Three Essays on Corporate Finance

by

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Abstract

The thesis consists of three essays. In the first essay, we investigate the relation between excess cash holdings and future stock returns using a sample of firms in developed markets and emerging markets. The results show a positive relation between excess cash and future returns in developed markets but not in emerging markets. In developed markets, firms with higher excess cash have higher market betas and invest more in the future. Furthermore, the positive relation between excess cash and future stock returns is driven by rising market states. In contrast, we do not find similar patterns in emerging market. When we use the United Kingdom to represent developed Europe and South Korea to represent emerging Asia, we get similar results. Overall, the evidence suggests that excess cash holdings proxy for growth opportunities in developed markets but not in emerging markets.

In the second essay, we investigate corporate cash holdings in developed countries. In particular, we find that the cash held by developed European companies is on average lower than that held by the US firms. This research assesses the cash difference between firms in developed Europe and the US and seeks to account for this difference. Results indicate that developed European firms hold less cash than are US firms, and this is largely explained by the regional differences in intangible assets. We further find that the difference in intangible assets between developed Europe and the US is mainly driven by sector specialization. This finding supports the literature that US companies outperform European firms in high R&D intensity sectors.

In the third essay, we examine the relation between corporate debt maturity and cross-sectional equity returns in non-US markets. Prior research has shown that the maturity structure of corporate debt matters in explaining the cross-section of equity risk premium of US stocks. In the US, debt refinancing intensity, as measured by the ratio of short-term to total debt, is associated with a positive risk premium. This essay re-evaluates this relation in international stocks. We find a similar positive relation between debt refinancing intensity and cross-sectional equity risk premium in developed European markets but not in emerging Asian markets. In developed Europe, the positive relation is driven by firms with low levels of information asymmetry. The results are consistent with the theory that investors demand compensation for risks associated with refinancing of short-term debt, especially for firms where short-term debt plays a limited role in reducing agency risks.

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Chapter 1 General Introduction

This thesis consists of three essays on corporate finance. In the first essay, we explore the effects of corporate cash reserves on future stock returns of international stocks. Cash is crucial for corporate operations and investments. Firms build up cash reserves for future operating cash flow, debt repayment, dividend payment, and project investment. The cash held by a firm reflects the firm's financial flexibility and potential investment opportunities. Simutin (2010) points out that firms hold excess cash in anticipation of future investment opportunities and that excess cash proxies for risky growth opportunities. In this sense, investment opportunities can serve as a determinant of corporate cash holdings and corporate cash reserves and future stock returns are expected to be positively correlated. Prior research has documented this positive relation for firms incorporated and listed in the US stock market. However, the US and international countries are different in many aspects, this positive relation may not exist in international context. The difference in corporate governance between developed and emerging markets could play a crucial role in the relationship between excess cash and stock returns. Emerging markets typically have weaker governance and investor protection than developed markets. In markets with poor investor protection, insiders may be motivated to maintain high cash holdings for personal benefits and potential exploitation of minority investors (Jensen, 1986; Nikolov and Whited, 2014; La Porta et al., 2000b). If firms with excess cash in these countries do not necessarily indicate riskier growth opportunities, investors may not demand higher stock returns. Consequently, excess cash holdings are less likely to be positively correlated with future stock returns in emerging markets. In Chapter 2, therefore, we test the relation between corporate excess cash and future stock returns for international firms.

From the first essay, we confirm that the cash levels in the US and developed Europe are basically driven by the same determinants. The difference in those determinants between the US and developed Europe should result in a cash difference between the two regions. This motivates our second essay. In the second essay, we quantify the corporate cash difference between the US and developed Europe and explore how much this difference is explained by corporate intangible assets. Intangible capital are assets associated with knowledge, information technology, brand, and employee training. These assets are becoming dramatically popular in modern corporations. Falato, Kadyrzhanova, Sim, and Steri (2022) show that the increase in the use of intangible assets accounts for a large portion of the increase in corporate cash holdings of US firms because intangible assets shrink firm's abilities of debt financing. Prior studies have revealed that corporate cash balances are very different, even for seemingly comparable firms. Furthermore, the US and developed European countries differ in their investment in intangible assets. Be more specific, we observe that the difference in intangible capital between the US and developed Europe is primarily driven by high R&D intensity sectors. This aligns with the concept of sector specialization. Moncada-Paternò-Castello, Ciupagea, Smith, Tübke, and Tubbs (2010) illustrate that US firms exhibit stronger sectoral specialization in high R&D intensity sectors, with a higher number of R&D investing firms in these sectors. Consequently, we anticipate a significant cash difference between the US and developed Europe, primarily originating from high R&D intensity sectors. In Chapter 3, we evaluate this potential difference in cash and test whether intangible capital explains this difference.

In the third essay, we focus on the cross-sectional relation between corporate debt maturity and stock returns in non-US markets. Extant literature does not consider debt maturity when studying the leverage effects on the cross-section of equity returns. Friewald, Nagler, and Wagner

(2022) fill this gap and provide evidence that debt maturity matters in studying the cross-sectional effects of financial leverage on stock returns of US stocks. They empirically show that short-term debt and long-term debt are priced differently by shareholders. Short-term debt is associated with a positive equity risk premium, while long-term debt is not. He and Xiong (2012) demonstrate that short-term debt exposes equity holders to debt refinancing risk, while long-term debt does not. Short-term debt typically involves debt instruments with shorter maturities. This exposes the company to frequent refinancing needs. If market conditions are unfavorable or interest rates rise, refinancing becomes more challenging, leading to increased uncertainty and potential disruptions in cash flow. Therefore, shareholders demand a premium for short-term compared to long-term debt. On the other hand, shareholders may not demand higher returns for long-term debt, as it offers advantages to equity holders. Long-term debt is less sensitive to changes in interest rates and market conditions. Furthermore, long-term debt requires less frequent repayments, demanding a lower level of liquidity. It is true that long-term debt compared to short-term debt is associated with higher maturity risk, but the entities who are facing maturity risk are primarily debt holders. Equity holders, particularly institutional investors with longer investment horizons, may even have a preference for stable and predictable cash flows associated with long-term debt, which could offset the perceived maturity risk. Therefore, short-term debt carries a positive equity risk premium, whereas long-term debt does not. In Chapter 4, we test the relation between short-term debt and cross-sectional stock returns for firms in developed Europe and emerging Asia respectively. We find that the relation is positive in developed Europe and not significant in emerging Asia. We show that information asymmetry negatively affects the relation between short-term debt and stock returns in developed Europe but has no moderating role in emerging Asia. The results are consistent with the suggestion that shareholders demand higher returns to compensate for refinancing risks associated with short-term debt, especially for firms where short-term debt plays a limited role in reducing agency risks. If short-term debt is effective in reducing agency risks, such as for firms with high information asymmetry, then the positive relation disappears.

Chapter 2 Excess cash, stock returns, and risky growth options: An international study

2.1 Introduction

Using US data for the 1960-2006 period, Simutin (2010) finds that firms with high excess cash holdings earn higher future stock returns. He presents evidence that the high excess cash firms have higher betas, earn lower returns during market downturns, and invest more in the future. Simutin interprets the evidence as support for the notion that excess cash holdings proxy for risky growth options. Like many other factors that have been found to correlate with stock returns, it is not clear whether the same patterns hold in out-of-sample tests. Therefore, we examine the relation between excess cash holdings and future stock returns using different datasets that includes firms from developed Europe and emerging Asia.

By choosing firms from developed Europe and emerging Asia, we can reach a balance between getting a larger number of observations for each dataset, maintaining some degree of similarity for firms in each dataset, and having significant differences between the datasets. Among all developed markets excluding the US, developed Europe accounts for 43% of all firms. Emerging Asia accounts for 79% of firms in emerging markets. Firms in developed Europe operate in largely similar business environments and tend to have good corporate governance. Firms in emerging Asia also face largely similar business environments but tend to have poor corporate governance (La Porta et al., 2000a).

The difference in corporate governance may be important for the relation between excess cash and stock return as documented in Simutin (2010). Several studies find that corporate governance affect cash holdings (Chen et al., 2012; Dittmar et al., 2003; Harford et al., 2008) and the value of excess cash (Frésard Laurent and Salva, 2010). In addition, growth opportunities become less important as a determinant of cash holdings in countries with poor investor protection (Dittmar et al., 2003). Developed Europe tend to have better investor protection than emerging Asia (La Porta et al., 2000a), therefore cash holdings is more likely to be affected by growth opportunities in developed Europe and less likely so in emerging Asia. If the association between cash holdings and risky growth opportunities is indeed the cause for the positive relation between excess cash holdings and stock returns in Simutin (2010), this effect is more applicable in developed Europe and less applicable in emerging Asia. Therefore, we expect a positive relation between excess cash and stock returns in developed Europe but a weaker relation in emerging Asia. These are the main hypotheses we test in this paper.

Our empirical tests use datasets that include firms from 16 developed Western European countries and 9 emerging Asian countries for the sample period of year 1997 to year 2020. For the sample firms from developed Europe, we find a positive and significant relation between corporate excess cash holdings and future stock returns. The European firms with higher excess cash holdings have higher betas, have better relative stock performance in rising markets, and tend to increase investment expenditures in the following year. For example, the European firms in the top excess cash group increase their investment-to-assets ratio of by nearly 44% in the following year, while the European firms in the bottom excess cash group decrease their investment ratio by around 22% in the following year. These results are consistent with those in Simutin (2010) and support the notion that excess cash holdings correlate with risky growth opportunities, at least in developed Europe.

For the sample firms from emerging Asia, we do not find similar patterns. The relation between corporate excess cash holdings and future stock returns is insignificant for these firms.

Consistent with the notion that excess cash holdings are less likely to proxy for risky growth opportunities in developing Asia, the Asian firms with higher excess cash holdings do not have higher beta, do not perform better in rising markets, and increase their investments by a much smaller magnitude in the following year when compared with European firms. These results support our prediction about a weaker relation between excess cash and risky growth opportunities in emerging Asia.

To make sure that our results are not driven by cross-country differences in developed Europe or emerging Asia, we repeat our analysis on the United Kingdom (UK) and South Korea. The UK is the country with the most observations from our developed Europe dataset. South Korea is the country with the most observations from our emerging Asia dataset. We find that the relation between corporate excess cash holdings and future stock returns is positive and significant in the UK but insignificant in South Korea. The positive relation between cash and stock return in the UK is driven by higher returns for high excess cash firms in rising markets. In South Korea, the relation between cash and stock return is insignificant in all market states. High excess cash firms in the UK tend to increase investment expenditures much more than the corresponding firms in South Korea in the following year. Overall, the patterns are similar to the patterns founded in developed Europe and emerging Asia datasets, and are consistent with our hypothesis that excess cash holdings proxy for growth opportunities in developed markets but not in emerging markets. Developed markets like the UK may have a more mature business environment with limited growth opportunities. In such markets, firms might hold excess cash as a signal to investors that they may use the cash for investments (Simutin, 2010). On the other hand, emerging markets like South Korea may have more abundant growth opportunities, but excess cash might not be as strongly associated with future growth due to the corporate governance and investor protection issues. In such markets, firms might hold excess cash as a signal to investors that they may use the cash for personal benefits and potential exploitation of minority investors (Jensen, 1986; Nikolov and Whited, 2014; La Porta et al., 2000b). Therefore, companies in high-growth environments might have various investment options, but the mere presence of excess cash may not necessarily signal growth opportunities or result in higher stock returns.

This paper contributes to the literature about asset pricing, corporate governance, and corporate finance. As far as we know, this paper is the first comprehensive study examining the relation between excess cash holding and stock return in non-US markets. We provide out-of-sample tests for the positive relation between excess corporate cash holdings and stock returns as documented in Simutin (2010). More importantly, we show that the positive relation disappears in countries where excess corporate cash holdings may not proxy for risky growth options, supporting Simutin's theory that the positive relation is caused by the link between excess cash holding and risky growth options. Given our result that the link weakens in countries with poor investor protection, we provide additional evidence to link the literature about corporate cash holdings with the literature about investor protection.

The rest of the paper is organized as follows: in section 2.2 we review the relevant literature and develop the hypotheses; in section 2.3 we describe the sample and data; in section 2.4 we test the relation between corporate excess cash holdings and future stock returns for developed Europe and emerging Asia; in section 2.5 we examine corporate investment activities for firms with different excess cash levels; in section 2.6 we conduct the analysis on the UK and South Korea; Section 2.7 concludes the paper.

2.2 Literature and hypothesis

Opler et al. (1999) find that investment opportunities are among the major determinants of corporate cash holdings. Because of financial constraints caused by information asymmetry and other frictions, firms with more risky investment opportunities need to keep higher excess cash so that they can take advantage of the investment opportunities. The other determinants include firm size, R&D expenditures, cash flow volatility, net working capital, etc. Based on the results in Opler et al. (1999), Simutin (2010) suggest that excess cash holdings can be a proxy for risky growth opportunities and use this to explain the positive relation between excess cash holding and stock return. Specifically, firms with high excess cash tend to have more risky growth opportunities. During economic expansions, risky investment opportunities are more valuable, thus the value of these firms rise more than other firms. During economic contractions, the risky investment opportunities are less valuable. In a nutshell, firms with higher excess cash holdings are riskier. Therefore, investors will demand higher stock returns from these firms. This positive relation of cash and stock returns is supported by the study of Palazzo (2012). His research posits that riskier firms, characterized by a higher correlation between cash flows and aggregate shocks, exhibit a greater need for precautionary savings, because they are more likely to experience a cash flow shortfall.

However, excess cash holdings may not be a good proxy for risky growth opportunities for some firms. In addition to the determinants examined by Opler et al. (1999), corporate governance can also have significant effects on cash holdings. In countries with poor investor protection, insiders may have the incentive to keep high cash holdings to make it easier to consumer perks (Jensen, 1986; Nikolov and Whited, 2014) and expropriate minority investors (La Porta et al., 2000b). Consistent with this view, Dittmar et al. (2003) find that companies in countries with weak shareholder protection hold up to twice as much cash as companies in countries with good shareholder protection. Najjar (2013) find similar results. Chen et al. (2012) find that the average cash holdings of Chinese-listed firms decreased significantly after the split share structure reform in China. Because it is generally agreed that the reform improved corporate governance in the relevant firms, the results in Chen et al. (2012) imply that poor corporate governance is associated with higher cash holdings in China. Kalcheva and Lins (2007) find that in countries with weak shareholder protection, firms holding more cash have lower value. Frésard Laurent and Salva (2010) find evidence that better corporate governance and investor protection cause investors to value excess cash holdings substantially higher for foreign firms listed in US markets than for their domestic peers. These results are also consistent with the view that insiders keep excess cash for purposes other than firm value maximization. In addition, Dittmar et al. (2003) find that growth opportunities become less important as a determinant of cash holdings in countries with poor investor protection. This is probably the most important evidence against using excess cash holdings as proxy for growth opportunities in those countries.

Following the same rationale as Simutin (2010), if firms with high excess cash holdings do not necessarily have more risky growth opportunities in countries with poor investor protection, then investors will not necessarily demand higher stock returns from these firms. In this case excess cash holdings are less likely to be positively related to future stock returns in countries like emerging Asia. At the same time, we should expect a stronger relation between excess cash and stock returns in markets like developed Europe where investors protection is better and excess cash is more likely to be a proxy for risky growth opportunities. Thus, we come up with the following hypotheses:

Hypothesis I: Excess cash is positively related to future stock returns in the markets of developed Europe.

Hypothesis II: Excess cash is not strongly related to future stock returns in the markets of emerging Asia.

