	132	139	196	162	173	161	106	123	98	92	83
Canada	140	197	146	132	98	130	145	165	210	226	248	241	225	183	136	143	114
France	74	156	104	70	62	79	92	121	141	112	101	129	148	140	140	210	250
Germany	124	212	128	92	86	87	101	119	132	120	85	94	127	101	98	120	108
India	44	42	30	33	30	48	56	52	47	47	43	34	34	36	38	44	55
Japan	64	71	102	132	117	143	153	163	179	171	142	123	127	126	126	144	201
South Korea	10	12	16	12	11	11	13	33	39	71	69	51	59	53	50	67	77
Sweden	52	98	77	44	29	46	60	65	88	66	53	60	72	55	46	38	50
United Kingdom	265	327	257	210	197	210	236	271	292	234	187	204	199	182	183	213	219
United States	815	949	627	520	519	595	626	659	686	601	467	507	539	548	561	654	673
Whole sample	339	403	286	247	243	281	299	319	341	303	245	255	264	264	265	308	329
	Total dollar volume of industry M&A attempts																
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Australia	698	2172	3178	905	1138	1801	1965	5707	7900	6453	6092	5151	11415	3788	2665	6805	4201
Canada	6589	10291	3883	2222	2246	4920	7608	15175	14738	8227	7079	10563	10297	11966	6237	9452	4677
France	6442	3275	2400	2318	1860	5107	3334	6005	4898	4133	1498	3371	2352	1079	1726	5477	3506
Germany	7208	7107	1467	1725	1646	2839	2842	5358	5923	3891	1869	1296	3650	2059	2602	2781	2848
India	298	206	350	320	250	792	846	1288	992	837	1159	917	923	946	745	1073	1241
Japan	1782	1655	2307	2504	2390	3838	3068	3286	2720	2591	1964	2248	3207	2411	2230	2957	3297
South Korea	1438	987	1077	1067	444	673	636	1035	1577	1363	1127	1145	1769	2465	1206	2477	2250
Sweden	3276	3417	1369	209	488	708	1193	2551	1836	2440	291	717	2987	701	404	1016	639
United Kingdom	10453	10040	4482	5019	6023	7881	10857	13208	15566	7801	4963	5640	6673	7045	6990	14383	15703
United States	83993	71665	32002	20636	23859	38516	52939	66490	76215	44164	38049	52181	59326	58506	69988	97052	113908
Whole sample	31145	26911	12540	8482	9615	15509	20604	26313	29859	17690	14940	20001	23344	22301	25892	36683	42258

This table shows the level of industry merger and acquisition over the years and across countries. Panel A provides the numbers and Panel B provides the volume.

Table I. Panel B. Sample size and cash-to-assets ratio

Target country	Sample size				Secular trend of cash/assets ratio				1999-2015 statistics of cash/assets ratio						
	# firms	% firms	# obs	% obs	2000	2005	2010	2015	mean	sd	p10	p25	p50	p75	p90
Australia	1935	0.0766	14129	0.0739	0.1343	0.2526	0.2615	0.2501	0.2423	0.2607	0.0148	0.0460	0.1354	0.3577	0.6749
Canada	1520	0.0602	6018	0.0315	0.1254	0.1518	0.1890	0.1435	0.1477	0.1855	0.0057	0.0233	0.0730	0.1986	0.4078
France	845	0.0335	7068	0.0370	0.0691	0.1193	0.1410	0.1847	0.1168	0.1331	0.0159	0.0356	0.0731	0.1442	0.2696
Germany	843	0.0334	6875	0.0360	0.1450	0.1655	0.1725	0.1653	0.1530	0.1666	0.0147	0.0370	0.0947	0.2065	0.3770
India	2658	0.1053	17282	0.0904	0.0358	0.0731	0.0680	0.0877	0.0603	0.0920	0.0040	0.0102	0.0269	0.0674	0.1546
Japan	3860	0.1529	42908	0.2245	0.1208	0.1517	0.1749	0.2507	0.1584	0.1238	0.0413	0.0727	0.1242	0.2067	0.3200
South Korea	1642	0.0650	10863	0.0568	0.0388	0.0713	0.0725	0.1042	0.0764	0.0736	0.0109	0.0260	0.0558	0.1032	0.1671
Sweden	517	0.0205	3417	0.0179	0.1440	0.1539	0.1513	0.2087	0.1623	0.1756	0.0155	0.0383	0.0990	0.2183	0.4231
United Kingdom	2370	0.0939	16816	0.0880	0.1499	0.1741	0.1590	0.1704	0.1545	0.1849	0.0104	0.0315	0.0839	0.2039	0.3998
United States	9060	0.3588	65773	0.3441	0.1447	0.1616	0.1774	0.1736	0.1627	0.1872	0.0096	0.0304	0.0934	0.2229	0.4210
Whole sample	25250	1.0000	191149	1.0000	0.1197	0.1522	0.1640	0.1844	0.1502	0.1722	0.0114	0.0344	0.0906	0.1974	0.3704

Table I. Panel D. Country factors

Target country	Financial market development				Economic freedom			Investor rights protection					National culture			
	Stock /GDP	Credit /GDP	Market vs. Bank	EFN	Finan.	Invest.	Busi.	CPI	ASDI	ADRI	RL	IPI	Law	Legal Origin	Primary Religion	UAI
Australia	1.080	1.083	Market	0.261	0.900	0.762	89.150	1	0.76	4	1.764	0.706	Common	English	Protestant	51
Canada	1.190	1.099	Market	0.273	0.755	0.649	90.707	1	0.64	4	1.748	0.699	Common	English	Catholic	48
France	0.763	0.853	Bank	0.300	0.599	0.571	79.548	0	0.38	5	1.408	0.704	Civil	French	Catholic	86
Germany	0.463	1.000	Bank	0.327	0.561	0.853	81.696	3	0.28	4	1.653	0.661	Civil	German	Protestant	65
India	0.693	0.430	Bank	0.284	0.368	0.374	43.308	4	0.58	4	0.008	0.003	Common	English	Buddhist	40
Japan	0.751	1.175	Bank	0.367	0.475	0.573	81.239	2	0.5	5	1.299	0.649	Civil	German	Buddhist	92
South Korea	0.784	0.950	Market	0.281	0.654	0.700	86.800	3	0.47	6	0.939	0.564	Civil	German	Protestant	85
Sweden	1.002	1.061	Market	0.307	0.795	0.851	86.951	2	0.33	4	1.895	0.758	Civil	Scandi.	Protestant	29
United Kingdom	1.274	1.503	Market	0.310	0.870	0.827	89.165	4	0.95	5	1.683	0.842	Common	English	Protestant	35
United States	1.249	0.513	Market	0.346	0.795	0.721	88.186	1	0.65	2	1.554	0.311	Common	English	Protestant	46

Panel C shows the number of firm observations and firm-year observations for each country that is included in the main regressions, sorted alphabetically. The table also presents the level and trend of corporate cash holdings for each country and for the whole sample, where cash holdings is the ratio of cash and cash equivalent to total assets.

Panel D presents country-level variables from financial market development to legal system development. The first four columns covers 1999-2015 average of stock market development (Stock market capitalization / GDP) and credit market development (Total bank credit / GDP), bank-based versus market-based external financing system, and the country-level external financing needs (EFN). The next three columns measure the average of financial, investment, and business freedom indices. The next five columns refer to investor rights protection, including creditor rights, anti-self dealing, minority shareholder rights, rule of law, and investor protection index. The last four columns classify countries into groups of legal systems, religion, and some measure of culture values (uncertainty avoidance and individualism).

Table II. Firm-level descriptive statistics

Table II. Panel A. Firm-level characteristics ($ million)

Target country	# obs	cash/assets (%)	cash ($mil)	assets ($mil)	cf ($mil)	nwc ($mil)	capex ($mil)	sale ($mil)	R&D ($mil)	acqui ($mil)	bv(equity) ($mil)	mk_cap ($mil)
Australia	14129	0.242	27.295	311.385	26.623	28.219	22.801	257.031	1.203	7.731	154.517	459.455
Canada	6018	0.148	91.457	1516.666	157.033	81.777	137.361	898.923	5.865	20.272	757.451	1559.496
France	7068	0.117	339.881	3482.902	267.391	54.755	140.821	2571.194	47.953	39.173	1062.950	2448.095
Germany	6875	0.153	259.786	3057.577	247.681	192.354	159.983	2327.039	84.781	39.311	864.761	1800.881
India	17282	0.060	41.576	383.707	28.768	44.774	32.372	289.856	1.375	2.721	147.389	479.258
Japan	42908	0.158	196.551	1586.028	98.025	190.890	65.239	1589.771	30.815	0.001	610.210	1061.241
South Korea	10863	0.076	148.715	1341.725	87.063	51.492	76.600	1216.034	7.065	0.009	450.090	768.966
Sweden	3417	0.162	64.236	817.606	72.816	78.812	38.823	706.236	31.053	16.679	341.855	806.913
United Kingdom	16816	0.154	137.023	1526.381	159.397	56.801	80.654	1221.668	17.857	25.198	564.438	1847.025
United States	65773	0.163	189.358	1836.670	181.979	218.444	93.085	1705.937	36.841	33.004	811.239	2811.625
Whole sample	191149	0.150	161.500	1557.367	133.084	144.587	78.979	1385.344	27.342	18.190	609.857	1707.978

Table II. Panel B. Firm-level control variables

Target country	# firms	mtb	cf/assets	nwc/assets	capex/assets	lev	dpayer	rd/sales	acqui/assets	rd-intense	ind_salesg	ind_cfvol
Australia	1935	2.127	-0.300	-0.076	0.104	0.160	0.246	0.802	0.017	0.140	1.468	0.101
Canada	1520	2.162	-0.370	-0.411	0.100	0.516	0.266	1.145	0.019	0.232	0.148	0.044
France	845	1.637	0.031	0.059	0.047	0.214	0.230	0.214	0.012	0.306	0.063	0.028
Germany	843	1.723	-0.015	0.085	0.050	0.187	0.329	0.228	0.013	0.339	0.082	0.043
India	2658	1.538	0.044	0.078	0.070	0.319	0.587	0.012	0.003	0.108	0.075	0.028
Japan	3860	1.180	0.044	0.027	0.033	0.214	0.850	0.018	0.000	0.128	0.032	0.023
South Korea	1642	1.221	0.032	0.046	0.052	0.266	0.578	0.016	0.000	0.165	0.059	0.023
Sweden	517	2.232	-0.080	0.040	0.034	0.154	0.398	0.419	0.019	0.404	0.202	0.046
United Kingdom	2370	1.941	-0.041	-0.020	0.050	0.196	0.470	0.645	0.017	0.236	0.358	0.042
United States	9060	2.414	-0.354	-0.463	0.053	0.488	0.325	2.063	0.022	0.287	0.181	0.071
Whole sample	4788	1.840	-0.144	-0.156	0.054	0.323	0.484	0.892	0.012	0.216	0.233	0.049

These two panels provide summary of firm characteristics for the data employed in the analysis. Sample period is 1999-2015. The variables to be used in main regressions are: ratio of cash to assets, market-to-book ratio, ratio of cash flow to assets, ratio of net working capital to assets, ratio of capital expenditure to assets, leverage, an identifier for dividend payers, ratio of acquisition to assets, and an identifier for R&D-intensive industries. All non-ratio, non-binary variables are converted to US$ million.