Consistent with the argument that excess cash proxies for risky growth opportunities, Simutin (2010) also show that firms with higher excess cash earn higher returns in high market states and invest more in future years. However, if excess cash is not a good proxy for risky growth opportunities in countries with poor investor protection, then firms with higher excess cash will be less likely to earn higher returns in rising market states and less likely to invest more subsequently. Therefore, in developed Europe, if we find a positive relation between excess cash and future stock returns, we expect that the positive relation is driven by rising market states. We also expect high excess cash firms to increase subsequent investments in developed Europe. For markets in emerging Asia, we expect to find much weaker patterns.

Hypothesis III: (a) In developed European markets, excess cash holdings positively correlate with future stock returns, particularly during rising market states, fostering increased subsequent investments; (b) In contrast, for markets in emerging Asia, the observed patterns between excess cash and future stock returns, as well as subsequent investments, are anticipated to be weaker due to the impact of poor investor protection.

2.3 Sample and data

Our sample includes 13,074 firms from 16 developed European markets and 9 emerging Asian markets. The developed Europe dataset includes 4,147 firms from following countries:

Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Israel, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and United Kingdom. The emerging Asia dataset includes 8,927 firms from the following markets: China, India, Indonesia, South Korea, Malaysia, Pakistan, Philippines, Taiwan, and Thailand. The lists follow the classifications used by Morgan Stanley Capital International (MSCI) in Year 2021. We collect the stock data from Datastream and financial data from Worldscope. Because most financial variables in Worldscope are available starting from Year 1987 and one of the variables for estimating excess cash needs 10 years corporate cash flow, we use the sample period of Year 1997 to Year 2020. All dollar amount variables are downloaded in US currency. All financial firms and utility firms are excluded. Our analysis focuses on the whole regions of developed Europe and emerging Asia. Therefore, we allow for firms cross-listed in the same region. For example, we allow for a UK firm cross-listed in other developed European countries as these markets are in the same region. However, if a UK firm is cross-listed in the South Korea's stock market, we do not include this firm in the developed Europe dataset. The similar criteria also applies to the emerging Asia dataset. We end up with 671,202 firm month observations, including 411,428 observations from emerging Asia and 259,774 observations from developed Europe.

2.3.1 Excess Cash Estimation

Following Simutin (2010), we estimate corporate excess cash as the total firm-level cash holdings net of the cash amount predicted by firm characteristics that impact corporate cash levels. The firm characteristics we use are based on the determinants of cash holdings as documented in Opler et al. (1999) and Najjar (2013). We derive a monthly Excess Cash Measure (ECM) using annual balance sheet data. Specifically, to calculate the ECM for stock i in month t, we consider all stocks with fiscal year-ends falling between $t-11$ and t. Each month (t), a cross-sectional regression of cash on its determinants is conducted. The dependent variable is the log of ratio of cash to total assets less cash. The independent variables include market-to-book ratio (MB), the log of real assets (Size), the ratio of capital expenditure to assets (CPX), the ratio of net working capital minus cash to assets (WC), the ratio of long-term debt to assets (LTD), the ratio of research and development expense to sales (RD), the ratio of cash flow to assets (CF), an industry-level cash flow volatility measure (σ^{IND}) estimated as the standard deviation of corporate cash flows over the previous 10 years (σ^{IND}), a dividend dummy (Div) that equals one for firms that pay dividends, zero otherwise, and 17 industry dummies based on Kenneth French's industry definitions[1]. The ECM, as of the end of month t, is defined as the residual from this regression.

We report the average coefficients, corresponding t-statistics, and average adjusted R^2 percentages of December cross-sectional regressions in Table 2.1. Consistent with Simutin (2010)'s results for US firms during the 1960-2006 period, in both developed Europe and emerging Asia cash increases with the ratios of market equity to book equity, research and development expense to sales, and industry volatility, and decrease with the ratios of capital expenditure to assets, working capital to assets, and long-term debt to assets. There are some minor differences between developed Europe and emerging Asia. Specifically, cash ratio is negatively related to firm size, cash flow ratio, and dividend dummy in developed Europe but the three determinants in emerging Asia are positively associated with the cash ratio. In Simutin (2010) cash ratio is negatively related to firm size but positively related to cash flow ratio and there is no significant difference in cash ratio between dividend paying firms and non-dividend paying firms. Based on these results, it is

[1] The industry definitions are from Kenneth French's data library, https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

hard to tell whether developed Europe is closer to the US than emerging Asia in terms of the determinants of cash holdings.

Table 2.1 Regressions for Excess Cash Estimation

This table reports the results of the cross-sectional regressions used to estimate excess cash measures. The dependent variable is the log of ratio of cash to total assets less cash. The independent variables include market-to-book ratio (MB), the log of real assets (Size), the ratio of capital expenditure to assets (CPX), the ratio of net working capital minus cash to assets (WC), the ratio of long-term debt to assets LTD), the ratio of research and development expense to sales (RD), the ratio of cash flow to assets (CF), an industry-level cash flow volatility measure (σ^{IND}), a dividend dummy (Div), and 17 industry dummies. The cross-sectional regressions are conducted for every month. The average coefficients and corresponding t-statistics of December regressions are reported in the table. The average adjusted R^2s are in percentage. The sample period is 1997-2020. The p-values are: * p < 0.1, ** p < 0.05, *** p < 0.001.

	Developed Europe		Emerging Asia	
	Coefficient	t-Statistic	Coefficient	t-Statistic
Intercept	-1.918***	-14.59	-2.567***	-20.27
MB	0.071***	7.18	0.067***	4.34
Size	-0.033***	-7.50	0.057***	7.44
CPX	-1.579***	-7.66	-1.840***	-11.76
WC	-0.984***	-4.88	-0.870***	-10.87
LTD	-1.125***	-6.99	-1.662***	-10.52
RD	0.016**	2.39	1.901***	3.46
CF	-0.280***	-3.34	0.867***	5.77
σ^{IND}	0.196	0.54	0.896*	1.73
Div	-0.088***	-2.75	0.434***	12.93
Adjusted R^2	13.957		19.528	

2.3.2 Descriptive Statistics

In Table 2.2 we present the summary statistics of sample observations. The means for the developed Europe dataset are reported in Panel A while those for the emerging Asia dataset are reported in Panel B. Panel C compares the overall average of each characteristic between developed Europe and emerging Asia and tests the significance for the differences between the two datasets. On average, the sample firms from developed Europe have higher cash relative to total assets (Cash), lower book-to-market ratio (BM), larger size (Size), lower ROA, lower cash flow relative to total assets (CF), lower accruals (ACR), and faster asset growth rate (AG) than those from emerging Asia. Panel D reports the sample coverage for both datasets. United Kingdom (28.27%), Germany (14.71%), and France (13.14%) account for about a half of developed Europe dataset. On the other hand, four markets account for nearly all of the emerging Asia dataset. They are South Korea (28.46%), China (25.41%), Taiwan (19.67%), and India (17.56%). For both datasets, firm year observations are sorted into deciles at the end of each calendar year based on their excess cash levels in that corresponding December. Then we aggregate the deciles across years to form 10 excess cash measure (ECM) groups and calculate the summary statistics for each of the 10 groups. In both developed Europe and emerging Asia, the ratio of cash to assets increases with excess cash. The differences in this ratio between high and low ECM groups in developed Europe and emerging Asia are 0.51 and 0.39 respectively. Both are highly significant. As we discussed earlier, if excess cash does correlate with a firm's risky growth opportunities, then excess cash holdings should be positively related to expected returns, investment activity, and market risk. Consistent with this expectation, Panel A shows that beta, which is usually considered a proxy of market risk, seems to increase monotonically when we move from low ECM groups to high ECM groups for firms in developed Europe. Not surprisingly, the difference in beta between the Highest

ECM group and the Lowest ECM group in developed Europe is highly significant. In contrast, Panel B shows that the change in beta does not show any obvious pattern when we move from low ECM groups to high ECM groups for firms in emerging Asia. The difference in beta between the Highest ECM group and the Lowest ECM group is not significantly different from zero. This evidence is consistent with the conjecture that excess cash may not correlate with risky growth opportunities in emerging markets.

In both developed Europe and emerging Asia book-to-market ratio seems to decrease with excess cash. Firms in the Lowest ECM group are on average larger than those in the Highest ECM group, but firm size seems to follow an inversed U-shape curve when moving from low ECM groups to high ECM groups in both Panel A and Panel B. ROA and cash flow (relative to total assets) show similar inverse U-shape patterns in both developed Europe and emerging Asia. Generally, firms with lower excess cash tend to have higher debt level and lower asset growth rates. The two patterns are stronger in emerging Asia. Accrual does not seem to have high correlation with excess cash in either of the two panels. Overall, excess cash seems to be correlated with quite a few firm characteristics (beta, book-to-market, firm size, profitability) that have been shown to correlate with stock returns in the finance literature (Fama and French, 1992, 2006). Therefore, we need to control for those characteristics when testing the relation between excess cash and future returns.

Corporate governance plays a pivotal role in shaping financial decisions. As established by prior research (Chen et al., 2012; Dittmar et al., 2003; Harford et al., 2008), governance practices influence cash holdings and the valuation of excess cash. Our hypotheses are formulated based on the governance disparity between developed Europe and emerging Asia. To enhance persuasiveness, it is crucial to present the governance data explicitly, illustrating the distinctions between the two regions. In Table 2.3, we present empirical evidence indicating that developed Europe exhibits stronger governance than emerging Asia. The table reports the governance disparity between developed Europe and emerging Asia, along with the corresponding t-statistics. Governance-related data are sourced from the World Bank's Worldwide Governance Indicators project, providing annual country-level governance data spanning our sample period of 1997-2020 across six dimensions: control of corruption, government effectiveness, political stability/no violence, regulatory quality, rule of law, and voice and accountability. For each dimension, the governance estimate ranges from approximately -2.5 (reflecting weak governance) to 2.5 (indicating strong governance performance), with a higher value signifying stronger governance.

In the bottom row of Table 2.3, we aggregate the six estimates for developed Europe and emerging Asia, respectively. The overall estimate and the estimates for each of the six dimensions in developed Europe are all significantly greater than those in emerging Asia. This robust evidence confirms, on average, that developed Europe possesses stronger governance than emerging Asia. It lays the foundation for understanding how the governance environment may contribute to variations in the relationship between excess cash holdings and future stock returns.

Table 2.2 Summary Statistics

This table reports the average firm characteristics of all firms and each excess cash decile. Firms are assigned into deciles based on their monthly excess cash measure (ECM). Portfolios are formed at the end of each calendar year. Cash is the ratio of cash to total assets; Beta from the market model is calculated on a rolling basis using the last 60 months stock data with one lead and one lag of market excess return; BM is the log of book-to-market ratio; Size is the log of real (CPI-adjusted) total assets; ROA is the ratio of operating income before depreciation to total assets. CF is the ratio of operating income before depreciation minus interest minus dividends minus taxes to total assets; Debt is long-term debt divided by long-term debt plus market value of equity; ACR is the accruals computed as [(change in current assets − change in cash) − (change in current liabilities − change in short-term debt − change in taxes payable) − depreciation expense]/average total assets; and AG is asset growth measured as the ratio of total assets to lagged total assets minus one. The t-statistics for the difference between High and Low values are reported in parentheses. The sample period is 1997-2020. The p-values are: * p < 0.1, ** p < 0.05, *** p < 0.001.

Panel A: Developed Europe									
ECM	Cash	Beta	BM	Size	ROA	CF	Debt	ACR	AG
All	0.159	1.107	-0.638	5.380	0.053	0.001	0.181	-0.050	0.176
Lowest	0.016	0.993	-0.460	4.620	-0.014	-0.061	0.193	-0.046	0.120
2	0.035	1.026	-0.530	5.391	0.050	0.004	0.203	-0.050	0.129
3	0.054	1.080	-0.556	5.592	0.068	0.021	0.207	-0.047	0.121
4	0.075	1.106	-0.583	5.730	0.069	0.023	0.209	-0.049	0.146
5	0.098	1.116	-0.620	5.792	0.127	0.042	0.200	-0.045	0.129
6	0.126	1.116	-0.626	5.746	0.078	0.023	0.198	-0.047	0.112
7	0.161	1.135	-0.690	5.755	0.092	0.041	0.191	-0.063	0.106
8	0.209	1.143	-0.689	5.595	0.068	0.016	0.174	-0.052	0.117
9	0.291	1.151	-0.753	5.216	0.040	-0.007	0.142	-0.052	0.223
Highest	0.528	1.190	-0.859	4.363	-0.044	-0.092	0.091	-0.046	0.574
Highest minus Lowest	0.512***	0.197***	-0.400***	-0.257***	-0.030***	-0.031***	-0.102***	-0.000	0.454***
	(51.09)	(3.23)	(-13.58)	(-10.75)	(-3.47)	(-3.91)	(-13.69)	(-0.01)	(3.98)

Panel B: Emerging Asia									
ECM	Cash	Beta	BM	Size	ROA	CF	Debt	ACR	AG
All	0.141	1.063	-0.252	4.976	0.076	0.026	0.192	-0.028	0.096
Lowest	0.010	1.030	-0.008	4.500	0.059	0.007	0.252	-0.039	0.032
2	0.028	1.080	-0.110	4.909	0.075	0.025	0.247	-0.024	0.062
3	0.050	1.105	-0.182	5.140	0.074	0.026	0.231	-0.027	0.073
4	0.073	1.103	-0.223	5.232	0.079	0.034	0.217	-0.022	0.082
5	0.097	1.088	-0.260	5.275	0.081	0.034	0.199	-0.023	0.080
6	0.126	1.073	-0.292	5.257	0.084	0.037	0.185	-0.025	0.091
7	0.159	1.065	-0.312	5.159	0.084	0.037	0.169	-0.026	0.100
8	0.202	1.030	-0.335	5.056	0.078	0.029	0.155	-0.026	0.106
9	0.262	0.994	-0.375	4.857	0.084	0.034	0.138	-0.030	0.121
Highest	0.400	1.037	-0.414	4.372	0.059	-0.001	0.130	-0.038	0.215
Highest minus Lowest	0.390*** (32.04)	0.007 (0.20)	-0.406*** (-11.96)	-0.129*** (-8.49)	0.000 (0.08)	-0.008** (-2.07)	-0.123*** (-17.00)	0.001 (0.29)	0.183*** (9.19)

Panel C: Developed Europe vs. Emerging Asia									
Region	Cash	Beta	BM	Size	ROA	CF	Debt	ACR	AG
Europe	0.159	1.107	-0.638	5.380	0.053	0.001	0.181	-0.050	0.176
Asia	0.141	1.063	-0.252	4.976	0.076	0.026	0.192	-0.028	0.096
Europe minus Asia	0.019*** (4.98)	0.044 (0.92)	-0.386*** (-8.40)	0.404*** (9.61)	-0.022*** (-2.99)	-0.025*** (-4.16)	-0.012 (-0.85)	-0.022*** (-4.59)	0.080** (2.43)

Panel D: Sample Coverage			
Market	No. of Firms	No. of Observations	% of Observations
Austria	56	3,980	1.53
Belgium	92	8,145	3.14
Denmark	111	7,323	2.82
Finland	105	8,246	3.17
France	439	34,126	13.14
Germany	601	38,203	14.71
Ireland	37	2,735	1.05
Israel	141	5,953	2.29
Italy	246	13,247	5.10
Netherlands	187	12,961	4.99
Norway	158	7,811	3.01
Portugal	55	2,838	1.09
Spain	131	7,532	2.90
Sweden	346	17,209	6.62
Switzerland	191	16,027	6.17
United Kingdom	1,251	73,438	28.27
Developed Europe	**4,147**	**259,774**	**100.00**
China	3,124	104,554	25.41
India	1,712	72,241	17.56
Indonesia	30	1,285	0.31
Malaysia	472	21,451	5.21
Pakistan	78	4,263	1.04
Philippines	26	1,561	0.38
South Korea	1,792	117,099	28.46
Taiwan	1,531	80,929	19.67
Thailand	162	8,045	1.96
Emerging Asia	**8,927**	**411,428**	**100.00**

Table 2.3 Developed Europe vs. Emerging Asia: Governance

This table reports the governance difference between developed Europe and emerging Asia and the corresponding t-statistics. The World Bank reports annual country-level governance data (Worldwide Governance Indicators) over the sample period of 1997-2020 for 6 dimensions of governance. For each dimension, the estimate of governance ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance. The higher value of estimate indicates stronger governance.