Table II. Panel C. Correlation matrix (Spearman ranking in top right corner and Pairwise in bottom left corner)

	cashta (A)	mtb (B)	sizerank (C)	cfassets (D)	nwc (E)	capat (F)	leverage (G)	dpayer (H)	rdsales (I)	acqui (J)	rdinten (K)	MAactivity (L)	MAactivity (-1) (M)	MAdensity (N)	MAdensity (-1) (O)
(A) cashta	1.00	0.24	-0.24	-0.11	-0.03	-0.15	-0.45	-0.07	0.28	-0.08	0.22	0.18	0.16	0.13	0.11
(B) mtb	0.16	1.00	-0.00	0.14	-0.07	0.09	-0.19	-0.13	0.20	0.16	0.19	0.21	0.19	0.29	0.25
(C) sizerank	-0.29	-0.08	1.00	0.35	0.05	0.21	0.18	0.30	-0.04	0.26	-0.17	-0.09	-0.09	-0.01	-0.02
(D) cfassets	-0.05	-0.20	0.10	1.00	0.19	0.27	-0.01	0.27	-0.09	0.16	-0.06	-0.05	-0.05	-0.04	-0.04
(E) nwc	-0.09	-0.01	0.03	0.57	1.00	-0.06	-0.33	0.07	0.15	0.03	0.03	-0.07	-0.06	-0.03	-0.02
(F) capat	-0.05	0.03	0.02	-0.05	-0.02	1.00	0.10	0.07	-0.12	0.01	-0.12	-0.06	-0.05	0.02	0.02
(G) leverage	-0.01	-0.09	-0.02	-0.55	-0.81	0.09	1.00	0.06	-0.17	0.03	-0.19	-0.13	-0.12	-0.09	-0.08
(H) dpayer	-0.15	-0.08	0.30	0.05	0.02	-0.05	-0.01	1.00	-0.04	-0.04	-0.18	-0.17	-0.16	-0.22	-0.22
(I) rdsales	0.05	0.02	-0.02	-0.03	-0.01	-0.00	0.01	-0.02	1.00	0.00	0.30	0.02	0.03	0.12	0.12
(J) acqui	-0.06	0.00	0.08	0.00	0.00	-0.03	-0.00	-0.04	-0.00	1.00	0.09	0.17	0.16	0.21	0.20
(K) rdinten	0.19	0.07	-0.17	-0.02	-0.00	-0.07	-0.00	-0.18	-0.01	0.06	1.00	0.27	0.24	0.20	0.18
(L) MAactivity	0.18	0.08	-0.09	-0.04	-0.01	0.00	0.00	-0.17	0.01	0.11	0.29	1.00	0.88	0.79	0.72
(M) MAactivity (-1)	0.16	0.07	-0.08	-0.04	-0.01	0.01	0.00	-0.17	0.01	0.10	0.26	0.87	1.00	0.71	0.79
(N) MAdensity	0.15	0.09	-0.01	-0.05	-0.02	0.04	0.01	-0.19	0.03	0.12	0.19	0.79	0.70	1.00	0.81
(O) MAdensity (-1)	0.13	0.08	-0.01	-0.05	-0.02	0.04	0.01	-0.19	0.03	0.11	0.17	0.71	0.79	0.78	1.00

(all non-zero coefficients are significant at 0.05 or higher)

This table provides correlation coefficients for pairwise Pearson correlation test (in lower triangular), and Spearman's rank test (in upper triangular). Variables from (A) through (Q) include cash/assets, market-to-book, country-year percentile ranking of firm size, cash flow/assets, net working capital/assets, capital expenditure/assets, leverage, dividend payer identifier, R&D/sales, acquisition/assets, R&D-intensive industry identifier, and four measures of takeover threat: M&A activity, 1-year lagged M&A activity, M&A density, and 1-year lagged M&A density.

Table III. Main regressions of cash holdings on industry takeover threats

Table III. Panel A. Industry takeover threat activity and density

		Number of takeover threats					Volume of takeover threats				
Cash / Assets		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Threat	All	Domestic	Foreign	Intra-ind	Control	All	Domestic	Foreign	Intra-ind	Control
mtb	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
sizerank	-0.111***	-0.110***	-0.111***	-0.111***	-0.111***	-0.112***	-0.112***	-0.112***	-0.114***	-0.115***	-0.114***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
cfassets	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.008	-0.008	-0.008
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
nwc	-0.190***	-0.187***	-0.188***	-0.186***	-0.187***	-0.190***	-0.187***	-0.188***	-0.189***	-0.188***	-0.189***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
capat	-0.144***	-0.145***	-0.144***	-0.146***	-0.146***	-0.144***	-0.149***	-0.148***	-0.150***	-0.153***	-0.150***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.015)	(0.015)	(0.015)
lev	-0.321***	-0.319***	-0.320***	-0.318***	-0.319***	-0.322***	-0.318***	-0.320***	-0.322***	-0.322***	-0.324***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
dpayer	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.019***	-0.019***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
acqui	-0.215***	-0.218***	-0.218***	-0.219***	-0.218***	-0.216***	-0.218***	-0.218***	-0.217***	-0.215***	-0.216***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
rdintensic4	0.041***	0.039***	0.039***	0.037***	0.039***	0.040***	0.039***	0.039***	0.038***	0.038***	0.038***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
MAactivity		0.003***	0.002***	0.005***	0.003***	0.001***					
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)					
MAdensity							0.004***	0.003***	0.004***	0.004***	0.003***
							(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.290***	0.274***	0.279***	0.271***	0.276***	0.287***	0.250***	0.263***	0.261***	0.258***	0.264***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Observations	174,497	174,497	174,228	169,783	172,612	172,530	173,595	172,153	158,544	165,294	167,510
R-squared	0.315	0.315	0.315	0.315	0.315	0.314	0.316	0.316	0.316	0.315	0.314
Year &ctryf.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results on the impact of both M&A activity (number of deals in industry) and M&A density (volume of deals in industry) on corporate cash holdings for the whole sample. Control variables include market-to-book ratio, percentile ranking of firm size, cash flow/assets, net working capital/assets, capital expenditure/assets, leverage, dividend payer identifier, R&D expenditure to sales, acquisition/assets, and R&D-intensive industry identifier. Models control for year fixed effects and country fixed effects.

Table III. Panel B. Previous year's industry takeover threat activity and density

	Previous number of takeover attempts					Previous volume of takeover attempts				
Cash / Assets	(1) Attempts	(2) Domestic	(3) Foreign	(4) Intra-ind	(5) Control	(6) Attempts	(7) Domestic	(8) Foreign	(9) Intra-ind	(10) Control
mtb	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.004***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
sizerank	-0.111***	-0.111***	-0.111***	-0.111***	-0.112***	-0.112***	-0.112***	-0.114***	-0.114***	-0.113***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
cfassets	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.008	-0.008	-0.008
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
nwc	-0.188***	-0.189***	-0.188***	-0.189***	-0.190***	-0.188***	-0.189***	-0.191***	-0.189***	-0.191***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
capat	-0.144***	-0.144***	-0.144***	-0.145***	-0.144***	-0.147***	-0.145***	-0.150***	-0.151***	-0.149***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.015)	(0.015)	(0.015)
lev	-0.320***	-0.320***	-0.320***	-0.321***	-0.322***	-0.320***	-0.320***	-0.324***	-0.322***	-0.324***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
dpayer	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.019***	-0.019***	-0.018***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
acqui	-0.217***	-0.216***	-0.217***	-0.217***	-0.215***	-0.217***	-0.217***	-0.216***	-0.215***	-0.216***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
rdintensic4	0.040***	0.040***	0.038***	0.040***	0.041***	0.039***	0.040***	0.038***	0.039***	0.039***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
MAactivity(-1)	0.001***	0.001***	0.003***	0.001***	-0.000					
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)					
MAdensity(-1)						0.003***	0.002***	0.003***	0.003***	0.002***
						(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.282***	0.286***	0.279***	0.284***	0.292***	0.263***	0.271***	0.273***	0.267***	0.275***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Observations	174,496	174,234	169,708	172,590	172,496	173,593	172,160	158,436	165,240	167,454
R-squared	0.315	0.315	0.315	0.314	0.314	0.315	0.315	0.315	0.315	0.313
Year &ctryf.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results on the impact of one-year lagged terms of both M&A activity (number of deals in industry) and M&A density (volume of deals in industry) on corporate cash holdings for the whole sample. Control variables include market-to-book ratio, percentile ranking of firm size, cash flow/assets, net working capital/assets, capital expenditure/assets, leverage, dividend payer identifier, R&D expenditure to sales, acquisition/assets, and R&D-intensive industry identifier. Models control for year fixed effects and country fixed effects.

Table IV. Takeover threats and cash holdings in individual countries

Table IV. Panel A. Industry takeover threat activity – number of M&A attempts

Cash / Assets	(1) Australia	(2) Canada	(3) France	(4) Germany	(5) India	(6) Japan	(7) S. Korea	(8) Sweden	(9) U.K.	(10) U.S.A.
mtb	0.023***	0.001	0.015***	0.002*	0.002***	0.020***	0.007***	0.021***	0.009***	0.002***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)
sizerank	-0.220***	-0.120***	-0.052***	-0.116***	0.015***	-0.114***	-0.030***	-0.099***	-0.078***	-0.115***
	(0.009)	(0.010)	(0.006)	(0.007)	(0.003)	(0.002)	(0.003)	(0.011)	(0.006)	(0.004)
cfassets	-0.031***	-0.029***	-0.047**	-0.002***	-0.017	0.067***	0.071***	-0.018*	-0.105***	-0.004
	(0.005)	(0.009)	(0.022)	(0.000)	(0.016)	(0.014)	(0.012)	(0.010)	(0.015)	(0.005)
nwc	-0.195***	-0.149***	-0.182***	-0.189***	-0.074***	-0.161***	-0.047***	-0.166***	-0.145***	-0.234***
	(0.010)	(0.013)	(0.009)	(0.010)	(0.005)	(0.004)	(0.005)	(0.017)	(0.007)	(0.004)
capat	-0.134***	-0.202***	-0.144***	-0.210***	-0.054***	-0.367***	-0.068***	-0.309***	-0.135***	-0.368***
	(0.021)	(0.021)	(0.034)	(0.031)	(0.009)	(0.016)	(0.012)	(0.052)	(0.019)	(0.011)
lev	-0.440***	-0.340***	-0.252***	-0.399***	-0.157***	-0.261***	-0.149***	-0.381***	-0.356***	-0.345***
	(0.012)	(0.015)	(0.011)	(0.012)	(0.005)	(0.004)	(0.006)	(0.020)	(0.009)	(0.004)
dpayer	-0.014***	-0.015***	0.003	0.001	0.017***	-0.005***	0.000	0.006	-0.025***	-0.030***
	(0.004)	(0.005)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)	(0.005)	(0.003)	(0.001)
rdsales	0.000***	0.000	0.010***	0.003***	-0.001***	0.151***	0.021	0.001	0.001	0.000**
	(0.000)	(0.000)	(0.002)	(0.001)	(0.000)	(0.026)	(0.019)	(0.001)	(0.001)	(0.000)
acqui	-0.179***	-0.167***	-0.070***	-0.140***	0.015	-2.742	-7.154***	-0.225***	-0.215***	-0.225***
	(0.023)	(0.022)	(0.027)	(0.027)	(0.032)	(2.005)	(2.249)	(0.033)	(0.016)	(0.008)
rdintensic4	-0.034***	0.065***	0.017***	0.014***	0.036***	0.056***	0.014***	-0.014**	0.042***	0.038***
	(0.005)	(0.007)	(0.004)	(0.004)	(0.003)	(0.002)	(0.002)	(0.006)	(0.004)	(0.002)
MAactivity	-0.001	-0.006***	-0.006***	0.005***	0.002*	0.009***	0.004***	-0.005***	-0.003***	0.002***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Constant	0.268***	0.288***	0.168***	0.285***	0.074***	0.205***	0.094***	0.245***	0.238***	0.319***
	(0.027)	(0.015)	(0.010)	(0.014)	(0.009)	(0.004)	(0.005)	(0.018)	(0.011)	(0.006)
Observations	12,959	5,356	6,383	6,205	15,530	42,141	10,454	3,067	15,665	56,737
R-squared	0.379	0.288	0.330	0.319	0.172	0.383	0.201	0.358	0.317	0.321
Country	Australia	Canada	France	Germany	India	Japan	S. Korea	Sweden	U.K.	U.S.A.
Year f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results on the impact of M&A activity (number of deals in industry) on corporate cash holdings for each individual country. Control variables include market-to-book ratio, percentile ranking of firm size, cash flow/assets, net working capital/assets, capital expenditure/assets, leverage, dividend payer identifier, R&D expenditure to sales, acquisition/assets, and R&D-intensive industry identifier. Models control for year fixed effects and country fixed effects.

Table IV. Panel B. Industry takeover threat density – dollar volume of all attempts

Cash / Assets	(1) Australia	(2) Canada	(3) France	(4) Germany	(5) India	(6) Japan	(7) S. Korea	(8) Sweden	(9) U.K.	(10) U.S.A.
mtb	0.023***	0.001	0.015***	0.002*	0.002***	0.020***	0.007***	0.020***	0.009***	0.002***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)
sizerank	-0.223***	-0.117***	-0.049***	-0.124***	0.014***	-0.118***	-0.031***	-0.095***	-0.077***	-0.116***
	(0.010)	(0.010)	(0.006)	(0.007)	(0.003)	(0.002)	(0.003)	(0.011)	(0.006)	(0.004)
cfassets	-0.032***	-0.029***	-0.052**	-0.002***	-0.016	0.061***	0.072***	-0.018*	-0.106***	-0.004
	(0.005)	(0.009)	(0.023)	(0.000)	(0.016)	(0.014)	(0.012)	(0.010)	(0.016)	(0.005)
nwc	-0.189***	-0.150***	-0.177***	-0.201***	-0.074***	-0.167***	-0.048***	-0.167***	-0.142***	-0.226***
	(0.010)	(0.013)	(0.009)	(0.010)	(0.005)	(0.004)	(0.005)	(0.018)	(0.007)	(0.004)
capat	-0.138***	-0.192***	-0.136***	-0.215***	-0.055***	-0.399***	-0.064***	-0.297***	-0.129***	-0.387***
	(0.021)	(0.021)	(0.034)	(0.032)	(0.009)	(0.016)	(0.012)	(0.054)	(0.019)	(0.011)
lev	-0.433***	-0.337***	-0.248***	-0.414***	-0.155***	-0.263***	-0.150***	-0.379***	-0.355***	-0.339***
	(0.012)	(0.015)	(0.011)	(0.013)	(0.005)	(0.004)	(0.006)	(0.021)	(0.009)	(0.004)
dpayer	-0.012***	-0.013***	0.003	0.005	0.017***	-0.004**	0.000	0.003	-0.026***	-0.027***
	(0.004)	(0.005)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)	(0.006)	(0.003)	(0.001)
rdsales	0.000***	0.000	0.010***	0.003***	-0.001***	0.141***	0.023	0.001	0.001	0.000**
	(0.000)	(0.000)	(0.002)	(0.001)	(0.000)	(0.025)	(0.019)	(0.001)	(0.001)	(0.000)
acqui	-0.179***	-0.169***	-0.080***	-0.140***	0.013	-2.538	-6.955***	-0.229***	-0.219***	-0.229***
	(0.023)	(0.022)	(0.027)	(0.027)	(0.032)	(1.865)	(2.201)	(0.034)	(0.016)	(0.008)
rdintensic4	-0.032***	0.064***	0.014***	0.013***	0.037***	0.059***	0.017***	-0.016**	0.040***	0.030***
	(0.005)	(0.007)	(0.004)	(0.004)	(0.003)	(0.002)	(0.002)	(0.006)	(0.004)	(0.002)
MAdensity	0.003**	-0.006***	-0.003***	0.001	0.002***	0.004***	0.001*	-0.001	-0.000	0.013***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Constant	0.248***	0.303***	0.163***	0.307***	0.073***	0.210***	0.095***	0.236***	0.227***	0.192***
	(0.027)	(0.015)	(0.011)	(0.014)	(0.009)	(0.004)	(0.006)	(0.019)	(0.011)	(0.006)
Observations	12,907	5,349	6,300	5,954	15,373	42,059	10,343	2,937	15,641	56,732
R-squared	0.379	0.289	0.328	0.326	0.172	0.380	0.200	0.353	0.317	0.328
Country	Australia	Canada	France	Germany	India	Japan	S. Korea	Sweden	U.K.	U.S.A.
Year f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results on the impact of M&A density (volume of deals in industry) on corporate cash holdings for each individual country. Control variables include market-to-book ratio, percentile ranking of firm size, cash flow/assets, net working capital/assets, capital expenditure/assets, leverage, dividend payer identifier, R&D expenditure to sales, acquisition/assets, and R&D-intensive industry identifier. Models control for year fixed effects and country fixed effects.

Table V. Cross-country variation of takeover threat and cash holdings

Table V. Panel A. Takeover threat, credit market development, and cash holdings

Cash / Assets		Number of deals (MAactivity)			Volume of deals (MAdensity)		
	(1) Credit	(2) Threat	(3) Both	(4) Interact	(5) Threat	(6) Both	(7) Interact
mtb1	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
sizerank	-0.113***	-0.110***	-0.112***	-0.113***	-0.112***	-0.114***	-0.114***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
cfassets1	-0.008	-0.009	-0.008	-0.008	-0.009	-0.008	-0.008
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
nwc	-0.190***	-0.187***	-0.187***	-0.187***	-0.187***	-0.187***	-0.187***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
capat	-0.136***	-0.145***	-0.137***	-0.137***	-0.149***	-0.141***	-0.142***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.015)	(0.015)
lev	-0.322***	-0.319***	-0.319***	-0.319***	-0.318***	-0.319***	-0.318***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
dpayer	-0.019***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
acqui	-0.217***	-0.218***	-0.220***	-0.220***	-0.218***	-0.220***	-0.220***
	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)
rdintensic4	0.039***	0.039***	0.037***	0.036***	0.039***	0.037***	0.036***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
privcred_gdp	-0.014***		-0.013***	-0.002		-0.014***	0.025***
	(0.002)		(0.002)	(0.003)		(0.002)	(0.004)
MAactivity		0.003***	0.003***	0.005***			
		(0.000)	(0.000)	(0.001)			
Interact				-0.003***			
				(0.001)			
MAdensity					0.004***	0.004***	0.009***
					(0.000)	(0.000)	(0.001)
Interact							-0.005***
							(0.001)
Constant	0.300***	0.241***	0.290***	0.304***	0.228***	0.248***	0.244***
	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.006)
Observations	163,372	174,497	163,372	163,372	173,595	162,502	162,502
R-squared	0.315	0.315	0.315	0.315	0.316	0.316	0.317
Yr & ctry f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results on the impact of both M&A activity (number of deals in industry) and M&A density (volume of deals) on corporate cash holdings in interaction with credit market development. Credit market development is measured by total private bank credit scaled by GDP (Rajan and Zingales, 1998). Control variables include market-to-book ratio, percentile ranking of firm size, cash flow/assets, net working capital/assets, capital expenditure/assets, leverage, dividend payer identifier, R&D expenditure to sales, acquisition/assets, and R&D-intensive industry identifier. Models control for year fixed effects and country fixed effects. Variable of interest are the M&A activity and M&A density measures. Dependent variable is the ratio of cash and cash equivalent to total assets. All of the non-ratio non-binary variables are scaled by total assets.

Table V. Panel B. Takeover threat economic freedom and cash holdings

Cash / Assets	Investment freedom			Business freedom		
	(1) Threat	(2) Interact	(3) Interact	(4) Interact	(5) Interact	(6) Interact
mtb1	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
sizerank	-0.111***	-0.110***	-0.112***	-0.111***	-0.111***	-0.112***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
cfassets1	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
nwc	-0.190***	-0.188***	-0.187***	-0.190***	-0.188***	-0.187***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
capat	-0.144***	-0.145***	-0.149***	-0.144***	-0.145***	-0.149***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
lev	-0.321***	-0.319***	-0.318***	-0.321***	-0.319***	-0.318***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
dpayer	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
acqui	-0.215***	-0.217***	-0.218***	-0.215***	-0.218***	-0.218***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
rdintensic4	0.041***	0.039***	0.039***	0.041***	0.039***	0.039***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Freedom	0.002	0.083***	0.031***	0.000	0.005***	0.000
	(0.007)	(0.011)	(0.011)	(0.001)	(0.001)	(0.001)
MAactivity		0.016***			0.015***	
		(0.001)			(0.002)	
MAactivity * freedom		-0.019***			-0.001***	
		(0.002)			(0.000)	
MAdensity			0.006***			0.004***
			(0.001)			(0.001)
MAdensity * freedom			-0.003**			-0.000
			(0.001)			(0.000)
Constant	0.248***	0.218***	0.229***	0.229***	0.234***	0.245***
	(0.007)	(0.008)	(0.008)	(0.004)	(0.009)	(0.009)
Observations	174,497	174,497	173,595	174,497	174,497	173,595
R-squared	0.315	0.315	0.316	0.315	0.315	0.316
Year and country f.e.	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results on the impact of both M&A activity (number of deals in industry) and M&A density (volume of deals) on corporate cash holdings in interaction with economic freedom. There are two measures of economic freedom, namely investment freedom and business freedom, provided by Heritage Foundation. Control variables include market-to-book ratio, percentile ranking of firm size, cash flow/assets, net working capital/assets, capital expenditure/assets, leverage, dividend payer identifier, R&D expenditure to sales, acquisition/assets, and R&D-intensive industry identifier. Models control for year fixed effects and country fixed effects. Variable of interest are the M&A activity and M&A density measures. Dependent variable is the ratio of cash and cash equivalent to total assets. All of the non-ratio non-binary variables are scaled by total assets.

Table V. Panel C. Takeover threat, quality of accounting standard, and cash holdings

Cash / Assets	(1) Threat	(2) MActivity	(3) Interact	(4) MAdensity	(5) Interact
mtb1	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
sizerank	-0.111***	-0.110***	-0.110***	-0.112***	-0.112***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
cfassets1	-0.009	-0.009	-0.009	-0.009	-0.009
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
nwc	-0.190***	-0.187***	-0.188***	-0.187***	-0.187***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
capat	-0.144***	-0.145***	-0.144***	-0.149***	-0.149***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
lev	-0.321***	-0.319***	-0.319***	-0.318***	-0.318***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
dpayer	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
acqui	-0.215***	-0.218***	-0.217***	-0.218***	-0.218***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
rdintensic4	0.041***	0.039***	0.038***	0.039***	0.039***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
acct_std_1990			-0.287***		-0.375***
			(0.032)		(0.035)
MAactivity		0.003***	0.030***		
		(0.000)	(0.004)		
MAactivity#c.acct_std_1990			-0.039***		
			(0.006)		
MAdensity				0.004***	0.004
				(0.000)	(0.003)
MAdensity#c.acct_std_1990					-0.000
					(0.004)
Constant	0.250***	0.241***	0.480***	0.226***	0.516***
	(0.004)	(0.004)	(0.024)	(0.004)	(0.025)
Observations	174,497	174,497	174,497	173,595	173,595
R-squared	0.315	0.315	0.315	0.316	0.316
Year and country f.e.	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results on the impact of both M&A activity (number of deals in industry) and M&A density (volume of deals) on corporate cash holdings in interaction with quality of accounting standards, provided by Rajan and Zingales (1998). Control variables include market-to-book ratio, percentile ranking of firm size, cash flow/assets, net working capital/assets, capital expenditure/assets, leverage, dividend payer identifier, R&D expenditure to sales, acquisition/assets, and R&D-intensive industry identifier. Models control for year fixed effects and country fixed effects. Variable of interest are the M&A activity and M&A density measures. Dependent variable is the ratio of cash and cash equivalent to total assets. All of the non-ratio non-binary variables are scaled by total assets.

Table V. Panel D. Takeover threat, investor protection, and cash holdings

	IPI1 = ADRI_DLLS * RL_WGI					IPI2 = ADRI_Spamann * RL_				
Cash / Assets	(1) IPI	(2) MAactivity	(3) Interact	(4) MAdensity	(5) Interact	(6) IPI	(7) MAactivity	(8) Interact	(9) MAdensity	(10) Interact
mtb1	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
sizerank	-0.111***	-0.110***	-0.111***	-0.112***	-0.112***	-0.111***	-0.110***	-0.110***	-0.112***	-0.112***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
cfassets1	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
nwc	-0.190***	-0.187***	-0.187***	-0.187***	-0.187***	-0.190***	-0.187***	-0.187***	-0.187***	-0.186***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
capat	-0.144***	-0.145***	-0.145***	-0.150***	-0.150***	-0.144***	-0.145***	-0.145***	-0.149***	-0.149***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
lev	-0.321***	-0.319***	-0.319***	-0.318***	-0.318***	-0.321***	-0.319***	-0.319***	-0.318***	-0.318***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
dpayer	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
acqui	-0.215***	-0.217***	-0.218***	-0.217***	-0.217***	-0.215***	-0.218***	-0.218***	-0.217***	-0.218***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
rdintensic4	0.041***	0.039***	0.038***	0.038***	0.038***	0.041***	0.039***	0.039***	0.039***	0.038***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
IPI	0.118***	0.116***	0.131***	0.130***	0.191***	0.068***	0.062***	0.034	0.084***	0.295***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)	(0.020)	(0.020)	(0.027)	(0.021)	(0.033)
MAactivity		0.003***	0.005***				0.003***	0.001		
		(0.000)	(0.001)				(0.000)	(0.002)		
IPI * MAactivity			-0.004***					0.007		
			(0.001)					(0.004)		
MAdensity				0.004***	0.009***				0.004***	0.013***
				(0.000)	(0.001)				(0.000)	(0.001)
IPI * MAdensity					-0.009***					-0.027***
					(0.001)					(0.003)
Constant	0.161***	0.154***	0.227***	0.134***	0.168***	0.223***	0.217***	0.265***	0.190***	0.146***
	(0.010)	(0.010)	(0.006)	(0.009)	(0.006)	(0.009)	(0.009)	(0.010)	(0.010)	(0.012)
Observations	174,497	174,497	174,497	173,595	173,595	174,497	174,497	174,497	173,595	173,595
R-squared	0.315	0.315	0.315	0.316	0.317	0.315	0.315	0.315	0.316	0.316
Year and country f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results on the impact of both M&A activity and density on cash holdings in interaction with investor protection index (IPI) where IPI=(ADRI*RL)/10

Table V. Panel E. Takeover threat, national culture, and cash holdings

Cash / Assets	(1)	Number of deals (MAactivity)				Volume of deals (MAdensity)			
		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Culture	Attempts	Interact	Completed	Interact	Attempts	Interact	Completed	Interact
mtb1	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
sizerank	-0.111***	-0.110***	-0.110***	-0.111***	-0.110***	-0.112***	-0.112***	-0.112***	-0.112***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
cfassets1	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
nwc	-0.190***	-0.187***	-0.186***	-0.188***	-0.187***	-0.187***	-0.186***	-0.187***	-0.187***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
capat	-0.144***	-0.145***	-0.144***	-0.144***	-0.144***	-0.149***	-0.149***	-0.149***	-0.149***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
lev	-0.321***	-0.319***	-0.318***	-0.320***	-0.319***	-0.318***	-0.318***	-0.319***	-0.319***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
dpayer	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
acqui	-0.215***	-0.218***	-0.218***	-0.218***	-0.218***	-0.218***	-0.218***	-0.218***	-0.218***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
rdintensic4	0.041***	0.039***	0.039***	0.039***	0.039***	0.039***	0.039***	0.039***	0.039***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
culture	0.002***	0.001**	0.033***	0.001**	0.035***	0.000	0.021***	0.000	0.028***
	(0.001)	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)
MAactivity		0.003***	-0.019***	0.002***	-0.018***				
		(0.000)	(0.002)	(0.000)	(0.002)				
MAactivity * culture			0.003***		0.003***				
			(0.000)		(0.000)				
MAdensity						0.004***	-0.009***	0.003***	-0.007***
						(0.000)	(0.001)	(0.000)	(0.001)
MAdensity * culture							0.002***		0.002***
							(0.000)		(0.000)
Constant	0.223***	0.214***	0.044**	0.218***	0.032*	0.206***	0.093***	0.211***	0.057***
	(0.005)	(0.005)	(0.019)	(0.005)	(0.019)	(0.005)	(0.020)	(0.005)	(0.019)
Observations	174,497	174,497	174,497	174,242	174,242	173,595	173,595	173,009	173,009
R-squared	0.315	0.315	0.315	0.315	0.315	0.316	0.316	0.316	0.316
Year and country f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides results on the impact of M&A activity and density on cash in interaction with culture (average of uncertainty avoidance and individualism, Hofstede, 1980).