Dimension	Developed Europe	Emerging Asia	Difference (Europe – Asia)
Control of corruption	1.676	0.130	1.545***
			(98.92)
Government effectiveness	1.588	0.628	0.960***
			(53.06)
Political stability/no violence	0.659	-0.111	0.769***
			(28.36)
Regulatory quality	1.522	0.383	1.139***
			(68.77)
Rule of law	1.579	0.435	1.144***
			(78.36)
Voice and accountability	1.333	0.137	1.193***
			(57.14)
Overall	8.358	1.603	6.750***
			(75.04)

2.4 Excess cash and future stock returns

In this section, we examine the relation between corporate excess cash and future stock returns for firms from developed Europe and emerging Asia. We start by conducting univariate analysis about this relation. Then, we run Fama-Macbeth regressions of stock returns on excess cash.

2.4.1 Univariate Analysis

The univariate analysis is based on the monthly stock returns four months after the estimation of excess cash for sample firms. We choose the four-month time gap following Simutin (2010). For excess cash computed as of the end of month t, we assume that investors gather this information and make their investment decisions at the end of month t+4. The position taken in each firm at the end of month t+4 is equal to the firm's market capitalization as of the end of month t+4. We also assume that investors hold their position without rebalancing for 12 months starting in month t+5. The calculation is performed for every month t during the sample period for 10 portfolios based on ECM decile. The results are reported in Table 2.4.

Consistent with Hypothesis I, Table 2.4 shows that the average monthly return of the Highest ECM decile is 0.3% higher than that of the lowest ECM decile in developed Europe. However, the average monthly returns of other ECM deciles show a mixed picture about the relation between excess cash and future stock return. This is not surprising because we have not controlled for any of the other factors that affect stock returns in the univariate test and Table 2.2 has shown that quite a few of those factors also correlate with excess cash. For the emerging Asian firms in our sample, the average monthly return of the Lowest decile is not significantly different from that of the Highest ECM decile. This result is consistent with the idea that poor shareholder protection weakens the link between excess cash and growth opportunities and supports Hypothesis II.

Table 2.4 Portfolio Returns of Excess Cash Deciles

This table reports the average monthly value-weighted returns of each excess cash measure (ECM) deciles in percentage. The t-statistics for every decile and for the difference of high and low excess cash firms are reported in parentheses. Stocks are assigned into deciles based on their ECMs computed as of month t. At the beginning of month t + 5, an investment is made in stocks that were assigned into a particular ECM decile as of the end of month t. The position taken in each firm at the beginning of month t + 5 is the market capitalization of the firm as of the end of month t. The position is held without rebalancing for 12 months starting from month t + 5. The p-values are: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$.

Decile	Developed Europe	Emerging Asia
Lowest	1.014***	0.231
	(8.22)	(1.54)
ECM2	1.166***	0.518***
	(10.63)	(3.10)
ECM3	1.412***	0.398**
	(12.22)	(2.35)
ECM4	1.099***	0.751***
	(9.49)	(5.05)
ECM5	0.933***	0.557***
	(8.74)	(3.40)
ECM6	1.330***	0.398***
	(12.04)	(2.55)
ECM7	1.299***	0.612***
	(11.31)	(3.86)
ECM8	0.855***	0.394***
	(7.51)	(2.87)
ECM9	1.195***	0.623***
	(9.81)	(4.51)
Highest	1.316***	0.237
	(11.04)	(1.29)
Highest – Lowest	0.302***	0.006
	(3.20)	(0.05)

2.4.2 Multivariate Analysis

Next, we perform multivariate analysis by running Fama-Macbeth regressions (Fama and MacBeth, 1973) of monthly stock returns. At the end of every month t, we regress the returns of month t on ECM computed as of month t-5, or excess cash lagged by 5 months, and control variables. The regression model can be described by the following equation:

$$R_{i,t} = \alpha + \beta_1 ECM_{i,t-5} + \sum_n \gamma_n Control_{n,i,t} + \varepsilon_{i,t} \quad (1)$$

Following Simutin (2010), We control for the following variables which are shown to correlate with future stock returns in our regression: beta (Beta), log of book-to-market ratio (BM), log of market capitalization (ME), asset growth rate (AG), accrual (ACR), investments (INV), cash flows (CF), debt (Debt), momentum (MOM), and equity issuance (Issue). Beta is the sum of slope coefficients from the market model using monthly stock data from t - 64 to t – 5 with one lead and one lag of market excess return; BM and ME are estimated at the end of month t – 1; AG is measured as the ratio of total assets to lagged total assets minus one; ACR is computed as [(change in current assets − change in cash) − (change in current liabilities − change in short-term debt − change in taxes payable) − depreciation expense]/average total assets; INV is the ratio of capital expenditure plus acquisitions less sale of property, plant, equipment to total assets; CF is the ratio of operating income before depreciation minus interest minus dividends minus taxes to total assets; Debt is long-term debt divided by long-term debt plus market value of equity; MOM is the 12-month (t – 12 to t – 1) compounded return; and Issue is measured as Ln[$\mathrm{ME}_{\mathrm{t-1}}$/$\mathrm{ME}_{\mathrm{t-36}}$] – RU36, where ME_{t} is the market capitalization as of the end of month t, and the RU36 is the 36-month (t – 36 to t – 1) compounded return. We run Fama-Macbeth regressions on the developed Europe dataset and the emerging Asia dataset. If excess cash is a good proxy for risky growth opportunities, then we expect a positive and significant relation between excess cash and future returns in the regression.

Table 2.5 reports the average coefficients of monthly cross-sectional regressions using model (1). Columns (1) and (2) are for developed Europe while columns (3) and (4) are for emerging Asia. The independent variables in columns (1) and (3) of Table 2.5 include ECM and only three control variables: Beta, BM, and ME. In columns (2) and (4) we include ECM and all control variables. The results are consistent with those in Table 2.4. For developed Europe, the average coefficient of ECM is positive and highly significant at 1% level in both columns (1) and (2), suggesting that high excess cash firms earn significantly higher returns than low excess cash firms do in developed Europe. These results are consistent with Hypothesis I. For emerging Asia, the average coefficient of ECM is not significantly different from zero in both columns (3) and (4), suggesting that excess cash is not significantly related to future stock returns in emerging Asia. These results support Hypothesis II.

The results for the control variables are generally consistent with our expectation. For both developed Europe and emerging Asia, the average coefficients of book-to-market ratio and momentum are positive and significant while the average coefficients of accrual are negative and significant. These results are consistent with the stylized facts in the literature. The average coefficients of debt and equity issuance are negative and significant in developed Europe but insignificant in emerging Asia. In addition, the average coefficient of investments is negative and significant in emerging Asia but not in developed Europe. This result implies that a lot of investments by Asian firms may destroy value.

Table 2.5 Fama-Macbeth Regressions: Developed Europe and Emerging Asia

This table reports the results of Fama-Macbeth regressions for developed Europe and emerging Asia. For every month t, stock returns in month t are regressed on the excess cash measure (ECM) computed as of the end of month t – 5. Control variables are included in regressions. Beta is the sum of slope coefficients from the market model using monthly stock data from t - 64 to t – 5 with one lead and one lag of market excess return; BM is the log of book-to-market ratio; ME is the log of market capitalization at the end of month t – 1; AG is asset growth measured as the ratio of total assets to lagged total assets minus one; ACR is the accruals computed as [(change in current assets − change in cash) − (change in current liabilities − change in short-term debt − change in taxes payable) − depreciation expense]/average total assets; INV is the ratio of capital expenditure plus acquisitions less sale of property, plant, equipment to total assets; CF is the ratio of operating income before depreciation minus interest minus dividends minus taxes to total assets; Debt is long-term debt divided by long-term debt plus market value of equity; MOM is the 12-month (t – 12 to t – 1) compounded return; and Issue is measured as $\mathrm{Ln}[\mathrm{ME}_{t-1}/\mathrm{ME}_{t-36}]$ – RU36, where ME_t is the market capitalization as of the end of month t, and the RU36 is the 36-month (t – 36 to t – 1) compounded return. The average coefficients and corresponding t-statistics are reported in the table. The sample period is 1997-2020. The p-values are: * p < 0.1, ** p < 0.05, *** p < 0.01.

	Developed Europe		Emerging Asia	
	(1)	(2)	(3)	(4)
ECM	0.094***	0.118***	-0.018	0.025
	(2.64)	(4.75)	(-0.31)	(0.51)
Beta	0.192	0.024	-0.183	-0.206
	(1.30)	(0.25)	(-1.13)	(-1.38)
BM	0.194***	0.185***	0.442***	0.358***
	(3.17)	(3.19)	(3.96)	(3.28)
ME	0.106***	0.085**	-0.102	-0.104
	(3.57)	(2.55)	(-1.28)	(-1.59)
AG		-0.250**		0.025
		(-2.49)		(0.14)
ACR		-1.061***		-1.568***
		(-3.06)		(-3.30)
INV		0.231		-1.354**
		(0.74)		(-2.13)
CF		0.673		1.961*
		(1.40)		(1.93)
Debt		-0.671***		-0.000
		(-2.77)		(-0.00)
MOM		0.689**		0.541*
		(2.55)		(1.86)
Issue		-0.327***		-0.139
		(-3.05)		(-1.13)

2.4.3 Excess Cash and Future Return in Market States

Rising markets usually reflect more optimistic expectations about business opportunities. Therefore, most of the risky growth opportunities are more valuable in rising market states. If excess cash is a proxy for risky growth opportunities, then the positive relation between excess cash and stock return will be stronger in rising markets. To test this prediction, we examine the relation between corporate excess cash and future return in different market states. Specifically, we sort the months in our sample period into quintiles based on market return in these months. The observations in the quintile with the highest market return are assigned into the High market group. The observations in the quintile with the lowest market return are assigned into the Low market group. The rest of the observations, all in the middle three quintiles, are assigned into the Medium market group. Then we conduct Fama-Macbeth cross-sectional regressions of monthly stock returns for the three groups using regression model (1) for both developed Europe and emerging Asia. The average coefficients of the monthly regressions are reported in Table 2.6.

For developed Europe, Table 2.6 shows that the average coefficient of ECM is insignificant for the Low market group, positive and marginally significant for the Medium market group, and positive and highly significant for the High market group. The results indicate a strengthened positive correlation between excess cash and stock returns in rising markets, thereby supporting Hypothesis III (a). This finding aligns with the argument positing excess cash as a proxy for risky growth opportunities in developed Europe.

For emerging Asia, Table 2.6 shows that the average coefficient of ECM is positive and significant for the Low market group but insignificant for both the Medium and High market groups. In rising market states, the relationships between excess cash and future stock returns are notably weaker compared to their developed European counterparts, thus providing support for Hypothesis III (b). The empirical results suggest that high excess cash firms in emerging Asia actually perform better in down markets. Maybe excess cash is used to reduce risk for these firms. This is consistent with our expectation that excess cash is not a good proxy for growth opportunities in emerging Asia.

Table 2.6 Fama-Macbeth Regressions Conditional on Market State: Developed Europe and Emerging Asia

This table reports the results of Fama-Macbeth regressions in each of market states for developed Europe and emerging Asia. Market state is determined by sorting monthly value-weighted market returns into three groups. For every month t, stock returns in month t are regressed on the excess cash measure (ECM) computed as of the end of month t – 5. Control variables are included in regressions. Beta is the sum of slope coefficients from the market model using monthly stock data from t - 64 to t – 5 with one lead and one lag of market excess return; BM is the log of book-to-market ratio; ME is the log of market capitalization at the end of month t – 1; AG is asset growth measured as the ratio of total assets to lagged total assets minus one; ACR is the accruals computed as [(change in current assets − change in cash) − (change in current liabilities − change in short-term debt − change in taxes payable) − depreciation expense]/average total assets; I is the ratio of capital expenditure plus acquisitions less sale of property, plant, equipment to total assets; CF is the ratio of operating income before depreciation minus interest minus dividends minus taxes to total assets; Debt is long-term debt divided by long-term debt plus market value of equity; RU12 is the 12-month (t – 12 to t – 1) compounded return; and Issue is measured as $\mathrm{Ln}[\mathrm{ME}_{t-1}/\mathrm{ME}_{t-36}]$ – RU36, where ME_t is the market capitalization as of the end of month t, and the RU36 is the 36-month (t – 36 to t – 1) compounded return. The average coefficients and corresponding t-statistics are reported in the table. The sample period is 1997-2020. The p-values are: * p < 0.1, ** p < 0.05, *** p < 0.001.

	Developed Europe			Emerging Asia		
Market State	Low	Medium	High	Low	Medium	High
ECM	0.046	0.069*	0.233***	0.188**	-0.036	-0.073
	(0.96)	(1.77)	(5.99)	(1.95)	(-0.49)	(-0.89)
Beta	-0.925***	-0.005	0.978***	-1.502***	0.022	0.842***
	(-5.73)	(-0.04)	(6.62)	(-6.43)	(0.10)	(3.28)
BM	0.233**	0.198**	0.126	0.625***	0.082	0.375*
	(2.12)	(2.40)	(1.20)	(3.77)	(0.50)	(1.64)
ME	-0.075	0.060	0.264***	-0.070	-0.259***	0.020
	(-1.40)	(1.21)	(4.21)	(-0.60)	(-2.74)	(0.15)
AG	-0.526***	-0.054	-0.161	-0.097	0.047	0.123
	(-2.78)	(-0.35)	(-0.93)	(-0.35)	(0.14)	(0.40)
ACR	-2.438***	-0.598	-0.142	-2.688***	-1.385	-0.646
	(-4.23)	(-1.09)	(-0.22)	(-4.15)	(-1.46)	(-0.78)

Continued

	Developed Europe			Emerging Asia		
Market State	Low	Medium	High	Low	Medium	High
I	0.391	0.009	0.280	-2.770***	-1.507	0.203
	(0.84)	(0.02)	(0.46)	(-2.79)	(-1.61)	(0.15)
CF	2.183***	0.825	-0.947	3.806***	0.027	2.112
	(2.71)	(1.00)	(-1.12)	(2.55)	(0.01)	(1.13)
Debt	-2.667***	0.079	0.586	-3.250***	0.817	2.380***
	(-5.89)	(0.24)	(1.55)	(-4.67)	(1.01)	(2.56)
RU12	2.236***	0.754***	-0.885	1.669***	0.476	-0.508
	(5.33)	(3.10)	(-1.50)	(3.12)	(1.41)	(-0.86)
Issue	0.024	-0.332***	-0.665***	-0.085	-0.028	-0.306
	(0.15)	(-2.93)	(-2.72)	(-0.42)	(-0.21)	(-1.08)

2.5 Excess Cash and Corporate Investment Activity

If companies hoard cash in anticipation of investment opportunities, we should observe increased investment activity in subsequent years. To examine this potential change in corporate investment, at the end of each calendar year we assign firms to five quintiles based on ECM and look at their investment activity during the 10 years preceding and following portfolio assignment. Following Simutin (2010), we use investment-to-assets ratio to measure investment activity. Investment is calculated as capital expenditures plus acquisitions less the sale of property, plant, and equipment. The average investment-to-assets ratio of firms in the top quintile (High ECM) and the bottom quintile (Low ECM) are reported in Table 2.7.