Table VI. Subsequent use of cash following industry takeover threat

Table VI. Panel A. Subsequent share repurchases post industry takeover threat

Repo / Assets	(1) Threat	(3) Cashrich	(5) Cashpoor	(8) Cashrich only	(9) Cashpoor only
mtb	0.009***	0.009***	0.009***	0.016***	0.015***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.002)
sizerank	0.031***	0.036***	0.032***	0.089***	0.017**
	(0.005)	(0.005)	(0.005)	(0.017)	(0.008)
cfassets	0.109*	0.112*	0.112*	0.058	0.148***
	(0.066)	(0.065)	(0.067)	(0.082)	(0.023)
lev	0.024***	0.030***	0.029***	0.072***	0.044***
	(0.006)	(0.007)	(0.007)	(0.022)	(0.009)
chasset	-0.005***	-0.005***	-0.005***	-0.011***	-0.004***
	(0.000)	(0.000)	(0.000)	(0.002)	(0.001)
kz1997	-0.000	-0.000	-0.000	-0.004*	0.000**
	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)
rete	0.001**	0.001**	0.001**	0.000	0.001***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
lag (MAactivity)	0.003***	0.001***	0.003***	0.004***	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
lag (Cashrich)		-0.011			
		(0.008)			
Interact		0.005***			
		(0.002)			
lag (Cashpoor)			0.001		
			(0.005)		
Interact			-0.001		
			(0.001)		
Constant	-0.018**	-0.009	-0.010	-0.052***	-0.062***
	(0.008)	(0.006)	(0.007)	(0.018)	(0.007)
R-squared	0.195	0.205	0.197	0.322	0.270
Year and country f.e.	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results on corporate share repurchase expenses subsequent to M&A activity (number of deals in industry). Control variables include market-to-book ratio, percentile ranking of firm size, cash flow/assets, leverage, relative change of assets, financial constraint measure (using Kaplan-Zingales 1997 equation), and retained earnings to total equity ratio. Models control for year fixed effects and country fixed effects. Variable of interest are previous M&A activity. Dependent variable is the ratio of share repurchase expenses to total assets where share repurchase is the net difference between purchase of common stock and sale of common stock within a year. All of the non-ratio non-binary variables are scaled by total assets.

Table VI. Panel B. Subsequent acquisitions post industry takeover threat

Acquisition / Assets	(1) Threat	(3) Cashrich	(5) Cashpoor	(8) Cashrich only	(9) Cashpoor only
mtb	-0.001***	-0.002***	-0.001***	-0.001***	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
sizerank	-0.031***	-0.028***	-0.030***	-0.016***	-0.039***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
cfassets	-0.001	-0.000	-0.001	0.010***	-0.021***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.006)
lev	0.022***	0.026***	0.024***	0.024***	0.028***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.002)
chasset	0.005***	0.005***	0.005***	0.005***	0.006***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
kz1997	0.000	0.000	0.000	0.000	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
rete	-0.000	-0.000	-0.000	-0.000	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lag (MAactivity)	0.001***	0.001***	0.001***	0.002***	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lag (Cashrich)		-0.001			
		(0.001)			
Interact		0.001***			
		(0.000)			
lag (Cashpoor)			-0.002		
			(0.001)		
Interact			-0.000		
			(0.000)		
Constant	0.020***	0.026***	0.026***	0.017***	0.013***
	(0.003)	(0.002)	(0.002)	(0.005)	(0.004)
R-squared	0.137	0.139	0.138	0.132	0.166
Year and country f.e.	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results on corporate acquisition expenses subsequent to M&A activity (number of deals in industry). Control variables include market-to-book ratio, percentile ranking of firm size, cash flow/assets, leverage, relative change of assets, financial constraint measure (using Kaplan-Zingales 1997 equation), and retained earnings to total equity ratio. Models control for year fixed effects and country fixed effects. Variable of interest are previous M&A activity. Dependent variable is the ratio of acquisition expenses to total assets. All of the non-ratio non-binary variables are scaled by total assets.

Table VII. Robustness check

Table VII. Panel A. Excluding Business Services (top M&A industry)

		Number of deals (MAactivity)					Volume of deals (MAdensity)				
Cash / Assets	(1) Base	(2) All	(3) Domestic	(4) Foreign	(6) Intra ind	(7) Control	(8) All	(9) Domestic	(10) Foreign	(12) Intra ind	(13) Control
mtb1	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
sizerank	-0.099***	-0.099***	-0.099***	-0.100***	-0.100***	-0.100***	-0.101***	-0.101***	-0.103***	-0.104***	-0.103***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
cfassets1	-0.025*	-0.025*	-0.025*	-0.025*	-0.025*	-0.025*	-0.025*	-0.025*	-0.025*	-0.024*	-0.025*
	(0.014)	(0.015)	(0.015)	(0.014)	(0.014)	(0.014)	(0.014)	(0.015)	(0.014)	(0.014)	(0.014)
nwc	-0.177***	-0.175***	-0.176***	-0.175***	-0.175***	-0.178***	-0.174***	-0.175***	-0.177***	-0.176***	-0.177***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
capat	-0.156***	-0.159***	-0.157***	-0.165***	-0.161***	-0.157***	-0.163***	-0.161***	-0.167***	-0.169***	-0.164***
	(0.015)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)	(0.017)	(0.016)
lev	-0.302***	-0.302***	-0.302***	-0.300***	-0.302***	-0.304***	-0.301***	-0.302***	-0.304***	-0.304***	-0.306***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
dpayer	-0.020***	-0.020***	-0.020***	-0.019***	-0.020***	-0.020***	-0.019***	-0.020***	-0.021***	-0.021***	-0.021***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
rdsales	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
acqui	-0.191***	-0.191***	-0.191***	-0.189***	-0.190***	-0.191***	-0.191***	-0.191***	-0.189***	-0.186***	-0.190***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
rdintensic4	0.038***	0.038***	0.038***	0.038***	0.039***	0.038***	0.038***	0.038***	0.037***	0.038***	0.037***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
MAactivity		0.003***	0.001***	0.008***	0.004***	-0.000					
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)					
MAdensity							0.004***	0.003***	0.005***	0.004***	0.003***
							(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.235***	0.223***	0.239***	0.230***	0.236***	0.236***	0.203***	0.236***	0.206***	0.229***	0.238***
	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)	(0.006)	(0.004)
Observations	147,613	147,613	147,344	142,899	145,728	145,646	146,711	145,269	131,660	138,410	140,642
R-squared	0.310	0.310	0.310	0.311	0.310	0.309	0.312	0.311	0.313	0.312	0.310
Year & ctry f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results on the impact of both M&A activity (number of deals in industry) and M&A density (volume of deals in industry) on corporate cash holdings for a subsample that exclude firms classified in "Business Service" industry to avoid dominant impact from this group. Control variables include market-to-book ratio, percentile ranking of firm size, cash flow/assets, net working capital/assets, capital expenditure/assets, leverage, dividend payer identifier, R&D expenditure to sales, acquisition/assets, and R&D-intensive industry identifier. All non-ratio non-binary variables are scaled to total assets. Models control for year fixed effects and country fixed effects.

Table VII. Panel B. Excluding U.S. firms

		Number of deals (MAactivity)						Volume of deals (MAdensity)					
Cash / Assets	(1) Base	(2) Attempts	(3) Domestic	(4) Foreign	(5) Hightech	(6) Intra ind	(7) Control	(8) Attempts	(9) Domestic	(10) Foreign	(11) Hightech	(12) Intra ind	(13) Control
mtb1	0.008***	0.008***	0.008***	0.008***	0.006***	0.008***	0.008***	0.008***	0.008***	0.007***	0.006***	0.008***	0.008***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
sizerank	-0.107***	-0.106***	-0.106***	-0.107***	-0.115***	-0.107***	-0.108***	-0.108***	-0.108***	-0.111***	-0.125***	-0.111***	-0.111***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
cfassets1	-0.017	-0.018	-0.017	-0.017	-0.011	-0.017	-0.017	-0.017	-0.017	-0.017	-0.009	-0.017	-0.017
	(0.011)	(0.011)	(0.011)	(0.011)	(0.008)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.007)	(0.011)	(0.011)
nwc	-0.161***	-0.159***	-0.159***	-0.159***	-0.179***	-0.159***	-0.162***	-0.160***	-0.161***	-0.162***	-0.193***	-0.161***	-0.163***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
capat	-0.090***	-0.092***	-0.092***	-0.091***	-0.176***	-0.092***	-0.091***	-0.092***	-0.091***	-0.091***	-0.179***	-0.092***	-0.093***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.023)	(0.014)	(0.014)	(0.014)	(0.014)	(0.015)	(0.029)	(0.015)	(0.015)
lev	-0.294***	-0.292***	-0.292***	-0.292***	-0.319***	-0.293***	-0.296***	-0.293***	-0.294***	-0.297***	-0.341***	-0.298***	-0.299***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)
dpayer	-0.011***	-0.011***	-0.011***	-0.011***	-0.013***	-0.012***	-0.012***	-0.011***	-0.012***	-0.012***	-0.015***	-0.013***	-0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
rdsales	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
acqui	-0.216***	-0.218***	-0.218***	-0.219***	-0.249***	-0.217***	-0.216***	-0.217***	-0.218***	-0.217***	-0.250***	-0.212***	-0.217***
	(0.010)	(0.010)	(0.010)	(0.011)	(0.014)	(0.011)	(0.010)	(0.010)	(0.011)	(0.011)	(0.015)	(0.011)	(0.011)
rdintensic4	0.037***	0.035***	0.036***	0.034***	0.021***	0.036***	0.037***	0.036***	0.037***	0.035***	0.022***	0.037***	0.036***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
MAactivity		0.003***	0.002***	0.004***	0.006***	0.002***	0.000						
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)						
MAdensity								0.002***	0.001***	0.002***	0.004***	0.001***	0.001***
								(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.222***	0.213***	0.215***	0.215***	0.233***	0.216***	0.222***	0.213***	0.218***	0.215***	0.233***	0.218***	0.221***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.009)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.011)	(0.008)	(0.007)
Observations	117,760	117,760	117,491	113,146	74,084	115,890	115,805	116,863	115,429	102,250	62,057	108,813	110,862
R-squared	0.324	0.325	0.325	0.324	0.320	0.324	0.323	0.325	0.325	0.325	0.320	0.323	0.323
Yr and ctry f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results on the impact of both M&A activity (number of deals in industry) and M&A density (volume of deals in industry) on corporate cash holdings for a subsample that exclude U.S. firms avoid dominant impact from this group. Control variables include market-to-book ratio, percentile ranking of firm size, cash flow/assets, net working capital/assets, capital expenditure/assets, leverage, dividend payer identifier, R&D expenditure to sales, acquisition/assets, and R&D-intensive industry identifier. All non-ratio non-binary variables are scaled to total assets. Models control for year fixed effects and country fixed effects.

Table VII. Panel C. Without cash-rich

Cash / Assets	(1) Base	Number of deals (MAactivity) (2) Attempts	(3) Domestic	(4) Foreign	(5) High-tech	(6) Intra-ind	(7) Control	Volume of deals (MAdensity) (8) Attempts	(9) Domestic	(10) Foreign	(11) High-tech	(12) Intra-ind	(13) Control
mtb1	0.001***	0.001***	0.001***	0.001***	0.000**	0.001***	0.001***	0.001***	0.001***	0.001***	0.000**	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
sizerank	-0.008***	-0.008***	-0.008***	-0.008***	-0.008***	-0.008***	-0.008***	-0.008***	-0.008***	-0.007***	-0.009***	-0.009***	-0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
cfassets1	-0.001	-0.001	-0.001	-0.001	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
nwc	-0.014***	-0.013***	-0.013***	-0.013***	-0.016***	-0.013***	-0.014***	-0.014***	-0.014***	-0.013***	-0.017***	-0.014***	-0.014***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
capat	0.002	0.001	0.001	0.000	-0.021***	0.001	0.002	0.001	0.001	0.001	-0.016***	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
lev	-0.073***	-0.072***	-0.072***	-0.072***	-0.074***	-0.072***	-0.073***	-0.072***	-0.073***	-0.073***	-0.077***	-0.074***	-0.074***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
dpayer	-0.004***	-0.004***	-0.004***	-0.004***	-0.003***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
rdsales	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
acqui	-0.014***	-0.015***	-0.015***	-0.015***	-0.019***	-0.015***	-0.014***	-0.014***	-0.014***	-0.014***	-0.018***	-0.013***	-0.014***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
rdintensic4	0.014***	0.013***	0.013***	0.013***	0.009***	0.013***	0.013***	0.014***	0.014***	0.014***	0.011***	0.014***	0.014***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MAactivity		0.002***	0.002***	0.002***	0.002***	0.001***	0.001***						
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)						
MAdensity								0.001***	0.000***	0.001***	0.001***	0.000***	0.000***
								(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.051***	0.043***	0.062***	0.045***	0.064***	0.046***	0.048***	0.046***	0.048***	0.046***	0.048***	0.049***	0.065***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Observations	121,682	121,682	121,470	118,067	82,817	120,330	120,219	120,961	119,894	109,505	69,491	114,915	116,538
R-squared	0.274	0.275	0.275	0.274	0.248	0.274	0.272	0.275	0.275	0.267	0.243	0.269	0.265
Yr and ctry f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results on the impact of both M&A activity (number of deals in industry) and M&A density (volume of deals in industry) on corporate cash holdings for a subsample that exclude cash-rich firms to avoid dominant impact from this group. Cash-rich firms are identified as firms with cash/assets ratio among top tercile for each country-industry-year ranking. Control variables include market-to-book ratio, percentile ranking of firm size, cash flow/assets, net working capital/assets, capital expenditure/assets, leverage, dividend payer identifier, R&D expenditure to sales, acquisition/assets, and R&D-intensive industry identifier. All non-ratio non-binary variables are scaled to total assets. Models control for year fixed effects and country fixed effects.

Table VII. Panel D. Post crisis period

		Number of deals (MAactivity)						Volume of deals (MAdensity)					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Cash / Assets	Base	Attempts	Domestic	Foreign	High-tech	Intra ind	Control	Attempts	Domestic	Foreign	High-tech	Intra ind	Control
mtb1	0.002***	0.002***	0.002***	0.002**	0.001**	0.002**	0.002***	0.002**	0.002**	0.002**	0.001**	0.002**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
sizerank	-0.111***	-0.111***	-0.111***	-0.111***	-0.125***	-0.111***	-0.112***	-0.112***	-0.112***	-0.113***	-0.125***	-0.116***	-0.115***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
cfassets1	-0.051***	-0.051***	-0.051***	-0.052***	-0.046**	-0.051***	-0.051***	-0.051***	-0.052***	-0.051***	-0.096***	-0.050***	-0.051***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.021)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.010)	(0.012)	(0.012)
nwc	-0.179***	-0.178***	-0.179***	-0.175***	-0.208***	-0.178***	-0.181***	-0.175***	-0.176***	-0.177***	-0.223***	-0.177***	-0.178***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)
capat	-0.188***	-0.188***	-0.188***	-0.189***	-0.280***	-0.188***	-0.189***	-0.192***	-0.191***	-0.193***	-0.285***	-0.192***	-0.195***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.017)	(0.021)	(0.021)	(0.021)	(0.021)	(0.022)	(0.020)	(0.022)	(0.022)
lev	-0.301***	-0.300***	-0.301***	-0.299***	-0.328***	-0.300***	-0.303***	-0.298***	-0.298***	-0.301***	-0.348***	-0.303***	-0.303***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)	(0.005)	(0.004)
dpayer	-0.007***	-0.007***	-0.007***	-0.007***	-0.011***	-0.007***	-0.007***	-0.006***	-0.007***	-0.007***	-0.011***	-0.007***	-0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
rdsales	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
acqui	-0.227***	-0.227***	-0.227***	-0.228***	-0.280***	-0.226***	-0.224***	-0.230***	-0.230***	-0.227***	-0.283***	-0.224***	-0.229***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.015)	(0.012)	(0.012)	(0.012)	(0.013)	(0.013)	(0.016)	(0.013)	(0.013)
rdintensic4	0.041***	0.040***	0.041***	0.038***	0.012***	0.040***	0.041***	0.039***	0.039***	0.037***	0.013***	0.038***	0.038***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
MAactivity		0.001	-0.000	0.004***	0.009***	0.001*	-0.001**						
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)						
MAdensity								0.004***	0.003***	0.004***	0.007***	0.004***	0.003***
								(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.299***	0.296***	0.267***	0.262***	0.293***	0.272***	0.293***	0.249***	0.276***	0.270***	0.264***	0.253***	0.276***
	(0.006)	(0.007)	(0.011)	(0.011)	(0.013)	(0.010)	(0.008)	(0.010)	(0.008)	(0.008)	(0.014)	(0.012)	(0.008)
Observations	45,757	45,757	45,704	44,469	30,654	45,015	45,149	45,445	44,951	41,184	25,533	42,450	43,383
R-squared	0.332	0.332	0.332	0.331	0.344	0.331	0.331	0.333	0.333	0.334	0.356	0.332	0.332
Yr and ctry f.e.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

This table provides empirical results on the impact of both M&A activity (number of deals in industry) and M&A density (volume of deals in industry) on corporate cash holdings for a subperiod of post-crisis time 2010-2015 when we not only experience a slow recovery of M&A but also a different pattern of more mid-size deals and not many of mega deals. Control variables include market-to-book ratio, percentile ranking of firm size, cash flow/assets, net working capital/assets, capital expenditure/assets, leverage, dividend payer identifier, R&D expenditure to sales, acquisition/assets, and R&D-intensive industry identifier. All non-ratio non-binary variables are scaled to total assets. Models control for year fixed effects and country fixed effects.

9. Appendices

Appendix A. Detailed takeover threat and cash holdings in high MA-activity industries

Year	Australia				Canada				France				Germany				India			
	Maactivity	Madensity	Cash PMT	Cash/TA	Maactivity	Madensity	Cash PMT	Cash/TA	Maactivity	Madensity	Cash PMT	Cash/TA	Maactivity	Madensity	Cash PMT	Cash/TA	Maactivity	Madensity	Cash PMT	Cash/TA
ALL INDUSTRIES																				
Total	128	4904	0.29	0.24	163	8092	0.32	0.15	125	3417	0.15	0.12	115	3360	0.10	0.15	41	905	0.26	0.06
1999	37	616	0.22	0.07	123	3903	0.26	0.10	71	6739	0.34	0.07	116	7172	0.07	0.13	17	113	0.16	0.02
2000	76	2163	0.26	0.14	207	13002	0.28	0.13	159	3349	0.18	0.07	216	7414	0.11	0.15	48	324	0.10	0.04
2001	85	3204	0.23	0.15	154	4013	0.29	0.12	106	2354	0.15	0.07	131	1452	0.12	0.12	41	193	0.29	0.04
2002	76	894	0.21	0.16	134	2169	0.29	0.13	71	2392	0.21	0.08	92	1717	0.14	0.12	30	377	0.28	0.04
2003	111	1126	0.29	0.20	94	1997	0.23	0.17	61	1731	0.15	0.07	86	1612	0.11	0.13	33	324	0.22	0.04
2004	134	1803	0.24	0.23	129	4814	0.28	0.16	79	5152	0.11	0.07	87	2859	0.11	0.14	30	232	0.15	0.05
2005	132	1920	0.26	0.25	142	6732	0.34	0.15	90	3092	0.14	0.12	100	2716	0.12	0.16	51	862	0.22	0.06
2006	138	5700	0.22	0.28	163	15800	0.33	0.16	121	6147	0.13	0.12	119	5372	0.09	0.17	56	845	0.14	0.07
2007	196	7910	0.25	0.29	209	14795	0.35	0.16	140	4872	0.11	0.13	133	6018	0.10	0.16	51	1298	0.20	0.09
2008	162	6468	0.25	0.27	221	8237	0.37	0.14	113	4339	0.12	0.13	121	3937	0.10	0.15	47	1034	0.23	0.08
2009	173	6075	0.28	0.27	251	6795	0.35	0.18	98	1369	0.11	0.14	85	1857	0.10	0.16	47	789	0.24	0.07
2010	161	5094	0.31	0.26	244	10470	0.35	0.19	128	3431	0.13	0.14	93	1211	0.06	0.17	43	1202	0.24	0.07
2011	106	11507	0.42	0.27	225	10350	0.39	0.16	148	2426	0.14	0.14	127	3722	0.13	0.16	34	896	0.30	0.07
2012	124	3796	0.34	0.23	190	12332	0.39	0.14	141	1074	0.19	0.15	102	1992	0.09	0.16	33	909	0.31	0.06
2013	98	2639	0.33	0.21	134	6200	0.35	0.15	134	1371	0.15	0.16	97	2636	0.09	0.17	36	963	0.31	0.05
2014	92	6835	0.37	0.22	146	9983	0.30	0.15	210	5674	0.13	0.18	121	2801	0.10	0.18	38	729	0.28	0.05
2015	83	4191	0.23	0.25	114	4465	0.26	0.15	250	3524	0.10	0.18	108	2832	0.08	0.16	44	1090	0.23	0.05
BUSINESS SERVICES																				
Total	281	3907	0.24	0.21	345	4233	0.22	0.25	376	6183	0.12	0.14	343	5415	0.10	0.22	176	2345	0.17	0.11
1999	248	1111	0.18	0.05	366	3309	0.16	0.17	236	3847	0.21	0.09	421	3760	0.07	0.25				
2000	348	3590	0.23	0.23	635	7801	0.17	0.22	528	8553	0.14	0.08	705	13916	0.07	0.24	281	1629	0.05	0.20
2001	282	1031	0.16	0.22	423	2603	0.17	0.22	329	3097	0.12	0.08	414	2755	0.13	0.20	135	689	0.11	0.12
2002	242	1022	0.20	0.22	314	1727	0.24	0.24	210	3458	0.15	0.09	250	3681	0.14	0.18	83	491	0.17	0.12
2003	273	1372	0.24	0.23	216	1931	0.19	0.28	175	3843	0.11	0.09	231	3053	0.12	0.20	104	1385	0.14	0.11
2004	298	2480	0.24	0.24	307	2349	0.24	0.30	238	8548	0.15	0.08	222	6748	0.11	0.19	119	1502	0.11	0.12
2005	307	3102	0.26	0.23	315	3974	0.28	0.23	273	3676	0.12	0.14	270	3436	0.10	0.24	167	1424	0.24	0.16
2006	325	2437	0.26	0.24	339	6462	0.28	0.28	341	15648	0.12	0.13	360	5477	0.10	0.22	189	3677	0.21	0.13
2007	419	6646	0.24	0.21	366	7390	0.27	0.29	418	6872	0.11	0.14	392	10895	0.10	0.20	207	1335	0.17	0.15
2008	349	5556	0.27	0.20	373	4338	0.25	0.26	327	12154	0.11	0.17	365	8249	0.09	0.23	176	2021	0.13	0.14
2009	240	1322	0.25	0.19	289	5340	0.25	0.30	273	2896	0.11	0.16	241	2295	0.11	0.22	167	1165	0.11	0.12
2010	235	2707	0.23	0.16	279	4384	0.23	0.28	370	8570	0.10	0.16	265	1994	0.09	0.23	166	2172	0.21	0.12
2011	214	4062	0.29	0.17	297	4312	0.25	0.24	421	4583	0.14	0.16	391	8680	0.07	0.22	158	3320	0.19	0.10
2012	218	2998	0.25	0.18	297	6600	0.24	0.23	407	2183	0.18	0.16	290	1944	0.09	0.22	140	1914	0.15	0.09
2013	225	5470	0.23	0.19	283	3262	0.21	0.23	391	3137	0.13	0.17	276	2706	0.08	0.22	144	1875	0.21	0.08
2014	267	8632	0.34	0.20	289	2618	0.19	0.23	650	7215	0.10	0.19	366	5640	0.07	0.23	202	2368	0.19	0.08
2015	270	8016	0.19	0.23	369	4775	0.15	0.24	772	5219	0.07	0.18	356	4931	0.05	0.22	262	4314	0.12	0.10
HEALTHCARE																				
Total	32	1185	0.20	0.15	23	685	0.27	0.24	9	210	0.25	0.04	33	1412	0.05	0.07	27	469	0.22	0.04
1999																				
2000	37	222	0.22	0.15					8	148	0.50	0.03	19	322	0.11	0.02				
2001	42	260	0.17	0.15					10	75	0.10	0.04	14	79	0.07	0.02				
2002	36	505	0.11	0.08					6	15	0.00	0.07	7	3	0.00	0.04				
2003	35	738	0.09	0.10	14	149	0.29	0.01	13	798	0.31	0.04	26	464	0.15	0.04				
2004	30	961	0.27	0.14	12	192	0.25	0.28					37	620	0.00	0.02				
2005	42	2305	0.33	0.24	24	948	0.21	0.23					16	1939	0.00	0.07				
2006	42	438	0.12	0.23	19	309	0.32	0.17					35	412	0.09	0.06				
2007	22	301	0.09	0.18	19	863	0.21	0.22					49	630	0.02	0.05	15	130	0.20	0.01
2008	26	1111	0.23	0.10	23	122	0.22	0.20					40	298	0.10	0.04	9	161	0.22	0.02
2009	19	204	0.32	0.10	18	80	0.28	0.29					22	40	0.09	0.07	14	243	0.00	0.03
2010	28	5675	0.25	0.10	21	1600	0.38	0.38					23	104	0.00	0.07	15	388	0.20	0.07
2011	18	202	0.28	0.13	27	510	0.33	0.38					29	23	0.03	0.07	19	273	0.26	0.05
2012	24	747	0.25	0.15	23	199	0.26	0.28					40	4218	0.08	0.07	33	601	0.21	0.05
2013	19	87	0.05	0.14	38	2797	0.18	0.03					39	4487	0.03	0.05	29	476	0.21	0.04
2014	41	744	0.20	0.13									46	2457	0.04	0.22	30	524	0.33	0.05
2015	45	2074	0.18	0.17	21	969	0.24	0.06					48	2999	0.06	0.05	34	574	0.18	0.04

Appendix A. (cont.)