Panel A of Table 2.7 reports the results based on all firms in the sample. In developed Europe, the average investment-to-assets ratio of firms in the High ECM group increases from 0.039 in Year 0, the year of portfolio assignment, to 0.056 next year (Year 1). This increase of 44% is highly significant with t-statistic of 8.17. This finding corroborates Hypothesis III (a), asserting that high excess cash firms in developed Europe are anticipated to demonstrate an enhanced inclination to invest in subsequent periods. However, over the subsequent years, investments gradually decline, returning to a level similar to that of Year 0 after a 5-year period. In contrast, firms in the Low ECM group reduce their average investment-to-assets ratio by around 22% in Year 1 relative to Year 0. This decrease is also statistically significant. In the next 9 years, investment level seems to stabilize at around 0.043 for Low ECM firms. The results are consistent with the notion that excess cash holdings correlate with growth opportunities in developed Europe.

The observed pattern in investment activity for the High ECM group in developed Europe suggests an interesting dynamic about the investment anticipation and timing and the cyclical nature of investment decisions. The initial decline in investment activity in the 10 years before portfolio formation could indicate firms accumulating excess cash in anticipation of future investment opportunities. The subsequent increase in investment activity in Year 1 may suggest that firms are acting on the anticipated opportunities by deploying their excess cash. The subsequent decline in investment activity one year after the portfolio formation could be influenced by changing market conditions or preparations for new investment opportunities. This observed pattern has two implications for this study: First, the continuous decline in investment activity one year after portfolio formation could imply that the initial increase in investment is a short-term effect. Firms may face challenges in maintaining high investment levels, returning to a conservative approach shortly after deploying excess cash. Second, the observed pattern underscores the importance of considering external factors and market dynamics when analyzing corporate investment behavior. Changes in market conditions or global events may affect the investment decisions and contribute to the observed fluctuations.

For emerging Asia, the average investment-to-assets ratio of High ECM group increases by just 14% in Year 1 relative to Year 0. Although this increase is also statistically significant, further tests show that this increase is significantly lower than the corresponding increase for developed Europe. The difference in investment pattern are both positive for the High ECM group in developed Europe and emerging Asia, but the increase in investment activity for emerging Asia exhibits a smaller magnitude than that for developed Europe. This finding is consistent with our expectation that corporate excess cash proxies for growth opportunities in developed Europe but less likely to proxy for investment opportunities in emerging Asia due to the overall weaker governance. The weaker association between cash and risky growth options may not necessarily mean that high ECM firms do not increase their investment in the future. They may increase their investment in smaller magnitude. Like the pattern for firms in developed Europe, investment level declines in the next 5 years and then stabilize, but the level at which it stabilized (around 0.035) seems to be lower than the investment level for Year 0 (0.042). The Low ECM group in emerging Asia also sees a smaller magnitude of decrease (13%) in average investment in Year 1 when compared with developed Europe. These results imply that the connection between excess cash and risky investment opportunities is less pronounced in emerging Asia than in developed Europe, lending support to Hypothesis III (b).

Because some firms may not have survived the 10 years after portfolio assignment, the results in Panel A may not be a proper apple-to-apple comparison across years. To address this issue, following Simutin (2010), we include only firms that survive for 10 years after portfolio assignment and calculate the average investment-to-assets ratio for these survivors. The results are reported in Panel B of Table 2.7.

Panel B shows similar patterns as Panel A for firms from developed Europe. The average investment-to-assets ratio of firms in the High ECM group increases from 0.039 in Year 0 to 0.061 in Year 1. The extent of increase is even higher at 56%, which is highly significant with t-statistic of 8.4. In subsequent years, investments gradually decrease. But even in Year 10, average investment level is still higher than that of Year 0. Firms in the Low ECM group see investments decrease significantly from Year 0 to Year 1, albeit by a smaller percentage (16%). After that, investment level continues to decline until it stabilizes at around 0.044 between Year 8 and Year 10 for Low ECM firms. For firms from emerging Asia, we see some interesting differences. The investments by firms in the High EMC group are slightly higher in the period from Year 1 to Year 4 when compared with Year 0, but the increase is not statistically significant. For example, the t-statistic of change in average investment-to-assets ratio in Year 1 relative to Year 0 is only 0.33. In the period from Year 5 to Year 10, investment level is quite stable at around 0.036, the same level as in Year 0. These results are consistent with our conjecture that high excess cash is a proxy for more risky investment opportunities in developed Europe but not in emerging Asia.

Overall, the link between excess cash and corporate investment activity is much stronger in developed Europe than in emerging Asia. This is consistent with our hypothesis that the positive relation between excess cash and future stock return in developed Europe markets is caused by the link between cash holdings and risky growth opportunities in these markets.

Table 2.7 Investment Activity: Developed Europe and Emerging Asia

This table reports the average firm-level investment activity of high and low excess cash measure (ECM) quintiles during the year(s) before, of, and after portfolio assignment. Investment activity (I) is measured as capital expenditure plus acquisitions less sale of property, plant, equipment scaled by total assets. At the end of every calendar year, firms are assigned into quintiles on the basis of their ECMs. The changes in investment between the year of portfolio assignment and the first year after portfolio assignment ($I_1 - I_0$) and the corresponding t statistics are presented. Panel A uses all firms, while Panel B keeps firms that survive for 10 years or longer. The sample period is 1997-2020.

Panel A: All Firms

	Developed Europe		Emerging Asia	
Year	High ECM	Low ECM	High ECM	Low ECM
-10	0.063	0.077	0.053	0.075
-9	0.062	0.076	0.057	0.076
-8	0.061	0.073	0.056	0.077
-7	0.056	0.070	0.055	0.074
-6	0.054	0.066	0.053	0.071
-5	0.052	0.066	0.048	0.069
-4	0.051	0.067	0.046	0.067
-3	0.049	0.067	0.044	0.064
-2	0.047	0.066	0.042	0.061
-1	0.044	0.064	0.041	0.056
0	0.039	0.059	0.042	0.048
1	0.056	0.046	0.048	0.042
2	0.049	0.043	0.044	0.042
3	0.047	0.044	0.041	0.042
4	0.043	0.042	0.037	0.042
5	0.042	0.042	0.037	0.041
6	0.040	0.044	0.035	0.043
7	0.041	0.044	0.035	0.043
8	0.041	0.043	0.035	0.044
9	0.040	0.044	0.035	0.043
10	0.041	0.044	0.034	0.042
$I_1 - I_0$	0.017***	-0.013***	0.006***	-0.006***
	(8.17)	(-4.80)	(3.49)	(-3.85)

Panel B: Survivors Only				
	Developed Europe		Emerging Asia	
Year	High ECM	Low ECM	High ECM	Low ECM
-10	0.070	0.083	0.058	0.090
-9	0.071	0.084	0.049	0.079
-8	0.061	0.080	0.051	0.083
-7	0.059	0.077	0.056	0.067
-6	0.055	0.074	0.049	0.059
-5	0.056	0.067	0.050	0.058
-4	0.050	0.062	0.041	0.062
-3	0.054	0.071	0.035	0.062
-2	0.052	0.067	0.034	0.055
-1	0.041	0.068	0.032	0.052
0	0.039	0.062	0.036	0.050
1	0.061	0.052	0.038	0.043
2	0.053	0.047	0.038	0.042
3	0.054	0.048	0.039	0.040
4	0.052	0.045	0.038	0.042
5	0.049	0.047	0.037	0.044
6	0.045	0.048	0.035	0.044
7	0.049	0.048	0.036	0.044
8	0.048	0.043	0.035	0.044
9	0.044	0.045	0.036	0.044
10	0.043	0.044	0.036	0.038
$I_1 - I_0$	0.022***	-0.010***	0.002	-0.007***
	(8.40)	(-3.02)	(0.33)	(-2.97)

2.6 Analysis using the UK and South Korea

The datasets for developed Europe and emerging Asia include multiple countries. This brings one potential issue to the analysis above: if there are country-specific differences in excess cash and stock returns and the differences are not related to investment opportunities, then the relation between excess cash and stock returns may not be caused by the relation between excess cash and investment opportunities. To address this issue, we select the two countries with the most observations from the two datasets: the UK from the developed Europe and South Korea from the emerging Asia. Then we repeat the analysis we have done in Tables 2.4 to 2.7 on firms from the two countries. If the previous results are not driven by country-specific differences, then Hypotheses I and III (a) should be applicable to the UK and Hypotheses II and III (b) should be applicable to South Korea. In addition, we should expect excess cash to be a good proxy for investment opportunities in the UK but not in South Korea.

2.6.1 Excess cash and future stock returns: the UK vs. South Korea

First, we conduct univariate analysis on the monthly stock returns for firms in the UK and South Korea using the same method as what we use for Table 2.4. The results are reported in Table 2.8.

Table 2.8 shows that for firms from the UK the average monthly return of the Highest ECM decile is 0.39% higher than that of the lowest ECM decile. For firms from South Korea, the average monthly return of the Lowest decile is not significantly different from that of the Highest ECM decile. These results are consistent with those reported in Table 2.4 and support both Hypothesis I and Hypothesis II.

Next, we perform multivariate analysis by running Fama-Macbeth regressions of monthly stock returns on observations from the UK and South Korea using regression model (1). The average coefficients of these monthly cross-sectional regressions are reported in Table 2.9.

In Table 2.9, columns (1) and (2) are for the UK while columns (3) and (4) are for South Korea. Like in Table 2.5, in columns (1) and (3) we include ECM and only three control variables: Beta, BM, and ME. In columns (2) and (4) we include ECM and all control variables. The results are similar to those in Table 2.5. For the UK, the average coefficient of ECM is positive and highly significant at 1% level in both columns (1) and (2), suggesting that high excess cash firms earn significantly higher returns than low excess cash firms do in the UK. For South Korea, the average coefficient of ECM is not significantly different from zero in both columns (3) and (4), suggesting that excess cash is not significantly related to future stock returns in South Korea. These results are consistent with Hypothesis I and Hypothesis II.

Table 2.8 Portfolio Returns of Excess Cash Deciles: United Kingdom and South Korea

This table reports the average monthly value-weighted returns of each excess cash measure (ECM) deciles in percentage for firms in the United Kingdom and South Korea. The t-statistics for every decile and for the difference of high and low excess cash firms are reported in parentheses. At the end of every month t, stocks are assigned into deciles on the basis of their ECMs computed as of month t – 4. At the beginning of month t + 1, an investment is made in stocks that were assigned into a particular ECM decile as of the end of month t – 4. The position taken in each firm at the beginning of month t + 1 is the market capitalization of the firm as of the end of month t. The position is held without rebalancing for 12 months starting from month t + 1. The p-values are: * p < 0.1, ** p < 0.05, *** p < 0.001.

Decile	United Kingdom	South Korea
Low	0.945***	0.806***
	(6.00)	(3.77)
ECM2	1.137***	1.338***
	(11.05)	(6.21)
ECM3	1.180***	0.976***
	(11.06)	(4.47)
ECM4	1.453***	1.662***
	(8.69)	(6.81)
ECM5	0.862***	1.385***
	(7.24)	(6.05)
ECM6	0.934***	1.301***
	(6.97)	(6.36)
ECM7	0.902***	1.177***
	(8.93)	(5.82)
ECM8	1.117***	0.968***
	(9.09)	(5.76)
ECM9	0.810***	1.152***
	(5.65)	(5.85)
High	1.337***	0.635***
	(7.76)	(3.09)
High-Low	0.392**	-0.171
	(2.26)	(-1.38)

Table 2.9 Fama-Macbeth Regressions: United Kingdom and South Korea

This table reports the results of Fama-Macbeth regressions for firms in the United Kingdom and South Korea. For every month t, stock returns in month t are regressed on the excess cash measure (ECM) computed as of the end of month t – 5. Control variables are included in regressions. Beta is the sum of slope coefficients from the market model using monthly stock data from t - 64 to t – 5 with one lead and one lag of market excess return; BM is the log of book-to-market ratio; ME is the log of market capitalization at the end of month t – 1; AG is asset growth measured as the ratio of total assets to lagged total assets minus one; ACR is the accruals computed as [(change in current assets − change in cash) − (change in current liabilities − change in short-term debt − change in taxes payable) − depreciation expense]/average total assets; I is the ratio of capital expenditure plus acquisitions less sale of property, plant, equipment to total assets; CF is the ratio of operating income before depreciation minus interest minus dividends minus taxes to total assets; Debt is long-term debt divided by long-term debt plus market value of equity; RU12 is the 12-month (t – 12 to t – 1) compounded return; and Issue is measured as $\mathrm{Ln}[\mathrm{ME}_{t-1}/\mathrm{ME}_{t-36}]$ – RU36, where ME_t is the market capitalization as of the end of month t, and the RU36 is the 36-month (t – 36 to t – 1) compounded return. The average coefficients and corresponding t-statistics are reported in the table. The sample period is 1997-2020. The p-values are: * p < 0.1, ** p < 0.05, *** p < 0.001.

	United Kingdom		South Korea	
	(1)	(2)	(3)	(4)
ECM	0.161***	0.106***	-0.063	-0.071
	(4.38)	(3.20)	(-0.71)	(-0.90)
Beta	0.044	0.093	-0.003	-0.294**
	(0.36)	(0.81)	(-0.02)	(-2.09)
BM	0.055	0.140**	0.359***	0.203
	(0.61)	(2.02)	(2.87)	(1.41)
ME	0.165***	0.099***	-0.345**	-0.175*
	(3.79)	(2.43)	(-2.38)	(-1.87)
AG		-0.091		-0.262
		(-0.67)		(-0.99)
ACR		-1.332**		-0.675
		(-2.24)		(-0.85)
I		-0.075		-3.041***
		(-0.17)		(-2.81)
CF		1.404*		5.606***
		(1.91)		(3.85)
Debt		-0.848**		0.264
		(-2.25)		(0.63)
RU12		0.579**		-0.097
		(1.97)		(-0.24)
Issue		-0.387***		-0.522*
		(-2.75)		(-1.84)

2.6.2 Excess cash and stock return in different market states: the UK vs. South Korea

If the positive relation between excess cash and stock return in the UK is caused by the association between excess cash and investment opportunities, this positive relation will be stronger in rising markets. We examine the relation between corporate excess cash and future return in different market states. Using the same method as in Table 2.6, we assign observations into High, Low and Medium market groups. Then we conduct Fama-Macbeth cross-sectional regressions of monthly stock returns for the three groups for both the UK and South Korea. The average coefficients of the monthly regressions are reported in Table 2.10.

For the UK, Table 2.10 shows that the average coefficient of ECM is insignificant for both the Low and the Medium market groups, but positive and significant at 1% level for the High market group. The results closely mirror those observed for developed Europe in Table 2.6, providing strong support for Hypothesis III (a). These findings align with our expectations, affirming that excess cash serves as a reliable proxy for growth opportunities in the UK.