Year	Japan				South Korea				Sweden				United Kingdom				United States			
	Maactivity	Madensity	Cash PMT	Cash/TA	Maactivity	Madensity	Cash PMT	Cash/TA	Maactivity	Madensity	Cash PMT	Cash/TA	Maactivity	Madensity	Cash PMT	Cash/TA	Maactivity	Madensity	Cash PMT	Cash/TA
ALL INDUSTRIES																				
Total	133	2600	0.40	0.16	50	1596	0.28	0.08	58	1320	0.15	0.16	231	8977	0.29	0.15	631	57244	0.26	0.16
1999	45	1125	0.16	0.14	9	1436	0.12	0.03	48	3259	0.21	0.10	242	9407	0.36	0.12	794	87131	0.28	0.14
2000	67	1860	0.19	0.12	12	978	0.06	0.04	98	3472	0.11	0.14	348	12723	0.30	0.14	997	77406	0.25	0.15
2001	72	1593	0.22	0.12	16	1096	0.10	0.05	79	1418	0.13	0.13	270	4491	0.27	0.15	637	33381	0.26	0.15
2002	107	2403	0.32	0.13	12	1084	0.05	0.05	44	194	0.08	0.14	212	4480	0.35	0.15	519	20085	0.25	0.15
2003	138	2509	0.43	0.14	11	450	0.10	0.06	29	493	0.11	0.16	195	5106	0.30	0.13	506	21033	0.24	0.17
2004	116	2495	0.20	0.14	11	672	0.11	0.06	46	662	0.09	0.16	204	6968	0.30	0.15	587	37505	0.25	0.16
2005	151	4088	0.27	0.15	13	621	0.12	0.07	60	1210	0.14	0.15	223	11023	0.37	0.17	626	51803	0.27	0.16
2006	155	2816	0.47	0.15	33	1041	0.41	0.07	65	2526	0.15	0.18	258	10369	0.33	0.18	653	62671	0.27	0.16
2007	166	3404	0.57	0.15	39	1574	0.52	0.07	88	1871	0.13	0.16	303	18737	0.30	0.17	698	82397	0.29	0.17
2008	184	2601	0.54	0.15	71	1370	0.53	0.07	67	2461	0.15	0.15	252	9327	0.26	0.16	624	45328	0.29	0.16
2009	166	2599	0.49	0.16	69	1114	0.31	0.07	53	264	0.11	0.16	184	4178	0.22	0.15	459	35644	0.23	0.17
2010	133	1747	0.44	0.17	51	1137	0.52	0.07	60	692	0.20	0.15	199	5802	0.27	0.16	506	50152	0.26	0.18
2011	119	2350	0.46	0.18	60	1782	0.56	0.08	73	2997	0.20	0.16	208	6073	0.28	0.15	540	60734	0.29	0.17
2012	131	3441	0.47	0.18	53	2460	0.29	0.08	55	744	0.18	0.16	187	8028	0.26	0.14	545	56349	0.26	0.17
2013	125	2192	0.44	0.19	50	1209	0.21	0.08	46	413	0.21	0.17	172	4632	0.26	0.16	546	70120	0.24	0.18
2014	127	2255	0.46	0.19	67	2468	0.16	0.09	38	1022	0.14	0.19	215	14490	0.27	0.17	654	92973	0.25	0.18
2015	152	3121	0.35	0.20	76	2249	0.09	0.10	49	623	0.10	0.21	219	14967	0.19	0.17	672	112503	0.20	0.17
BUSINESS SERVICES																				
Total	494	4754	0.43	0.27	144	3887	0.29	0.12	174	2833	0.13	0.18	714	14824	0.29	0.19	2614	114201	0.18	0.22
1999	143	1235	0.09	0.19	27	892	0.11	0.01	151	2429	0.11	0.20	791	13284	0.33	0.19	3004	155306	0.18	0.24
2000	301	3167	0.08	0.17	74	1696	0.12	0.05	256	7592	0.08	0.20	1155	19749	0.27	0.24	3967	207892	0.15	0.22
2001	296	1521	0.10	0.20	84	1178	0.14	0.03	209	3356	0.08	0.13	836	7678	0.23	0.23	2463	60772	0.19	0.22
2002	324	3337	0.22	0.22	46	1178	0.09	0.07	123	195	0.08	0.15	630	4669	0.33	0.23	1938	42219	0.20	0.22
2003	405	1777	0.28	0.22	34	256	0.03	0.12	76	726	0.09	0.17	588	7411	0.34	0.20	1905	45566	0.19	0.24
2004	439	7787	0.15	0.23	30	1116	0.27	0.11	128	908	0.10	0.18	621	11016	0.35	0.21	2381	70491	0.21	0.22
2005	557	8386	0.32	0.25	52	1213	0.15	0.17	164	2800	0.10	0.19	656	15677	0.40	0.19	2588	96183	0.21	0.22
2006	617	4345	0.57	0.26	117	7929	0.43	0.14	193	6199	0.17	0.22	778	16452	0.36	0.20	2803	145652	0.22	0.21
2007	639	4810	0.61	0.26	111	3308	0.59	0.11	251	4549	0.12	0.17	928	29751	0.35	0.18	3014	199586	0.21	0.22
2008	669	5403	0.62	0.26	202	3427	0.53	0.09	197	2671	0.11	0.18	774	21237	0.30	0.17	2718	109435	0.21	0.21
2009	635	6649	0.58	0.26	144	1318	0.30	0.10	145	500	0.13	0.18	552	7138	0.21	0.18	2005	46158	0.17	0.22
2010	467	2274	0.53	0.27	131	1974	0.44	0.09	170	950	0.14	0.15	608	11649	0.27	0.17	2279	112094	0.17	0.23
2011	424	3936	0.53	0.27	147	1750	0.52	0.11	220	7912	0.23	0.15	672	10831	0.25	0.16	2382	104108	0.18	0.22
2012	446	5648	0.43	0.30	151	1789	0.31	0.10	163	1058	0.17	0.15	581	22151	0.25	0.16	2341	108010	0.16	0.21
2013	427	4101	0.47	0.31	131	1429	0.21	0.11	157	713	0.18	0.18	563	10110	0.24	0.20	2347	127541	0.15	0.23
2014	438	4385	0.49	0.33	174	9899	0.14	0.15	138	3868	0.12	0.20	672	17610	0.26	0.18	2797	148139	0.16	0.23
2015	532	5864	0.32	0.33	196	8246	0.10	0.15	177	2071	0.10	0.23	680	21759	0.15	0.19	2915	183637	0.12	0.21
HEALTHCARE																				
Total	44	530	0.42	0.20					13	262	0.09	0.10	61	4525	0.31	0.07	365	24680	0.18	0.12
1999																	324	14196	0.21	0.09
2000													29	2581	0.31	0.01	224	9517	0.22	0.10
2001									6	79	0.00	0.04	46	692	0.39	0.06	207	3623	0.19	0.11
2002									3	0	0.00	0.06	53	1351	0.53	0.15	229	13006	0.27	0.12
2003	9	200	0.11	0.15					3	15	0.33	0.04	50	1050	0.28	0.10	245	19024	0.23	0.12
2004	14	26	0.21	0.20					7	30	0.14	0.04	44	4541	0.52	0.07	324	22494	0.17	0.13
2005	25	140	0.24	0.30									66	5863	0.35	0.07	377	26913	0.20	0.11
2006	32	98	0.66	0.25									65	7868	0.25	0.12	395	92757	0.17	0.11
2007	57	754	0.67	0.28									81	8210	0.23	0.02	422	43476	0.22	0.13
2008	38	276	0.47	0.20					24	29	0.13	0.19	68	3679	0.26	0.02	375	9935	0.15	0.13
2009	46	912	0.41	0.14					13	8	0.00	0.15	55	1697	0.25	0.05	320	6327	0.12	0.12
2010	47	2676	0.36	0.14					25	1732	0.04	0.15					397	32130	0.17	0.12
2011	35	299	0.40	0.20					26	201	0.12	0.14					443	31920	0.16	0.11
2012	41	319	0.51	0.18													469	19084	0.12	0.10
2013	44	242	0.32	0.18													497	21024	0.10	0.15
2014	48	327	0.40	0.20									70	4044	0.27	0.15	497	19038	0.11	0.13
2015	61	495	0.25	0.19									71	2084	0.07	0.05	617	48199	0.11	0.13

Appendix A. (cont.)

Year	Australia				Canada				France				Germany				India			
	Maactivity	Madensity	Cash PMT	CashTA	Maactivity	Madensity	Cash PMT	CashTA	Maactivity	Madensity	Cash PMT	CashTA	Maactivity	Madensity	Cash PMT	CashTA	Maactivity	Madensity	Cash PMT	CashTA
WHOLESALE																				
Total	62	1718	0.23	0.13	59	1062	0.22	0.08	79	1339	0.13	0.08	79	2660	0.07	0.10	26	442	0.20	0.05
1999	46	603	0.20	0.01	57	203	0.30	0.04	79	2963	0.24	0.07	131	594	0.06	0.02				
2000	62	684	0.19	0.04	76	1490	0.21	0.02	146	1667	0.23	0.08	109	18413	0.07	0.12				
2001	62	449	0.15	0.07	58	740	0.33	0.06	77	215	0.10	0.05	74	1546	0.14	0.10				
2002	49	433	0.20	0.08	49	561	0.31	0.08	44	138	0.20	0.06	70	467	0.10	0.08	7	267	0.14	0.01
2003	51	822	0.33	0.13	36	410	0.14	0.06	57	1568	0.07	0.07	67	1841	0.06	0.12	12	39	0.33	0.07
2004	67	3967	0.25	0.11	52	422	0.23	0.05	39	1526	0.10	0.06	68	1332	0.07	0.10	14	164	0.21	0.10
2005	84	455	0.25	0.10	62	1159	0.27	0.03	57	1328	0.11	0.08	63	2144	0.14	0.06	36	900	0.28	0.14
2006	81	1245	0.26	0.13	53	2217	0.26	0.02	89	1039	0.06	0.09	67	183	0.04	0.08	13	54	0.00	0.12
2007	85	1975	0.28	0.14	59	2788	0.36	0.01	87	2876	0.09	0.09	134	285	0.02	0.16	21	291	0.05	0.07
2008	71	1186	0.20	0.15					87	4247	0.13	0.08	69	424	0.06	0.11	20	428	0.35	0.03
2009	41	1643	0.15	0.16					53	835	0.13	0.09	51	48	0.02	0.13	40	95	0.18	0.08
2010	56	2619	0.25	0.19					64	590	0.08	0.09	79	891	0.04	0.17	38	126	0.21	0.06
2011	55	1173	0.27	0.17	47	381	0.17	0.17	95	561	0.11	0.09	70	780	0.07	0.08	30	371	0.33	0.05
2012	70	6092	0.21	0.13	63	4676	0.21	0.07	81	2962	0.14	0.09	58	68	0.03	0.09	30	68	0.30	0.07
2013	47	2720	0.23	0.11	61	921	0.15	0.07	76	603	0.11	0.09	63	5385	0.10	0.08	20	66	0.10	0.06
2014	29	403	0.14	0.08	65	347	0.20	0.09	103	306	0.06	0.11	67	1660	0.04	0.11	28	10	0.11	0.04
2015	54	582	0.15	0.08	60	610	0.10	0.21	141	833	0.04	0.11	73	161	0.05	0.08	25	1424	0.24	0.04
RETAIL																				
Total	52	4217	0.22	0.14	43	4693	0.27	0.05	55	5230	0.15	0.09	78	2113	0.05	0.15	26	717	0.14	0.03
1999	40	388	0.38	0.02	66	3526	0.36	0.04	52	20617	0.40	0.08	86	1014	0.07	0.23				
2000	56	1119	0.20	0.03	62	946	0.31	0.10	67	1560	0.18	0.06	102	8176	0.10	0.14				
2001	85	2586	0.27	0.03	52	1751	0.42	0.08	38	5037	0.16	0.08	46	45	0.02	0.06				
2002	41	413	0.17	0.15	27	879	0.44	0.08	33	6750	0.18	0.09	44	2525	0.11	0.07				
2003	53	1727	0.34	0.16					27	1980	0.26	0.07	57	1118	0.04	0.08				
2004	61	1971	0.30	0.11					43	8121	0.12	0.05	50	3310	0.10	0.12				
2005	54	1260	0.17	0.15	40	3009	0.43	0.03	44	4680	0.07	0.09	56	2144	0.05	0.20				
2006	58	17201	0.36	0.12	38	847	0.21	0.02	58	7971	0.12	0.10	61	707	0.03	0.16				
2007	68	18174	0.26	0.16	59	2001	0.27	0.03	63	3945	0.05	0.11	97	3509	0.01	0.16	15	41	0.20	0.07
2008	52	1526	0.15	0.15	42	1556	0.40	0.05	55	2250	0.07	0.10	79	223	0.01	0.14	24	322	0.08	0.04
2009	43	766	0.14	0.16	34	1270	0.35	0.05	50	2321	0.16	0.11	83	256	0.06	0.17	22	165	0.09	0.02
2010	67	2101	0.15	0.14	36	2979	0.36	0.03	55	3464	0.16	0.10	85	295	0.04	0.26	20	104	0.05	0.02
2011	42	1682	0.14	0.16	46	4340	0.33	0.06	85	4085	0.14	0.09	84	803	0.06	0.14	22	95	0.23	0.03
2012	42	2603	0.26	0.15	37	2204	0.30	0.06	71	2369	0.13	0.10	86	2943	0.08	0.07	33	451	0.03	0.02
2013	46	983	0.15	0.17	40	21389	0.23	0.04	77	2664	0.19	0.09	98	795	0.06	0.17	21	65	0.10	0.04
2014	30	4039	0.30	0.16	36	1158	0.22	0.04	88	7910	0.13	0.10	96	1046	0.04	0.20	23	1128	0.26	0.02
2015	29	470	0.14	0.12	38	714	0.13	0.04	122	3449	0.06	0.11	125	7060	0.02	0.21	32	1581	0.13	0.02
COMMUNICATION																				
Total	42	3577	0.33	0.20	63	9167	0.25	0.07	36	12967	0.18	0.13	43	14287	0.17	0.14	32	5982	0.24	0.09
1999					112	14658	0.21	0.05	39	17632	0.49	0.08	64	248327	0.09	0.07				
2000	59	1899	0.20	0.17	138	26539	0.31	0.11	44	15566	0.20	0.10	94	32032	0.23	0.25	53	737	0.00	0.01
2001	51	9064	0.27	0.06	90	2548	0.20	0.05	41	12166	0.17	0.12	65	5780	0.11	0.14	29	396	0.03	0.17
2002	49	841	0.18	0.09	71	9573	0.18	0.07	33	20940	0.30	0.10	54	2070	0.13	0.10	25	957	0.24	0.08
2003	56	764	0.30	0.15	32	891	0.16	0.11	33	9688	0.15	0.06	41	4575	0.27	0.15	30	169	0.10	0.10
2004	37	892	0.38	0.21	48	6950	0.25	0.07	43	4489	0.12	0.06	54	6982	0.17	0.16	25	1071	0.32	0.10
2005	53	1102	0.26	0.15	41	1522	0.27	0.05	34	11187	0.21	0.19	46	8690	0.15	0.18	38	13231	0.29	0.08
2006	50	2925	0.28	0.19	46	9158	0.22	0.08	37	18168	0.24	0.10	43	16544	0.19	0.20	51	8934	0.08	0.08
2007	69	2527	0.30	0.27	45	55344	0.38	0.03	36	20500	0.14	0.15	61	3714	0.10	0.12	49	20167	0.20	0.14
2008	41	2836	0.37	0.25	36	2147	0.33	0.02	31	349	0.06	0.10	49	3902	0.14	0.09	55	8704	0.16	0.10
2009	40	8292	0.43	0.24	42	2698	0.26	0.02	24	1741	0.08	0.12	32	6875	0.16	0.12	42	11529	0.26	0.09
2010	27	9114	0.52	0.28	36	8569	0.39	0.02	46	11859	0.09	0.14	33	558	0.06	0.12	35	2944	0.11	0.09
2011	31	8159	0.61	0.23	35	1904	0.26	0.03	29	1335	0.21	0.13	39	5001	0.23	0.12	17	1746	0.29	0.10
2012	25	4759	0.32	0.15	29	1750	0.31	0.08	36	779	0.14	0.17	18	1831	0.11	0.09	33	1583	0.21	0.07
2013	24	1242	0.17	0.20	43	3253	0.28	0.10	23	1930	0.22	0.18	19	21703	0.21	0.17	17	4135	0.29	0.06
2014	21	445	0.29	0.23	23	6263	0.39	0.11	33	51265	0.21	0.20	18	8187	0.28	0.15	23	870	0.35	0.08
2015	24	3210	0.33	0.21	24	2264	0.08	0.04	42	17113	0.21	0.24	16	5227	0.25	0.10	26	8209	0.27	0.09

Appendix A. (cont.)

Year	Japan				South Korea				Sweden				United Kingdom				United States			
	Maactivity	Madensity	Cash PMT	CashTA	Maactivity	Madensity	Cash PMT	CashTA	Maactivity	Madensity	Cash PMT	CashTA	Maactivity	Madensity	Cash PMT	CashTA	Maactivity	Madensity	Cash PMT	CashTA
WHOLESALE																				
Total	**216**	**3048**	**0.31**	**0.14**	**36**	**719**	**0.26**	**0.08**	**46**	**581**	**0.08**	**0.10**	**168**	**3638**	**0.27**	**0.10**	**374**	**20009**	**0.17**	**0.09**
1999	119	1703	0.12	0.13	5	5	0.00	0.04	48	1218	0.15	0.07	265	4853	0.38	0.13	534	17392	0.23	0.06
2000	131	4783	0.15	0.12	11	17	0.00	0.04	39	312	0.10	0.11	263	4460	0.32	0.10	453	25983	0.20	0.06
2001	174	2115	0.14	0.12	10	34	0.00	0.06	33	94	0.03	0.11	186	7879	0.32	0.08	280	11577	0.22	0.08
2002	259	2375	0.22	0.13	15	78	0.00	0.05	22	191	0.09	0.18	156	2582	0.32	0.09	258	7441	0.14	0.08
2003	272	4563	0.39	0.13	9	2	0.11	0.07	20	7	0.05	0.18	140	1419	0.25	0.08	320	9061	0.18	0.09
2004	208	2275	0.14	0.13	5	79	0.20	0.08	32	264	0.09	0.19	124	2506	0.31	0.10	341	12369	0.16	0.09
2005	293	4287	0.17	0.13	8	84	0.50	0.11	41	601	0.10	0.10	138	7835	0.31	0.13	434	14324	0.17	0.10
2006	207	3062	0.37	0.13	21	78	0.48	0.10	51	497	0.06	0.09	166	3896	0.33	0.15	425	21724	0.20	0.09
2007	236	2394	0.50	0.12	21	363	0.48	0.14	62	108	0.08	0.08	205	6582	0.23	0.12	463	39598	0.17	0.08
2008	266	2480	0.45	0.13	42	1022	0.55	0.11	60	470	0.07	0.23	194	915	0.18	0.11	410	17302	0.17	0.08
2009	203	2772	0.45	0.15	43	3410	0.28	0.11	26	113	0.08	0.05	95	269	0.19	0.08	247	9589	0.15	0.10
2010	233	1157	0.35	0.15	47	407	0.40	0.08	51	1624	0.06	0.04	86	2121	0.26	0.09	284	22459	0.19	0.10
2011	179	1668	0.29	0.15	63	721	0.57	0.07	75	765	0.13	0.10	140	3471	0.18	0.08	359	15151	0.20	0.10
2012	215	8148	0.40	0.15	39	172	0.21	0.09	50	2530	0.14	0.09	130	1069	0.18	0.07	322	18693	0.13	0.09
2013	165	1343	0.34	0.16	39	679	0.10	0.07	39	153	0.05	0.06	97	659	0.22	0.10	345	31312	0.11	0.08
2014	173	3155	0.36	0.15	47	1033	0.13	0.07	34	86	0.06	0.06	131	1611	0.18	0.06	409	16341	0.13	0.08
2015	231	2315	0.25	0.15	51	1173	0.08	0.08	47	147	0.04	0.07	110	1336	0.06	0.06	466	65195	0.11	0.09
RETAIL																				
Total	**195**	**4929**	**0.40**	**0.14**	**21**	**2621**	**0.25**	**0.08**	**28**	**1003**	**0.10**	**0.10**	**139**	**14800**	**0.27**	**0.09**	**356**	**55950**	**0.25**	**0.10**
1999	102	1757	0.08	0.12	8	344	0.25	0.01					212	24956	0.35	0.07	540	36622	0.25	0.11
2000	107	4689	0.14	0.12	7	0	0.00	0.03					209	5643	0.30	0.07	546	26217	0.24	0.10
2001	108	2870	0.19	0.11	8	35	0.00	0.08					149	2988	0.32	0.06	317	15337	0.25	0.10
2002	165	4483	0.27	0.12	4	461	0.00	0.09	9	26	0.00	0.06	127	8242	0.45	0.07	289	16813	0.23	0.10
2003	244	2359	0.32	0.12	3	136	0.33	0.11	16	154	0.06	0.07	161	18498	0.25	0.07	326	31266	0.25	0.10
2004	172	3383	0.16	0.13	5	29	0.20	0.08	22	1780	0.05	0.05	147	31665	0.29	0.08	367	59391	0.24	0.11
2005	232	9835	0.26	0.14	7	894	0.14	0.14	30	213	0.07	0.11	163	13489	0.32	0.09	364	61013	0.33	0.10
2006	242	6877	0.54	0.14	18	3554	0.39	0.07	38	788	0.08	0.11	130	10800	0.31	0.10	382	47542	0.24	0.10
2007	245	10296	0.57	0.15	20	3087	0.40	0.09	39	2343	0.13	0.08	158	90334	0.30	0.10	444	126027	0.26	0.09
2008	268	5456	0.52	0.13	25	2834	0.36	0.06	28	32	0.04	0.02	114	8038	0.19	0.10	345	24918	0.25	0.09
2009	231	2633	0.46	0.13	16	639	0.31	0.07	30	407	0.13	0.12	132	1845	0.10	0.09	248	33298	0.20	0.11
2010	168	2107	0.51	0.13	18	2256	0.28	0.06	34	739	0.12	0.11	115	8985	0.22	0.10	271	52098	0.28	0.13
2011	159	2805	0.49	0.15	23	6889	0.52	0.08	27	322	0.11	0.05	109	4585	0.19	0.08	301	101149	0.32	0.13
2012	160	4593	0.43	0.15	37	2526	0.24	0.06	24	139	0.04	0.15	102	4552	0.17	0.09	313	63651	0.29	0.12
2013	199	4764	0.49	0.15	20	1340	0.20	0.07	39	3753	0.10	0.12	93	1446	0.17	0.10	295	114873	0.23	0.11
2014	177	5233	0.44	0.15	20	122	0.20	0.08	21	881	0.19	0.15	76	6548	0.20	0.12	299	64142	0.23	0.11
2015	172	4992	0.41	0.16	40	6975	0.13	0.10	21	189	0.10	0.09	91	9677	0.19	0.13	341	137465	0.25	0.10
COMMUNICATION																				
Total	**42**	**8758**	**0.40**	**0.17**	**27**	**1708**	**0.30**	**0.07**	**16**	**4099**	**0.20**	**0.13**	**73**	**17959**	**0.31**	**0.15**	**372**	**147184**	**0.24**	**0.12**
1999					31	2760	0.23	0.02	11	487	0.27	0.08	64	76584	0.36	0.07	659	656558	0.20	0.14
2000	72	25864	0.11	0.09	21	3934	0.14	0.03	22	9164	0.05	0.06	130	67492	0.28	0.24	730	167442	0.18	0.11
2001	44	11981	0.09	0.11	62	2323	0.13	0.04	26	1861	0.15	0.04	87	13554	0.24	0.21	440	84896	0.20	0.10
2002	48	2950	0.10	0.12	21	9929	0.10	0.03	17	52	0.06	0.06	58	1383	0.33	0.17	349	23848	0.24	0.11
2003	46	9587	0.26	0.14	11	1262	0.00	0.04	21	1362	0.24	0.12	61	3232	0.23	0.14	375	29520	0.25	0.12
2004	47	21593	0.34	0.14	14	491	0.21	0.06	12	2822	0.17	0.10	78	6667	0.36	0.14	439	74544	0.21	0.12
2005	66	22597	0.44	0.15	15	832	0.00	0.05	22	3089	0.27	0.18	91	45907	0.45	0.18	383	159734	0.27	0.12
2006	48	18805	0.42	0.21	57	1474	0.54	0.05	21	845	0.19	0.24	93	24138	0.34	0.17	390	132787	0.27	0.13
2007	56	1760	0.41	0.16	46	2054	0.46	0.04	22	39	0.14	0.29	92	12489	0.29	0.17	388	124877	0.26	0.13
2008	65	3123	0.40	0.14	39	3908	0.56	0.08	23	42805	0.13	0.16	72	5491	0.31	0.13	323	81771	0.27	0.12
2009	26	2209	0.62	0.17	44	5256	0.30	0.07	15	12	0.07	0.18	74	12396	0.19	0.15	257	64997	0.21	0.13
2010	45	2501	0.49	0.18	31	2449	0.61	0.08	11	1273	0.55	0.13	57	14933	0.46	0.17	220	100132	0.26	0.13
2011	19	7909	0.58	0.19	26	189	0.54	0.07	17	4252	0.29	0.09	45	8983	0.31	0.10	183	81481	0.32	0.12
2012	34	5988	0.38	0.19	19	408	0.32	0.08	6	0	0.00	0.12	53	2300	0.26	0.11	208	113128	0.31	0.12
2013	20	2978	0.40	0.22	19	426	0.32	0.08	13	265	0.23	0.13	54	4416	0.24	0.12	232	231288	0.25	0.12
2014	27	15322	0.59	0.23	19	555	0.05	0.09	13	140	0.23	0.12	47	22233	0.26	0.15	195	219028	0.24	0.12
2015	23	169	0.35	0.24	21	2660	0.14	0.11	12	561	0.17	0.10	43	27591	0.21	0.12	148	116224	0.22	0.12