For South Korea, Table 2.10 shows that the average coefficient of ECM is insignificant for all the three market state groups. The weaker correlations between corporate excess cash and future returns during rising market states in South Korea, compared to those in the UK, lend support to our Hypothesis III (b). In addition, these results are consistent with our expectation that excess cash is not a good proxy for growth opportunities in South Korea.

Table 2.10 Fama-Macbeth Regressions Conditional on Market State: United Kingdom and South Korea

This table reports the results of Fama-Macbeth regressions in each of market states for the United Kingdom and South Korea. Market state is determined by sorting monthly value-weighted market returns into three groups. For every month t, stock returns in month t are regressed on the excess cash measure (ECM) computed as of the end of month t – 5. Control variables are included in regressions. Beta is the sum of slope coefficients from the market model using monthly stock data from t - 64 to t – 5 with one lead and one lag of market excess return; BM is the log of book-to-market ratio; ME is the log of market capitalization at the end of month t – 1; AG is asset growth measured as the ratio of total assets to lagged total assets minus one; ACR is the accruals computed as [(change in current assets − change in cash) − (change in current liabilities − change in short-term debt − change in taxes payable) − depreciation expense]/average total assets; I is the ratio of capital expenditure plus acquisitions less sale of property, plant, equipment to total assets; CF is the ratio of operating income before depreciation minus interest minus dividends minus taxes to total assets; Debt is long-term debt divided by long-term debt plus market value of equity; RU12 is the 12-month (t – 12 to t – 1) compounded return; and Issue is measured as $\mathrm{Ln}[\mathrm{ME}_{t-1}/\mathrm{ME}_{t-36}]$ – RU36, where ME_t is the market capitalization as of the end of month t, and the RU36 is the 36-month (t – 36 to t – 1) compounded return. The average coefficients and corresponding t-statistics are reported in the table. The sample period is 1997-2020. The p-values are: * p < 0.1, ** p < 0.05, *** p < 0.001.

	United Kingdom			South Korea		
Market State	Low	Medium	High	Low	Medium	High
ECM	0.002	0.074	0.187***	-0.081	0.078	-0.236
	(0.03)	(1.18)	(3.04)	(-0.59)	(0.73)	(-1.41)
Beta	-0.713***	-0.183	0.945***	-0.709**	-0.371*	0.205
	(-2.49)	(-1.17)	(4.14)	(-2.33)	(-1.78)	(0.97)
BM	0.102	0.075	0.070	0.302	0.136	0.183
	(0.73)	(0.63)	(0.52)	(1.30)	(0.59)	(0.65)
ME	-0.026	0.049	0.357***	-0.376**	-0.175	0.023
	(-0.35)	(0.75)	(4.85)	(-2.38)	(-1.32)	(0.12)
AG	-0.554**	-0.316	0.395	-0.218	-0.299	-0.262
	(-2.11)	(-1.04)	(1.32)	(-0.41)	(-0.74)	(-0.58)

Continued

	United Kingdom			South Korea		
Market State	Low	Medium	High	Low	Medium	High
ACR	-3.381***	0.270	-1.015	-2.598*	-0.118	0.568
	(-2.97)	(0.25)	(-0.79)	(-1.83)	(-0.10)	(0.36)
I	-0.602	1.118	0.154	-2.458	-4.065**	-2.413
	(-0.70)	(1.25)	(0.16)	(-1.43)	(-2.36)	(-1.10)
CF	1.480	0.279	-0.795	4.686**	4.758**	7.509**
	(1.03)	(0.17)	(-0.42)	(2.12)	(2.20)	(2.36)
Debt	-2.315***	-1.102	-1.053	-1.701***	0.186	2.292***
	(-2.61)	(-1.59)	(-1.52)	(-2.85)	(0.28)	(2.77)
RU12	1.857***	0.710*	-0.799	1.019*	-0.437	-0.797
	(3.42)	(1.82)	(-1.15)	(1.94)	(-0.69)	(-0.87)
Issue	-0.076	-0.244	-0.891***	-0.108	-0.167	-1.346
	(-0.34)	(-1.38)	(-2.83)	(-0.59)	(-0.86)	(-1.59)

2.6.3 Excess Cash and Corporate Investment Activity: the UK vs. South Korea

To examine the change in corporate investment for the UK and South Korea, we assign firms into the High ECM and Low ECM quintiles using the same method as what we use for Table 2.7. Then we calculate the average investment-to-assets ratio of during the 10 years preceding and following portfolio assignment. The results are reported in Table 2.11.

Panel A of Table 2.11 reports the results based on all firms from the UK and South Korea. In the UK, the average investment-to-assets ratio of firms in the High ECM group increases from 0.040 in Year 0 to 0.064 in Year 1. This increase of 60% is highly significant with t-statistic of 9.04, thus providing support for Hypothesis III (a). In contrast, firms in the Low ECM group reduce their average investment-to-assets ratio by around 30% in Year 1 relative to Year 0. This decrease is also statistically significant. The results are consistent with the notion that excess cash holdings is associated with growth opportunities in the UK. For South Korea, the average investment-to-assets ratio of High ECM group increases by just 11% in Year 1 relative to Year 0 and this increase is significant only at 10% level. This increase is significantly lower than the corresponding increase for the UK. The Low ECM group in South Korea also sees a smaller magnitude of decrease (16%) in average investment in Year 1 when compared with developed Europe. These results suggest that the relation between excess cash and risky investment opportunities is weaker in South Korea than in the UK, thereby supporting Hypothesis III (b).

Panel B reports the results for surviving firms only. It shows similar patterns as Panel A for firms from the UK. The average investment-to-assets ratio of firms in the High ECM group increases by more than 132% from Year 0 to Year 1 and the t-statistic for this increase is 12.6. Firms in the Low ECM group see investments decrease by 27% from Year 0 to Year 1. For firms from South Korea, firms in the High EMC group do not seem to increase their investments significantly in Year 1. During some of the following years such as Year 2 and Year 5, the High EMC firms increase their investments, but the magnitude of the increase seems to be smaller than that for the UK. The Low ECM firms in South Korea do not seem to decrease their investments significantly in the years after portfolio assignment. These results are consistent with our conjecture that excess cash is a proxy for investment opportunities in the UK but not in South Korea.

Overall, the results for the UK and South Korea are consistent with those for developed Europe and emerging Asia. They all suggest that excess cash is positively related to future stock returns in countries with good corporate governance and this positive relation seems to be caused by the association between excess cash and investment opportunities.

Table 2.11 Investment Activity: United Kingdom and South Korea

This table reports the average firm-level investment activity of high and low excess cash measure (ECM) quintiles during the year(s) before, of, and after portfolio assignment. Investment activity (I) is measured as capital expenditure plus acquisitions less sale of property, plant, equipment scaled by total assets. At the end of every calendar year, firms are assigned into quintiles on the basis of their ECMs. The changes in investment between the year of portfolio assignment and the first year after portfolio assignment ($I_1 - I_0$) and the corresponding t statistics are presented. Panel A uses all firms, while Panel B keeps firms that survive for 10 years or longer. The sample period is 1997-2020.

Panel A: All firms				
	United Kingdom		South Korea	
Year	High ECM	Low ECM	High ECM	Low ECM
-10	0.069	0.082	0.040	0.071
-9	0.066	0.078	0.045	0.066
-8	0.067	0.077	0.043	0.064
-7	0.059	0.071	0.042	0.066
-6	0.058	0.068	0.042	0.065
-5	0.053	0.068	0.043	0.062
-4	0.055	0.069	0.039	0.060
-3	0.054	0.070	0.039	0.059
-2	0.049	0.070	0.038	0.056
-1	0.046	0.069	0.036	0.054
0	0.040	0.063	0.035	0.045
1	0.064	0.044	0.039	0.038
2	0.055	0.042	0.035	0.039
3	0.054	0.043	0.031	0.039
4	0.046	0.042	0.029	0.040
5	0.047	0.041	0.027	0.041
6	0.044	0.043	0.029	0.043
7	0.045	0.044	0.029	0.045
8	0.044	0.040	0.030	0.044
9	0.043	0.040	0.030	0.043
10	0.045	0.042	0.029	0.041
$I_1 - I_0$	0.024***	-0.019***	0.004*	-0.007***
	(9.04)	(-7.27)	(1.81)	(-3.55)

Panel B: Survivors only				
	United Kingdom		South Korea	
Year	High ECM	Low ECM	High ECM	Low ECM
-10	0.079	0.086	0.038	0.086
-9	0.075	0.082	0.037	0.066
-8	0.068	0.079	0.038	0.058
-7	0.061	0.072	0.038	0.059
-6	0.057	0.077	0.036	0.053
-5	0.060	0.063	0.039	0.062
-4	0.058	0.058	0.016	0.058
-3	0.048	0.067	0.027	0.053
-2	0.044	0.067	0.017	0.054
-1	0.035	0.067	0.013	0.050
0	0.028	0.062	0.019	0.044
1	0.065	0.045	0.021	0.040
2	0.060	0.042	0.027	0.042
3	0.059	0.045	0.019	0.040
4	0.053	0.045	0.019	0.042
5	0.052	0.044	0.025	0.043
6	0.046	0.044	0.023	0.043
7	0.049	0.049	0.020	0.044
8	0.048	0.038	0.027	0.043
9	0.042	0.041	0.027	0.041
10	0.043	0.041	0.025	0.036
$I_1 - I_0$	0.037***	-0.017***	0.002	-0.004
	(12.60)	(-3.37)	(0.63)	(-0.94)

2.7 Conclusions

We examine the relation between excess corporate cash holdings and future stocks returns in an international context. We find that excess cash is positively related to future stock returns in developed Europe but not in emerging Asia. In developed Europe, firms with higher excess cash have higher beta, better stock performance in rising markets, and increase their investments significantly. In contrast, these patterns either do not exist or are much weaker for firms from emerging Asia. These results suggest that excess cash is not a good proxy for investment opportunities in emerging Asia and this may have caused the insignificant relation between excess cash and future stock returns.

Chapter 3 How Much International Variation in Corporate Cash Can Intangible Assets Explain?

3.1 Introduction

Corporate cash is a topic of growing interest to researchers, in large part because of the large increase in corporate cash holdings in recent years (Graham and Leary, 2018). Despite the growing in corporate cash balances is a common pattern in international countries, we find that differences in corporate cash balances among countries are fairly persistent. Over the last three decades, for example, US firms on average maintain a higher level of cash holdings relative to firms in developed Europe. This international variation in firm-level cash holdings across developed countries is not well explained. In this paper, we fill out this gap.

One candidate explanation which has received small but growing attention of the puzzle of regional cash differences is intangible capital. Extant literature documents that intangible capital has a strong positive influence on corporate cash holdings (Falato, Kadyrzhanova, Sim, and Steri, 2022). In addition, literature shows that US firms exhibit better performance on investments in intangible assets than are European firms (Moncada-Paternò-Castello, Ciupagea, Smith, Tübke, and Tubbs, 2010). In this paper, we explore whether intangible capital accounts for the differences in corporate cash holdings between the US and developed Europe. If so, how much this international variation can be explained by intangible assets.

Our sample consists of the US and 12 developed European countries with a sample period of 1997-2020. We collect data mainly from Worldscope and Compustat databases. Follow Falato, Kadyrzhanova, Sim, and Steri (2022), we measure intangible capital by taking the sum of three types of capital accumulated through investments in intangible assets (knowledge capital, organizational capital, and informational capital) and dividing total assets net of cash. To measure informational capital and perform robustness checks, we employ data from the Organisation for Economic Co-operation and Development (OECD).

We first explore whether the positive relation of corporate cash and intangible assets holds in the context of developed Europe. The empirical results indicate that intangible capital robustly predicts firm-level cash balances in developed European countries. We then examine the explanatory power of intangible assets on the difference in corporate cash holdings between the US and developed Europe by quantifying the changes in coefficients between regression models. We find that 77% of the variation in corporate cash holdings can be explained by differences in intangible capital between the two regions, even after controlling for R&D intensity and other firm characteristics.

Finally, we investigate in depth the cross-sectional differences in firm-level intangible assets between the US and developed Europe over a period of 1987-2020. Three clear patterns emerge. First, corporate intangible assets trend up in both regions and their intangible capital gap is fairly stable over time. Second, we explore in depth the components of intangible assets. We find that much of the intangible capital gap comes from the regional difference in R&D related capital (Knowledge capital). Third, we document that the difference in intangible capital between the US and developed Europe is mainly occurred in high R&D intensity sectors, supporting the notion of sector specialization in which European firms exhibit significantly lower R&D performance in high R&D intensity sectors compared to their US counterparts in the same sectors. This sector specialization notion receives support by prior studies. Cincera and Veugelers (2014) and Castellani, Piva, Schubert, and Vivarelli (2019) document that US firms have a higher capacity to translate R&D investments into stock gains and productivity profits than European firms do.

Overall, we propose that sector specialization is the key reason for which intangible assets can explain the international variation in corporate cash holdings.

This paper contributes to corporate finance literature. First, we examine the relation between corporate cash holdings and intangible assets in developed European markets and we contribute out-of-sample tests for the positive relation of cash and intangible assets as documented in study of Falato, Kadyrzhanova, Sim, and Steri (2022). Second, our results show that intangible assets account for a large portion of the cash difference between the US and developed Europe and that the difference in intangible assets between the US firms and developed European firms is mainly caused by sector specialization. This finding confirms the literature that US firms outperform European firms in high R&D intensity sectors. Our research also contributes to the policy makers by showing them that governments' intangible capital-related policies affect not only their productivity but also their overall corporate cash level (relative to their competing countries) which is also an important indicator of corporate performance. Policy makers may want to maintain an optimal balance between intangible assets and corporate cash holdings.

The rest of paper is organized as follows. Section 3.2 reviews literature and construct hypotheses. Section 3.3 constructs samples and provides summary statistics and correlation analysis for variables of our interest. Section 3.4 tests the relation of corporate cash holdings and intangible assets and explains regional cash differences by using intangible assets. We then discuss why intangible assets explain cash difference between the US and developed Europe in Section 3.5. Section 3.6 performs robustness check. Lastly, Section 3.7 concludes.

3.2 Literature and Hypotheses

Cash and marketable securities held by companies are usually used as internal funds to invest on promising projects, especially when external financing is too costly, or to meet short-term liabilities. Thus, they are important for corporate daily routines, and investors use them as indicators for evaluating a firm's future stock performance and the ability to avoid a bankruptcy. Because of their importance, there has been a bunch of studies exploring the determinants of cash and marketable securities (hereafter, we call them together as cash).

Opler, Pinkowitz, Stulz, and Williamson (1999) explore the determinants of firm-level cash holdings. Simutin (2010) follows Opler's paper by using a US sample with a sample period of 1960-2006 and shows that corporate excess cash increases with ratios of the market equity to book equity, the research and development (R&D) expense to sales, and the cash flow to assets, and increases with cash flow volatility. Conversely, he shows that corporate cash balances decrease with firm size and ratios of the capital expenditure to assets, the net working capital to assets, as well as financial leverage. In addition, Al-Najjar (2013) shows evidence that dividend policy strongly correlates with firm-level cash holdings. Recent research has found that corporate intangible capital can also serve as a determinant of cash.

During recent decades, corporate investment in intangible assets dramatically increase in the US (Falato, Kadyrzhanova, Sim, and Steri, 2022). Probably the key reason is the shift towards a knowledge-related economy in which technological innovation and intellectual property contribute prominent value. Firms invest in information technology, research and development, and employee training for competing in markets. The most significant increase in intangible capital in the US is during the late 1990s and the beginning of 2000s. Within this period, firms started to realize the importance of intellectual property, internet, software, and human capital. Because of the fast speed of technology advancement, more and more firms compete globally by investing in intangible assets. As a result, the increase in intangible assets becomes to a global phenomenon. We demonstrate this global pattern in plots which are shown and discussed in Section 3.5.