Appendix B. Break-down of takeover activities by industries

Target industry	Complete rate	Withdraw rate	Quick withdraw rate	Domestic acquirer rate	Foreign acquirer rate	US acquirer rate	JP acquirer rate	Tech-deal rate	Intra-industry rate	Inter-industry rate	Wholly-owned rate	Control rate	Cash deal rate	Cash-only deal rate	Average cash payment
Agriculture	0.83	0.01	0.01	0.79	0.21	0.26	0.12	0.01	0.35	2.22	0.72	0.79	0.21	0.19	95.4
Aircraft	0.82	0.02	0.01	0.76	0.24	0.59	0.06	0.15	0.37	2.01	0.81	0.84	0.29	0.24	95.6
Apparel	0.77	0.02	0.01	0.80	0.20	0.32	0.17	0.00	0.32	2.81	0.58	0.68	0.29	0.25	94.3
Automobiles & Truck	0.76	0.02	0.02	0.72	0.28	0.21	0.31	0.02	0.42	1.68	0.49	0.62	0.32	0.30	96.8
Beer & Liquor	0.80	0.02	0.02	0.73	0.27	0.17	0.11	0.00	0.56	1.07	0.65	0.75	0.21	0.19	96.5
Business Services	0.86	0.01	0.01	0.80	0.20	0.38	0.17	0.40	0.54	0.90	0.70	0.78	0.24	0.19	88.7
Business Supplies	0.76	0.02	0.02	0.79	0.21	0.27	0.29	0.00	0.44	1.56	0.58	0.71	0.32	0.30	96.0
Candy & Soda	0.82	0.01	0.01	0.82	0.18	0.38	0.25	0.00	0.45	1.69	0.73	0.79	0.25	0.23	94.2
Chemicals	0.75	0.01	0.01	0.78	0.22	0.21	0.29	0.01	0.46	1.37	0.57	0.71	0.27	0.26	96.9
Coal	0.68	0.05	0.04	0.66	0.34	0.24	0.02	0.00	0.43	2.04	0.55	0.66	0.30	0.23	87.2
Communication	0.79	0.02	0.02	0.82	0.18	0.47	0.07	0.53	0.52	1.05	0.67	0.77	0.26	0.21	90.3
Computers	0.80	0.02	0.02	0.80	0.20	0.44	0.18	0.62	0.24	3.56	0.67	0.74	0.31	0.26	91.6
Construction	0.79	0.01	0.01	0.84	0.16	0.15	0.43	0.01	0.33	2.73	0.55	0.69	0.31	0.29	95.5
Construction Mat	0.78	0.01	0.01	0.80	0.20	0.22	0.30	0.01	0.39	1.94	0.60	0.71	0.30	0.28	97.0
Consumer Goods	0.77	0.02	0.01	0.80	0.20	0.27	0.26	0.04	0.33	2.60	0.57	0.68	0.32	0.29	96.1
Defense	0.72	0.02	0.01	0.85	0.15	0.84	0.01	0.25	0.31	2.76	0.85	0.87	0.42	0.34	94.0
Electrical Equipment	0.78	0.01	0.01	0.78	0.22	0.28	0.30	0.15	0.28	3.27	0.58	0.71	0.30	0.28	95.9
Electronic Equipment	0.79	0.02	0.02	0.78	0.22	0.40	0.16	0.56	0.40	1.93	0.63	0.71	0.35	0.29	92.5
Entertainment	0.79	0.02	0.02	0.78	0.22	0.31	0.12	0.03	0.38	1.81	0.65	0.74	0.22	0.18	90.7
Fabricated Products	0.83	0.01	0.01	0.81	0.19	0.37	0.20	0.03	0.19	5.37	0.67	0.76	0.25	0.22	96.9
Food Products	0.80	0.01	0.01	0.84	0.16	0.21	0.33	0.01	0.46	1.51	0.56	0.70	0.30	0.29	96.4
Healthcare	0.87	0.01	0.01	0.89	0.11	0.69	0.05	0.29	0.58	0.84	0.80	0.85	0.19	0.14	88.9
Machinery	0.80	0.01	0.01	0.77	0.23	0.27	0.31	0.04	0.36	2.22	0.61	0.73	0.31	0.29	96.1
Measuring & Cont	0.83	0.02	0.01	0.79	0.21	0.52	0.21	0.49	0.30	2.67	0.75	0.80	0.33	0.28	93.6
Medical Equipment	0.83	0.02	0.01	0.77	0.23	0.56	0.07	0.51	0.43	1.77	0.71	0.76	0.35	0.27	90.3
Non-Metallic	0.61	0.05	0.04	0.69	0.31	0.05	0.01	0.00	0.39	1.74	0.48	0.59	0.34	0.24	83.6
Personal Service	0.85	0.01	0.01	0.89	0.11	0.41	0.25	0.03	0.46	1.33	0.74	0.80	0.22	0.19	93.4
Petroleum	0.72	0.03	0.03	0.73	0.27	0.37	0.03	0.00	0.58	0.78	0.62	0.73	0.30	0.23	89.3
Pharmaceutical	0.78	0.02	0.02	0.72	0.28	0.44	0.07	0.63	0.54	0.95	0.66	0.73	0.31	0.25	90.0
Precious Metals	0.62	0.06	0.04	0.73	0.27	0.06	0.00	0.00	0.51	1.11	0.48	0.58	0.34	0.22	80.5
Printing & Public	0.84	0.01	0.01	0.84	0.16	0.34	0.17	0.05	0.46	1.57	0.71	0.79	0.22	0.19	92.6
Recreation	0.79	0.02	0.02	0.81	0.19	0.35	0.27	0.11	0.31	2.87	0.56	0.65	0.32	0.29	94.1
Restaurants, Hotel	0.81	0.02	0.02	0.83	0.17	0.35	0.24	0.00	0.39	1.74	0.73	0.80	0.27	0.25	96.0
Retail	0.80	0.02	0.01	0.89	0.11	0.37	0.34	0.07	0.45	1.39	0.68	0.76	0.30	0.27	95.5
Rubber & Plastic	0.80	0.01	0.01	0.80	0.20	0.24	0.27	0.02	0.26	3.16	0.62	0.74	0.28	0.26	97.4
Shipbuilding &R	0.71	0.03	0.02	0.80	0.20	0.29	0.19	0.02	0.36	1.90	0.57	0.71	0.27	0.25	97.4
Shipping Contain	0.74	0.00	0.00	0.83	0.17	0.26	0.38	0.00	0.28	2.75	0.60	0.81	0.31	0.28	94.2
Steel Works	0.73	0.02	0.02	0.81	0.20	0.18	0.30	0.02	0.41	1.85	0.49	0.65	0.28	0.26	97.2
Textiles	0.64	0.03	0.03	0.85	0.15	0.09	0.21	0.01	0.27	3.47	0.38	0.57	0.34	0.33	98.9
Tobacco Products	0.63	0.07	0.04	0.76	0.24	0.59	0.01	0.00	0.57	0.37	0.65	0.70	0.44	0.41	95.9
Transportation	0.84	0.02	0.01	0.82	0.18	0.30	0.29	0.02	0.55	0.92	0.67	0.78	0.21	0.18	93.9
Wholesale	0.82	0.01	0.01	0.87	0.13	0.28	0.46	0.05	0.38	2.07	0.68	0.78	0.25	0.22	95.2
Total	0.79	0.02	0.02	0.80	0.20	0.32	0.21	0.21	0.43	1.70	0.63	0.73	0.29	0.25	92.7

Appendix C. List of variables

Variable name	Variable description
Dependent variable - Firm-level (From Compustat Global)	
cashta	Ratio of cash and cash equivalent, to book value of total assets.
repo_asset	The difference between purchase of common and preferred stock and sale of common and preferred stock, scaled by book value of total assets.
acqui_asset	The ratio of acquisition expenditure to book value of total assets.
Variables of interest - Industry level (SDC Platinum and Compustat Global)	
MAactivity	Number of all M&A attempts to industry targets, including completed, pending, withdrawn, or unknown status, log-normalized.
MAdensity	Total dollar value of all M&A attempts to industry targets, including completed, pending, withdrawn, or unknown status, log-normalized.
Control variables - Firm level (Compustat Global)	
mtb	Market-to-book ratio, a proxy for investment opportunities
sizerank	Percentile ranking of firm size within each country-industry-year, a proxy for life cycle.
cfassets	Earnings after interest, dividends, taxes but before depreciation to total assets, a proxy for profitability.
nwc	Net working capital scaled by total assets, a proxy for liquidity demand and substitute for cash.
capat	The ratio of capital expenditure to total assets, a proxy for productivity and temporary investment requirements and financial distress costs.
lev	Sum of long-term debt and debt in current liabilities, divided by assets, a proxy for financial distress.
dpayer	Binary variable that takes value of 1 in years a firm pays common dividend and 0 otherwise, a proxy for payout policy and accessibility to financial markets.
rdsales	R&D spending over sales where firms that do not report R&D expenses are treated as having no R&D expenses, a proxy for growth opportunities.
acqui	Acquisition expenditure divided by total assets, a proxy for investment policy via acquisition activities.
kz1997	Financial constraint measure following Kaplan-Zingales (1998).
chassets	Year-on-year change in assets, a proxy for asset growth rate.
rete	Ratio of retained earnings to total equity, a proxy for life cycle.
cashrich	A binary variable that takes value of 1 if firms are in top tercile of cash holdings each country-year.
cashpoor	A binary variable that takes value of 1 if firms are in bottom tercile of cash holdings each country-year.
Control variables - Industry level (Compustat)	
rdintense	A binary variable that takes value of 1 if in R&D-intensive industries, zero otherwise, a proxy for risk.
Control variables - Country level (World Bank, IMF, Beck & Levine, La Porta et al., Hofstede)	
credit_gdp	Total bank credit to GDP for each year
acct_std_1990	Quality of accounting standards (LLSV, 1998)
ADRI	Anti-directorship rights index (by DLLS, 2006, and by Spamann, 2008)
RL	Rule of law (by World Governance Indices)
IPI	Investor protection index, the product of ADRI and RL.

CHAPTER 4

CONCLUSIONS

My first essay documents positive impact of industry competition on corporate cash holdings. My second essay reports a positive influence of industry takeover threats on corporate cash holdings. Both essays support trade-off theory of corporate liquidity which assert that the optimal choice of cash level depends on the offsetting between the disciplinary effect of product market on corporate free cash flow, and the risk management effect of excess cash under operational risks at product market level.

Using large international data sets spanning developed and emerging economiecs from 1999 through 2015, I find that on average, firms hold more percentage of total assets in the form of cash and cash equivalent under both intensified industry pricing competition, and industry takeover threats. My results are qualitatively and quantitatively similar after a number of robustness checks and alternative identification methods, such as excluding potential dominating effect of U.S. firms or cash-rich firms, dividing into sub-periods of pre-crisis, crisis, and post-crisis times, and controlling for unobservable factors with different fixed effects. Further tests find that both impacts vary across firms of different financial strength and needs, and across countries with different financial development and investor protection. In addition, I confirm the substitute effect between product market disciplines and investor protection at country level.

My dissertation as a whole suggests that there is a strategic dimension of cash holdings in preparation for unexpected risk from product market dynamics. It is important to investigate how stock market development and credit market development differ in the way they perceive product market risks and facilitate or hinder the level of cash holdings in preparation for these risks. My work suggests further examination on the risk factor of product market dynamics.

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EDUCATION

Ph.D., Business Administration with concentration in Finance, The University of Texas at Arlington (2012-2017)

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