Intangible assets are the opposite of tangible assets. Tangible assets have physical substance, such as building, machine and equipment, and office furniture. They are depreciated over time. While intangible assets are the accumulated expenditures on knowledge, brand, human capital, and information technology and they are also depreciated over time. Researchers notice that over the last decades, corporate investment in intangible assets grows dramatically in the US firms (Falato, Kadyrzhanova, Sim, and Steri, 2022). They argue that the increase in intangible assets will motivate companies to stockpile cash on hands as the intangible assets cannot serve as collateral in debt financing. The growth in intangible capital mitigates corporate debt capacity under current circumstances, thereby increasing the need for internal funds. In Falato's paper, it is empirically demonstrated that intangible capital is positively correlated with firm-level cash holdings, as evidenced by a US sample from the period 1970-2010. Given the rapid global increase in intangible capital and cash holdings, our first hypothesis anticipates that this positive relationship also persists in other regions, including developed European countries.

Hypothesis I: In developed Europe, corporate cash holdings and corporate intangible capital are positively correlated.

If Hypothesis I is true, the cash held by firms in both the US and developed Europe can be affected by the intangible capital. Accordingly, we can think that there might be a difference in cash between the two regions if the two regions treat intangible capital differently. By plotting the time series of corporate cash holdings and intangible assets for the US and developed Europe, we observe evident differences in cash between the two regions over time. In addition, we observe that the differences in corporate cash balances between the US and developed Europe are fairly persistent. Over the last three decades, US firms on average maintain a higher level of cash holdings relative to firms in developed Europe. Similarly, we observe evident differences in intangible assets between the US and developed Europe. Over the last three decades, US firms keep maintaining higher level of intangible assets than developed European firms do. These clear patterns suggest that the US and developed Europe have a fundamental or structural difference in dealing with intangible capital. We show and discuss details of those patterns in Section 3.5.

Prior studies support the above patterns and conclusions. In particular, the existing literature indicates that US firms specialize more in high R&D intensity sectors than European firms, and that the US boasts a greater number of firms investing in R&D within these sectors compared to European countries. For example, Moncada-Paternò-Castello, Ciupagea, Smith, Tübke, and Tubbs (2010) show that the lower overall corporate R&D performance of European firms is the result of sector specialization. Cincera and Veugelers (2014) and Castellani, Piva, Schubert, and Vivarelli (2019) document that US firms have a higher capacity to translate R&D investments into stock gains and productivity profits than European firms do. Consequently, corporate R&D performance gap between the US and developed Europe is induced by sector specialization. In particular, this corporate R&D performance gap is mainly occurred in high R&D intensity sectors.

R&D-related capital, also known as knowledge capital, is a major component of intangible capital. Because US firms have stronger specialization in high R&D sectors than European firms, thus US firms invest more in those sectors. As a result, US firms maintain a higher-level investment in intangible capital than European firms do. As we discussed earlier, corporate cash holdings in both regions can be positively impacted by intangible capital because of the debt capacity mechanism. Therefore, we predict that the regional differences in intangible capital result in the cash difference between the US and developed Europe. In other words, intangible capital should be able to explain at least some portion of cash difference between US and developed Europe. Our rest of hypotheses are presented below.

Hypothesis II: Firms in developed European countries have lower level of cash holdings than are US firms.

Hypothesis III: Intangible assets can explain some portion of corporate cash differences between US and developed Europe.

3.3 Sample and Data

Our sample includes 12,257 firms from the US markets and 12 developed European markets. The developed Europe dataset includes 4,955 firms from following countries: Austria, Belgium, Finland, France, German, Italy, Netherlands, Norway, Portugal, Spain, Sweden, and United Kingdom. The list of countries in our dataset corresponds to the Morgan Stanley Capital International (MSCI) list of developed European countries in 2021. Because of data availability issues, our sample does not include firms from Demark, Ireland, Israel, and Switzerland. The US dataset includes 7,302 firms. For the US dataset, we collect financial data from Compustat database. For the developed Europe dataset, we download data from Worldscope. Since most variables of our interest in Worldscope are available from 1987 and one of the cash determinants needs 10 years corporate cash flow, our sample period spans from 1997 to 2020. All dollar amount variables are downloaded in the US currency. All financial firms and utilities are excluded. Our analysis focuses on the US and the whole region of developed Europe. Therefore, we allow for firms cross-listed in the same region. For example, we allow for a UK firm cross-listed in other developed European countries as these markets are in the same region. However, if a UK firm is cross-listed in the US stock market, we do not include this firm in the developed Europe dataset. The similar criteria also applies to the US dataset. Our sample ends up with 89,351 firm-year observations, including 54,364 observations from the US and 34,987 observations from developed Europe.

3.3.1 Measurement of Intangible Capital and Cash

We construct intangible capital measure by following the method of Falato, Kadyrzhanova, Sim, and Steri (2022). For each firm-year observations, the intangible capital ratio (Intangible) is measured as the sum of knowledge capital, organizational capital, and informational capital divided by total assets (net of cash). Peters and Taylor (2017) point out that intangible assets generated within a firm are expensed on the income statement and seldom reflected as assets on the balance sheet. For instance, a company's investment in developing knowledge or patents is expensed as R&D. The expenditure on advertising to enhance brand capital is categorized as a selling expense within Selling, General, and Administrative (SG&A) costs. Similarly, employee training aimed at developing human capital is classified as a general or administrative expense within SG&A. Consequently, researchers measure intangible capital by capitalizing these expenses at a depreciation rate. Lots of prior studies have estimated a proper depreciation rate. Unlike tangible assets which depreciate due to physical decay, intangible capital depreciates because its contribution to a firm's profit declines over time (Hall, 2007; Li and Hall, 2018). The prior studies estimate the depreciation rate by solving a profit maximization problem. For instance, a firm seeking to maximize profits will strategically invest in R&D to ensure that the marginal benefit equals the marginal cost. In other words, the firm will select an optimal R&D investment amount aimed at maximizing the net present value of returns from R&D investment (Li and Hall, 2018). For measuring knowledge capital, corporate R&D expenditures are accumulated over time with a depreciation rate of 15%. Organizational capital is characterized by capitalized SG&A expenses subject to a 20% depreciation rate. Organizational capital refers to the stock of assets resulting from investments in the value of brand names and employee training (Falato, Kadyrzhanova, Sim, and Steri, 2022). The SG&A expenses are considered organizational capital because they encompass expenditures aimed at enhancing the firm's brand names and other intellectual assets embedded in firm-specific human capital. Lev and Radhakrishnan (2013) assert that SG&A expenses capture labor expenses that cannot be directly attributed to a specific unit of output, making it a suitable indicator for spending on activities that contribute to the development of organizational capital. Since not all of the SG&A expenses are related to organizational capital, we follow Falato, Kadyrzhanova, Sim, and Steri (2022) and weigh the stock of organizational capital by 0.2. Informational capital is associated with expenditures on software. Because these expenditures are not reported at the firm level, we use the industry-level capital formation data from the National Accounts of the Organisation for Economic Co-operation and Development (OECD). We construct a multiple of this stock to the total fixed capital at the industry level for each country. We then apply this multiple to firm-level data to derive the firm-level stock of informational capital. In this paper, the variable Cash is measured as the ratio of cash and marketable securities to total assets.

3.3.2 Control Variables

Opler, Pinkowitz, Stulz, and Williamson (1999) explore the determinants of firm-level cash holdings. Simutin (2010) follows Opler's paper by using a US sample with a sample period of 1960-2006 and shows that corporate excess cash increases with ratios of the market equity to book equity, the research and development (R&D) expense to sales, and the cash flow to assets, and increases with cash flow volatility. Conversely, he shows that corporate cash balances decrease with firm size and ratios of the capital expenditure to assets, the net working capital to assets, as well as financial leverage. In addition, Al-Najjar (2013) shows evidence that dividend policy strongly correlates with firm-level cash holdings. In this paper, we control for these factors that may affect cash held by firms in the US and developed Europe. Specifically, we control for the following variables: cash flow volatility (Industry Sigma), market-to-book ratio (MB), firm size (Size), corporate cash flow ratio (CF), capital expenditure ratio (CPX), dividend dummy (Div), net working capital ratio (WC), financial leverage (LTD), R&D intensity (RD), and acquisition ratio (Acquisitions). Industry Sigma is the arithmetic average of standard deviations of corporate cash flows over 10 years for firms in the same two-digit SIC industry. MB is the book value of assets less the book value of equity plus the market value of equity divided by assets. Size is the log of real (adjusted by CPI) assets. CF is the corporate cash flow measured as the ratio of operating income before depreciation less interest less dividends less taxes to assets. CPX is capital expenditures divided by assets. Div is a dummy variable for dividend-paying firms. WC is net working capital calculated without cash divided by assets. LTD is the ratio of long-term debt to assets. RD is the research and development expenditures divided by sales. Acquisitions is the cash outflow relating to acquisition scaled by assets.

3.3.3 Descriptive Statistics

In Table 3.1, we report summary statistics for variables of our interest. The results show that both cash and intangible capital ratios in the US are on average greater than those in developed Europe. US firms have an average cash ratio of 0.179 in Panel A, whereas the cash ratio of developed Europe dataset is 0.165 in Panel B. This evidence suggests that there is a cash difference between the two regions, consistent with our Hypothesis II. The difference in intangible capital between these two datasets is even more dramatic. The intangible capital in the US (1.150) is greater than that in developed Europe (0.849). Panel C reports the difference in means between the two regions for each variable and the corresponding t-statistics. On average, US firms have higher cash level, more intangible capital, larger firm size, lower volatility of cash flow, higher market-to-book ratio, more corporate net cash flows, higher capital expenditure, higher net working capital, higher leverage, higher R&D expenditure, less cash outflow relating to acquisition, and less dividend-paying firms than those for firms in developed Europe. All of these differences are strongly significant at 1% level. The country-level descriptive statistics for developed Europe dataset are reported in Panel D. There are a total of 34,987 firm-year observations. Nearly 50% of observations in this dataset are from the market of United Kingdom.

To provide a visual representation of the differences in cash ratio and intangible capital ratio between the US and developed Europe, we present the long-term trends of intangible assets and cash in these regions. Figure 3.1 illustrates the time series of intangible assets and cash by plotting their annual averages of their respective ratios across firms in the US dataset and firms in the developed Europe dataset. The data spans from 1987 to 2020 based on data availability. The figure shows an upward trend in both intangible capital and cash over time in both the US and developed Europe datasets. In Panel A, there is a noticeable disparity in cash holdings between the two regions, indicating that firms in developed Europe hold less cash than their US counterparts. Panel B also demonstrates a clear difference in intangible assets, with US firms investing more on average in intangible capital compared to firms in developed Europe.

Table 3.1 Summary Statistics

This table reports descriptive statistics of characteristics for firms in the US (Panel A) and firms in developed Europe (Panel B). Panel C reports the difference in means between the two regions and corresponding t-statistics. Panel D reports country-level descriptive statistics for developed Europe dataset. Cash is the ratio of cash and marketable securities to assets. Intangible is intangible capital measured as the sum of knowledge capital, organization capital, and information capital scaled by net assets (Falato et al., 2022). Industry Sigma is the arithmetic average of standard deviations of corporate cash flows over 10 years for firms in the same two-digit SIC industry. MB is the book value of assets less the book value of equity plus the market value of equity divided by assets. Size is the log of real (adjusted by CPI) assets. CF is the corporate cash flow measured as the ratio of operating income before depreciation less interest less dividends less taxes to assets. CPX is capital expenditures divided by assets. Div is a dummy variable for dividend-paying firms. WC is net working capital calculated without cash divided by assets. LTD is the ratio of long-term debt to assets. RD is the research and development expenditures divided by sales. Acquisitions is the cash outflow relating to acquisition scaled by assets. The sample period is 1997-2020.

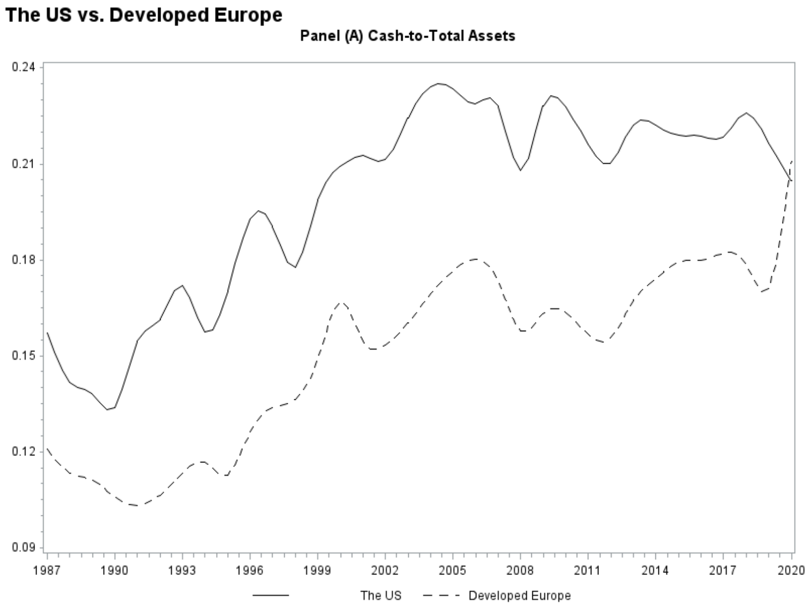
Panel A: The US					
Variable	N	Mean	Standard Deviation	Minimum	Maximum
Cash	54,364	0.179	0.202	0.000	0.958
Intangible	54,364	1.150	2.641	0.001	45.012
Industry Sigma	54,364	0.076	0.040	0.009	0.459
MB	54,364	1.874	1.436	0.421	22.122
Size	54,364	5.828	2.003	0.033	12.439
CF	54,364	0.054	0.114	-0.864	0.313
CPX	54,364	0.058	0.066	0.000	0.501
Div	54,364	0.401	0.490	0.000	1.000
WC	54,364	0.123	0.170	-0.382	0.653
LTD	54,364	0.193	0.194	0.000	1.053
RD	54,364	0.039	0.125	0.000	4.889
Acquisitions	54,364	0.019	0.046	-0.018	0.371
Panel B: Developed Europe					
Variable	N	Mean	Standard Deviation	Minimum	Maximum
Cash	34,987	0.165	0.184	0.000	0.897
Intangible	34,987	0.849	1.730	0.000	15.321
Industry Sigma	34,987	0.078	0.069	0.009	1.489
MB	34,987	1.778	1.451	0.259	20.155
Size	34,987	5.101	2.212	-1.895	12.542
CF	34,987	0.025	0.135	-0.982	0.326
CPX	34,987	0.048	0.057	0.000	0.451
Div	34,987	0.602	0.489	0.000	1.000
WC	34,987	0.084	0.176	-0.532	0.661
LTD	34,987	0.136	0.147	0.000	0.851
RD	34,987	0.028	0.096	0.000	1.125
Acquisitions	34,987	0.023	0.060	-0.022	0.471

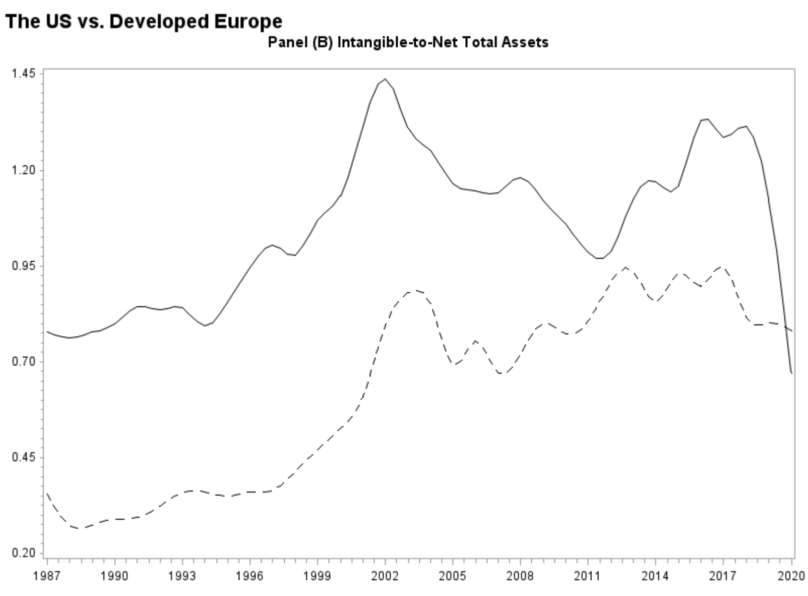
Panel C: The US vs. Developed Europe				
Variable	The US	Developed Europe	Difference	t-statistic
Cash	0.179	0.165	0.014***	17.04
Intangible	1.150	0.849	0.301***	28.42
Industry Sigma	0.076	0.078	-0.002***	-5.42
MB	1.874	1.778	0.096***	9.65
Size	5.828	5.101	0.727***	49.72
CF	0.054	0.025	0.029***	33.58
CPX	0.058	0.048	0.010***	23.72
Div	0.401	0.602	-0.201***	-59.94
WC	0.123	0.084	0.039***	32.92
LTD	0.193	0.136	0.057***	49.63
RD	0.039	0.028	0.012***	15.47
Acquisitions	0.019	0.023	-0.004***	-10.11

Panel D: Country-Level Summary Statistics of Developed Europe					
Country	Cash	Intangible	No. of Firms	No. of Observations	% of Observations
Austria	0.141	0.616	68	600	1.71
Belgium	0.186	1.408	57	458	1.31
Finland	0.148	0.714	142	1,051	3.00
France	0.190	0.941	288	1,991	5.69
Germany	0.169	0.687	673	5,374	15.36
Italy	0.126	0.404	369	3,024	8.64
Netherlands	0.119	0.504	150	1,316	3.76
Norway	0.183	0.627	248	1,380	3.94
Portugal	0.068	0.267	7	29	0.08
Spain	0.149	0.491	77	448	1.28
Sweden	0.194	0.947	464	2,402	6.87
United Kingdom	0.157	1.037	2,412	16,914	48.34

Figure 3.1 Long-Run Trends in the US and Developed Europe: Cash and Intangible Assets

This figure plots the long-run trends in the cash ratio (relative to total assets) in Panel A and the intangible capital ratio (relative to the assets without cash) in Panel B. The ratios are plotted as equal-weighted averages across all firms in each year for each of the two samples (the US firms and the firms in developed Europe). Each sample includes firm-year observations from 1987 to 2020 for firms incorporated and listed in the corresponding region. Financial firms (SIC: 6000-6999) and utilities (SIC: 4900-4999) are excluded from the sample.





3.3.4 Correlation Analysis

To rule out the multicollinearity concern, we perform a Pearson correlation test and report the results in Table 3.2. Most coefficients are relatively small and does not indicate much correlation between the variables. However, some coefficients are worth further attention. The variables Cash and Intangible show the highest correlation in both datasets (0.677 for the US; 0.562 for developed Europe). This is in line with what we expect as Hypothesis I predicts a positive relationship between corporate cash and intangible capital. Variables RD and Intangible show the second highest correlation in both datasets (0.486 for US; 0.447 for developed Europe). This is not a surprising finding because both RD and Intangible use R&D expenditure in their measurement. Div and Size have a positive coefficient of 0.402 in the US dataset and 0.429 in developed Europe dataset. This is consistent with literature that larger firms are more likely to pay dividends. All of the explanatory variables exhibit similar correlation sign to dependent variable Cash in both datasets. The correlation matrix does not lead us to raise a multicollinearity concern in our sample. To support the conclusion of the correlation test, we conduct Variance Inflation Factor (VIF) test and this test does not find evidence of multicollinearity. The VIF results are reported in each panel of Table 3.2.

Table 3.2 Correlation Analysis

This table reports the Pearson correlation matrix for firms in the US (Panel A) and firms in developed Europe (Panel B). Cash is the ratio of cash and marketable securities to assets. Intangible is intangible capital measured as the sum of knowledge capital, organization capital, and information capital scaled by net assets (Falato et al., 2022). Industry Sigma is the arithmetic average of standard deviations of corporate cash flows over 10 years for firms in the same two-digit SIC industry. MB is the book value of assets less the book value of equity plus the market value of equity divided by assets. Size is the log of real (adjusted by CPI) assets. CF is the corporate cash flow measured as the ratio of operating income before depreciation less interest less dividends less taxes to assets. CPX is capital expenditures divided by assets. Div is a dummy variable for dividend-paying firms. WC is net working capital calculated without cash divided by assets. LTD is the ratio of long-term debt to assets. RD is the research and development expenditures divided by sales. Acquisitions is the cash outflow relating to acquisition scaled by assets. The results of variance inflation factor (VIF) test are provided in this table. The p-values are: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$. The sample period is 1997-2020.

Panel A: The US												
Variable	Cash	Intangible	Industry Sigma	MB	Size	CF	CPX	Div	WC	LTD	RD	Acquisitions
Cash	1.000											
Intangible	0.677***	1.000										
Industry Sigma	0.157***	0.105***	1.000									
MB	0.349***	0.306***	0.074***	1.000								
Size	-0.185***	-0.250***	-0.001	-0.020***	1.000							
CF	-0.126***	-0.195***	-0.058***	0.062***	0.260***	1.000						
CPX	-0.140***	-0.189***	0.048***	0.026***	-0.004	0.042***	1.000					
Div	-0.164***	-0.181***	-0.096***	0.000	0.402***	0.100***	-0.019***	1.000				
WC	-0.256***	-0.085***	-0.159***	-0.157***	-0.246***	0.099***	-0.214***	-0.036***	1.000			
LTD	-0.358***	-0.283***	-0.052***	-0.110***	0.278***	-0.014***	0.100***	0.088***	-0.141***	1.000		
RD	0.366***	0.486***	0.126***	0.184***	-0.040***	-0.221***	-0.089***	-0.130***	-0.110***	-0.121***	1.000	
Acquisitions	-0.122***	-0.095***	0.008*	-0.005	0.040***	0.041***	-0.099***	-0.005	-0.019***	0.126***	0.002	1.000
VIF	NA	1.677	1.054	1.163	1.563	1.206	1.150	1.236	1.260	1.202	1.392	1.047
Tolerance	NA	0.596	0.949	0.860	0.640	0.830	0.870	0.809	0.794	0.832	0.718	0.955

Panel B: Developed Europe												
Variable	Cash	Intangible	Industry Sigma	MB	Size	CF	CPX	Div	WC	LTD	RD	Acquisitions
Cash	1.000											
Intangible	0.562***	1.000										
Industry Sigma	0.099***	0.110***	1.000									
MB	0.341***	0.257***	0.066***	1.000								
Size	-0.245***	-0.288***	-0.155***	-0.185***	1.000							
CF	-0.262***	-0.239***	-0.034***	-0.110***	0.333***	1.000						
CPX	-0.098***	-0.107***	-0.037***	0.045***	0.024***	0.073***	1.000					
Div	-0.209***	-0.162***	-0.148***	-0.058***	0.429***	0.337***	0.018***	1.000				
WC	-0.236***	-0.136***	-0.146***	-0.120***	-0.017***	0.126***	-0.084***	0.146***	1.000			
LTD	-0.275***	-0.223***	-0.057***	-0.114***	0.310***	0.063***	0.122***	0.058***	-0.069***	1.000		
RD	0.347***	0.447***	0.011**	0.161***	-0.072***	-0.238***	-0.063***	-0.165***	-0.063***	-0.115***	1.000	
Acquisitions	-0.088***	-0.082***	0.009*	0.045***	0.019***	0.057***	-0.061***	0.052***	-0.074***	0.068***	-0.016***	1.000
VIF	NA	1.480	1.064	1.117	1.568	1.271	1.054	1.363	1.118	1.174	1.327	1.037
Tolerance	NA	0.676	0.940	0.896	0.638	0.787	0.949	0.734	0.895	0.852	0.754	0.964

3.4 Multivariate Analysis

The previous section gives us a brief overview of the positive relation between corporate cash and intangible assets and shows that there is a cash difference between the US and developed Europe. These findings still need further exploration. First, we use regressions to detect the positive relation of corporate cash and intangible assets for the US and developed Europe datasets, respectively. Second, we conduct regression models to quantify how much cash difference between the US and developed Europe can be explained by corporate intangible assets. Third, if the cash difference is explained by intangible capital, we are interested in whether this explanatory power robustly work across all subsamples of firms (such as, large firms and small firms).

3.4.1 Cash and Intangible Assets

Falato, Kadyrzhanova, Sim, and Steri (2022) find a positive relationship between corporate cash holdings and intangible capital in the US firms with a sample period of 1970-2010. In this part, we examine whether this relation still holds for the US dataset with a different sample period and for developed Europe dataset. For each dataset, we regress the corporate cash ratio on the intangible capital ratio and control variables previously identified as determinants of cash holdings in the literature. To better understand the differences and similarities between the US and developed Europe, we examine the intricacies within developed Europe by dividing the dataset into two subsamples: firms in the UK and firms in other developed European countries. We split observations in this way because the resulting two subsamples have equivalent sample size. We then run regressions on these four samples separately: the US, developed Europe, the UK, and other developed European countries. Regression results are reported in Table 3.3.

In Table 3.3, intangible assets (Intangible) have a strong positive effect on corporate cash holdings (Cash) in all samples. For firms in developed Europe, the coefficient of Intangible is

0.153 at the significance level of 1%. This result implies that one-standard-deviation increase in intangible capital is associated with an 15.3% increase in the cash ratio, which is nearly equal to the sample mean cash ratio of 15.4%. Coefficients are similar in magnitude for all samples, suggesting that intangible capital has similar explanatory power among developed countries. Most coefficients show similar sign to cash ratio in the US and developed Europe. Market-to-book ratio (MB) and R&D intensity (RD) have strong positive effects on cash. Capital expenditure (CPX), dividend dummy (Div), net working capital (WC), leverage (LTD), and acquisition-related cash outflow (Acquisitions) negatively affect cash. The negative and significant coefficients on capital expenditures and acquisitions suggest that companies are utilizing their cash holdings to actively pursue investment opportunities (Falato, Kadyrzhanova, Sim, and Steri, 2022). Capital expenditures and acquisitions typically involve significant cash outflows. As a result, an increase in capital expenditures or acquisitions may lead to a decrease in the overall cash balance of the company. The coefficients of intangible assets (Intangible) and acquisition-related cash outflow (Acquisitions) are consistent with the results in Table 3.2 in which the variables Intangible and Acquisitions are negatively correlated. These results support the notion that firms with high intangible assets are less likely to engage in mergers and acquisitions (M&A) activities. One study, conducted by Masulis, Reza, and Guo (2023), explores the sources of value creation in acquisitions of intangible assets. The research indicates that firms may be less inclined to pursue M&A when they have significant intangible assets. Additionally, Hamood Al-Sabri, Nordin, and Shahar (2020) argue that tangible assets may play a role in the choice of M&A investments, suggesting that firms with high intangible assets may prioritize alternative strategies over mergers and acquisitions.

In Table 3.3, some variables have different influence on corporate cash holdings. Firm size (Size) negatively affects cash in the US sample but has no significant effects in developed Europe sample. This difference may be induced by the access to capital markets. Larger firms in the US may have easier access to external financing through vibrant capital markets. This could lead them to maintain lower cash reserves, relying on the availability of external funding when needed. In contrast, the UK firms might follow diverse funding strategies influenced by regional banking structures and regulatory constraints that mitigate the direct impact of firm size on cash holdings, making the relationship statistically nonsignificant. Corporate cash flow (CF) has strong positive influence on cash holdings for the US firms, whereas in developed Europe corporate cash holdings decrease as cash flows increase. In developed Europe, cash flow volatility (Industry Sigma) has no effects on cash. However, it increases cash holdings in the US. From Table 3.3, we can see that the positive relation between cash and intangible assets is valid in the US and developed Europe.

Table 3.3 The Relation Between Intangible Capital and Cash

This table reports regression results for four different samples: the US firms, developed European firms, Britain firms, and firms in other developed European countries. Cash is the ratio of cash and marketable securities to assets. Intangible is intangible capital measured as the sum of knowledge capital, organization capital, and information capital scaled by net assets (Falato et al., 2022). Industry Sigma is the arithmetic average of standard deviations of corporate cash flows over 10 years for firms in the same two-digit SIC industry. MB is the book value of assets less the book value of equity plus the market value of equity divided by assets. Size is the log of real (adjusted by CPI) assets. CF is the corporate cash flow measured as the ratio of operating income before depreciation less interest less dividends less taxes to assets. CPX is capital expenditures divided by assets. Div is a dummy variable for dividend-paying firms. WC is net working capital calculated without cash divided by assets. LTD is the ratio of long-term debt to assets. RD is the research and development expenditures divided by sales. Acquisitions is the cash outflow relating to acquisition scaled by assets. Industry and year dummies are included in all regressions. Standard errors are clustered at firm level for all samples. The t-statistics are reported in parentheses. The p-values are: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$. The Adjusted R^2s are in percentage. The sample period is 1997-2020.

	Dependent Variable: Cash			
			Developed Europe	
	The US	Developed Europe	The UK	Other Countries
Intangible	0.167***	0.153***	0.177***	0.134***
	(59.96)	(31.33)	(28.67)	(17.91)
Industry Sigma	0.156***	0.004	-0.008	0.156
	(5.66)	(0.21)	(-0.08)	(0.98)
MB	0.016***	0.022***	0.021***	0.022***
	(18.61)	(20.24)	(15.24)	(13.84)
Size	-0.005***	-0.001	0.002	-0.008***
	(-6.21)	(-0.74)	(1.35)	(-7.04)
CF	0.033***	-0.081***	-0.061***	-0.070***
	(3.55)	(-6.95)	(-4.05)	(-4.00)
CPX	-0.230***	-0.192***	-0.182***	-0.230***
	(-15.15)	(-9.29)	(-6.97)	(-6.89)
Div	-0.015***	-0.015***	-0.022***	0.001
	(-5.64)	(-5.23)	(-5.06)	(0.29)
WC	-0.269***	-0.145***	-0.120***	-0.204***
	(-30.65)	(-15.80)	(-9.59)	(-14.72)
LTD	-0.169***	-0.168***	-0.194***	-0.141***
	(-27.07)	(-17.93)	(-14.50)	(-10.80)
RD	0.036***	0.143***	0.134***	0.147***
	(3.74)	(8.67)	(6.22)	(6.00)
Acquisitions	-0.234***	-0.161***	-0.089***	-0.187***
	(-19.60)	(-12.96)	(-5.99)	(-8.92)
Intercept	0.161***	0.126***	0.050***	0.162***
	(15.04)	(16.00)	(4.47)	(12.61)
Industry & Year FE	Yes	Yes	Yes	Yes
No. of Observations	54,364	34,987	16,870	18,035
No. of Firms	7,302	4,955	2,406	2,540
Adjusted R^2	57.82	44.03	49.05	41.40

3.4.2 Cash Difference

Based on the evidence of previous part, we can conclude that intangible assets have explanatory power on corporate cash holdings in both the US and developed Europe. In addition, we already find that there is a difference in cash between the two regions from Section 3.3. Therefore, a question naturally comes up: Is this cash difference caused by the difference in intangible assets between these two regions? To answer this question, we pool the two datasets together and create a region dummy (EU) taking value of one for firms in developed Europe. Otherwise, this dummy takes value of zero for the US firms. We firstly run regressions without intangible capital to assess the magnitude of cash difference. We then add intangible capital into regressions to see how the estimates change. This design allows examination of changes in coefficients as the intangible capital is entered into the equation, and quantifies the cash difference explained.

The analysis involved tests for whether an additive or interactive model (by region) was more appropriate. Firms in the US and firms in developed Europe may experience differences in relationships among variables, in which case they would need to be examined separately (e.g., government's R&D policy may influence cash management differently for the US firms and developed European firms). Ordinary Least Square (OLS) regressions were performed and a comparison made between an additive model and a model that included interaction terms for region (EU) with intangible capital (Intangible) in the model. A Chi-square difference test indicates that there is a significant improvement in the model fit by including the interaction. Therefore, an interactive model is used in which EU is one exogenous variable.

Table 3.4 presents the result of the OLS regressions of corporate cash on region (EU) and other predictors. Models (1), (3), (5), and (7) include region (EU), while Models (2), (4), (6), and

(8) add intangible capital-related variables. Models (1) and (2) do not control for any fixed effects or any influences by other predictors. Model (1) results indicate that EU is significantly related to corporate cash holdings. The cash held by firms in developed Europe is less than that by the US firms. However, once intangible capital-related variables are controlled (Model (2)), the region coefficient is no longer significant, suggesting that the effect of region on corporate cash operates indirectly through these intangible capital variables. Models (3) and (4) add other cash determinants without controlling fixed effects. Although the region coefficient is marginally significant after the intangible capital-related variables are controlled (Model (4)), its estimate changes from -0.025 (Model (3)) to -0.005 (80% decrease). This result suggests that intangible capital has explanatory power on the cash difference between developed Europe and the US. Models (5)-(8) repeat the regression models (1)-(4) except they include industry and year fixed effects. Models (5)-(8) results are similar to those in Models (1)-(4). Their results indicate that the cash difference between the two regions can be largely explained by their intangible assets, at least 59% of cash difference is explained. Overall, results are in line with our Hypothesis III which states that intangible assets can explain the difference in corporate cash holdings between the US and developed Europe. The results of Table 3.4 also support the positive relation between cash and intangible capital (Hypothesis I). Models (2), (4), (6), and (8) show positive coefficients of intangible capital with a range from 0.08 to 0.17. As we expect, intangible capital affects corporate cash holdings differently for firms in the US and developed Europe. The interactive terms in Models (2), (4), (6), and (8) are significant at 1% level.

For better understanding, we further investigate whether the intangible assets explain cash difference among firms in developed Europe. By doing so, we split developed Europe dataset into two subsets: the UK and other developed European countries. A region dummy (GB) is constructed for the following comparison. The model specifications of Table 3.5 are the same to those of Table 3.4. Models (1) and (2) and Models (5) and (6) show similar results. The estimates of GB are even insignificant before the intangible assets-related variables are entered. After the inclusion, the GB coefficients increase their magnitude, suggesting that intangible capital has no explanatory power on the cash difference among developed European countries. Models (3), (4), (7), and (8) reach to the same conclusion in which intangible capital does not explain cash difference within developed Europe although they show that Britain firms exhibit lower levels of cash holdings than are other developed European countries.

Table 3.4 Explain the Difference in Cash between Developed Europe and the US

This table assesses how much corporate cash difference between developed Europe and the US can be explained by intangible assets. EU is a dummy variable taking value of one for companies incorporated and listed in developed Europe. Cash is the ratio of cash and marketable securities to assets. Intangible is intangible capital measured as the sum of knowledge capital, organization capital, and information capital scaled by net assets (Falato et al., 2022). Industry Sigma is the arithmetic average of standard deviations of corporate cash flows over 10 years for firms in the same two-digit SIC industry. MB is the book value of assets less the book value of equity plus the market value of equity divided by assets. Size is the log of real (adjusted by CPI) assets. CF is the corporate cash flow measured as the ratio of operating income before depreciation less interest less dividends less taxes to assets. CPX is capital expenditures divided by assets. Div is a dummy variable for dividend-paying firms. WC is net working capital calculated without cash divided by assets. LTD is the ratio of long-term debt to assets. RD is the research and development expenditures divided by sales. Acquisitions is the cash outflow relating to acquisition scaled by assets. Standard errors are clustered at firm level for all regressions. The t-statistics are reported in parentheses. The p-values are: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$. The Adjusted R^2s are in percentage. The sample period is 1997-2020.

	Dependent Variable: Cash							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EU	-0.015***	-0.005	-0.025***	-0.005*	-0.017***	-0.007	-0.026***	-0.006**
	(-5.64)	(-0.99)	(-10.25)	(-1.79)	(-6.45)	(-1.42)	(-10.24)	(-2.39)
Explained		**67%**		**80%**		**59%**		**77%**
Intangible		0.084***		0.163***		0.080***		0.167***
		(10.05)		(61.81)		(10.02)		(63.74)
EU*Intangible		0.031***		-0.013***		0.030***		-0.012***
		(3.46)		(-2.89)		(3.56)		(-2.59)
Industry Sigma			0.082***	0.050***			0.057***	0.018
			(4.92)	(3.27)			(3.26)	(1.14)
MB			0.028***	0.018***			0.028***	0.019***
			(35.81)	(27.11)			(35.71)	(27.67)
Size			-0.008***	-0.001***			-0.008***	-0.002***
			(-13.81)	(-2.55)			(-12.78)	(-4.02)
CF			-0.059***	-0.035***			-0.066***	-0.026***
			(-6.45)	(-4.72)			(-7.22)	(-3.50)
CPX			-0.376***	-0.190***			-0.326***	-0.212***
			(-28.26)	(-16.21)			(-24.04)	(-17.18)
Div			-0.021***	-0.019***			-0.020***	-0.018***
			(-9.80)	(-9.34)			(-9.20)	(-8.79)
WC			-0.254***	-0.207***			-0.264***	-0.212***
			(-38.75)	(-34.13)			(-38.08)	(-33.33)
LTD			-0.240***	-0.179***			-0.233***	-0.172***
			(-41.76)	(-34.24)			(-40.44)	(-32.70)
RD			0.342***	0.074***			0.325***	0.067***
			(17.19)	(7.70)			(16.56)	(7.12)
Acquisitions			-0.332***	-0.203***			-0.340***	-0.198***
			(-35.00)	(-23.59)			(-34.93)	(-22.74)
Intercept	0.167***	0.120***	0.246***	0.125***	0.139***	0.114***	0.249***	0.176***
	(80.28)	(25.88)	(45.69)	(24.44)	(22.97)	(21.24)	(29.46)	(22.44)
Industry & Year FE	No	No	No	No	Yes	Yes	Yes	Yes
N	112,457	112,457	89,864	89,864	111,817	111,817	89,351	89,351
Adjusted R^2	0.00	22.89	37.79	51.32	5.83	25.48	38.59	52.06

Table 3.5 Explain the Difference in Cash between the UK and Other Developed European Countries

This table assesses how much corporate cash difference between the United Kingdom (UK) and other developed European countries can be explained by intangible assets. GB is a dummy variable taking value of one for companies incorporated and listed in the UK. Cash is the ratio of cash and marketable securities to assets. Intangible is intangible capital measured as the sum of knowledge capital, organization capital, and information capital scaled by net assets (Falato et al., 2022). Industry Sigma is the arithmetic average of standard deviations of corporate cash flows over 10 years for firms in the same two-digit SIC industry. MB is the book value of assets less the book value of equity plus the market value of equity divided by assets. Size is the log of real (adjusted by CPI) assets. CF is the corporate cash flow measured as the ratio of operating income before depreciation less interest less dividends less taxes to assets. CPX is capital expenditures divided by assets. Div is a dummy variable for dividend-paying firms. WC is net working capital calculated without cash divided by assets. LTD is the ratio of long-term debt to assets. RD is the research and development expenditures divided by sales. Acquisitions is the cash outflow relating to acquisition scaled by assets. Standard errors are clustered at firm level for all regressions. The t-statistics are reported in parentheses. The p-values are: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$. The Adjusted R^2s are in percentage. The sample period is 1997-2020.

	Dependent Variable: Cash							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GB	-0.004	-0.029***	-0.026***	-0.038***	-0.003	-0.035***	-0.026***	-0.045***
	(-0.95)	(-7.30)	(-7.51)	(-9.01)	(-0.63)	(-8.77)	(-7.01)	(-10.47)
Explained	**not applicable**		**not applicable**		**not applicable**		**not applicable**	
Intangible		0.212***		0.131***		0.214***		0.143***
		(38.77)		(19.13)		(38.75)		(20.99)
GB*Intangible		0.006		0.021***		0.008		0.022***
		(0.78)		(2.68)		(1.09)		(2.81)
Industry Sigma			0.394***	0.167**			0.327***	0.053
			(4.77)	(2.13)			(3.58)	(0.64)
MB			0.027***	0.021***			0.027***	0.022***
			(23.79)	(20.00)			(23.71)	(20.26)
Size			-0.007***	-0.002**			-0.007***	-0.003***
			(-8.62)	(-2.09)			(-8.41)	(-3.95)
CF			-0.107***	-0.080***			-0.107***	-0.067***
			(-7.57)	(-6.92)			(-7.55)	(-5.80)
CPX			-0.233***	-0.140***			-0.246***	-0.206***
			(-11.28)	(-6.97)			(-11.28)	(-9.86)
Div			-0.011***	-0.017***			-0.009***	-0.011***
			(-3.64)	(-5.89)			(-2.91)	(-3.79)
WC			-0.194***	-0.156***			-0.194***	-0.158***
			(-21.61)	(-17.27)			(-20.57)	(-16.68)
LTD			-0.213***	-0.176***			-0.213***	-0.172***
			(-21.72)	(-18.73)			(-21.54)	(-18.26)
RD			0.401***	0.151***			0.400***	0.144***
			(18.81)	(9.02)			(18.76)	(8.81)
Acquisitions			-0.233***	-0.136***			-0.239***	-0.129***
			(-18.56)	(-11.23)			(-18.34)	(-10.54)
Intercept	0.157***	0.074***	0.194***	0.125***	0.171***	0.102***	0.243***	0.215***
	(61.33)	(28.25)	(24.39)	(15.38)	(17.31)	(12.09)	(19.52)	(17.71)
Industry & Year FE	No	No	No	No	Yes	Yes	Yes	Yes
N	48,279	48,279	35,024	35,024	48,142	48,142	34,905	34,905
Adjusted R^2	0.01	30.96	33.60	43.69	4.17	32.80	33.96	44.99

3.4.3 Investigation in Subsamples

In previous part, we document that intangible assets can explain the cash difference between the US and developed Europe but cannot explain that difference within developed European countries. In current part, we wonder whether these findings are robust across subsamples of firms. To implement, we split firms into two subsets by firm size, industry, and firm age. Specifically, small (large) firms are classified as firms with size below (above) the median of firm size in a sample. Young (old) firms are firms with less than or equal to (more than) 10 years since IPO. We then apply Models (7) and (8) of Table 3.4 on all subsets. Results are reported in Table 3.6. M1 regresses cash on region and other control variables and control for industry and time fixed effects, while M2 adds intangible capital-related variables in the equation. Generally speaking, intangible capital maintains its explanatory power on cash difference between the US and developed Europe across most of subsamples, except the subsample of large firms in which the EU estimate does not shrink but instead increases from -0.006 (M1) to 0.017 (M2). Intangible capital shows the highest degree of explanation in old firms and the lowest degree in small firms.

Next, we apply our procedure of Table 3.6 on firms in developed Europe only and find that intangible assets still not explain any difference in cash between Britain firms and firms in other developed European countries. In Table 3.7, the coefficients of GB get more negative when intangible capital-related variables are included across all subsamples of firms.

In conclusion, we find supportive evidence of the positive relation between corporate cash holdings and intangible capital, and the explanatory power of intangible capital on the difference in cash held by European and the US firms. We further explore the mechanism behind this explanation process.

Table 3.6 Developed Europe vs. The US: Explain Cash Difference in Subsamples

This table reports regression results for explaining corporate cash difference between developed Europe and the US in subsamples. Firms are assigned into subsamples based on firm size, firm age, and industries. EU is a dummy variable taking value of one for companies incorporated and listed in developed Europe. Cash is the ratio of cash and marketable securities to assets. Intangible is intangible capital measured as the sum of knowledge capital, organization capital, and information capital scaled by net assets (Falato et al., 2022). Industry Sigma is the arithmetic average of standard deviations of corporate cash flows over 10 years for firms in the same two-digit SIC industry. MB is the book value of assets less the book value of equity plus the market value of equity divided by assets. Size is the log of real (adjusted by CPI) assets. CF is the corporate cash flow measured as the ratio of operating income before depreciation less interest less dividends less taxes to assets. CPX is capital expenditures divided by assets. Div is a dummy variable for dividend-paying firms. WC is net working capital calculated without cash divided by assets. LTD is the ratio of long-term debt to assets. RD is the research and development expenditures divided by sales. Acquisitions is the cash outflow relating to acquisition scaled by assets. Industry and year dummies are included in all regressions. Standard errors are clustered at firm level for all samples. The t-statistics are reported in parentheses. The p-values are: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$. The Adjusted R^2s are in percentage. The sample period is 1997-2020.

	Dependent Variable: Cash											
	Small Firms		Large Firms		High-Tech Firms		Non-High-Tech Firms		Young Firms		Old Firms	
	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2
EU	-0.037***	-0.020***	-0.006**	0.017***	-0.060***	-0.021**	-0.020***	-0.003	-0.030***	-0.009***	-0.024***	0.002
	(-9.12)	(-4.61)	(-2.38)	(4.78)	(-7.91)	(-2.50)	(-7.73)	(-1.18)	(-8.71)	(-2.73)	(-7.76)	(0.49)
Explained		**46%**		**not applicable**		**65%**		**85%**		**70%**		**92%**
Intangible		0.167***		0.158***		0.160***		0.166***		0.166***		0.172***
		(55.43)		(27.90)		(35.51)		(48.60)		(58.79)		(36.48)
EU*Intangible		0.016***		-0.068***		0.003		-0.018***		0.015***		-0.052***
		(3.32)		(-7.15)		(0.39)		(-2.84)		(3.44)		(-6.68)
Industry Sigma	0.048*	-0.023	0.074***	0.065***	-0.168**	-0.199***	0.056***	0.031*	0.038	0.005	0.055***	0.024
	(1.79)	(-1.03)	(3.86)	(3.55)	(-2.17)	(-3.11)	(3.16)	(1.90)	(1.51)	(0.24)	(2.51)	(1.22)
MB	0.030***	0.020***	0.027***	0.020***	0.026***	0.018***	0.028***	0.020***	0.029***	0.019***	0.026***	0.017***
	(29.76)	(23.03)	(22.10)	(18.36)	(18.84)	(14.79)	(29.35)	(23.50)	(31.23)	(24.04)	(18.32)	(14.69)
Size	0.000	0.008***	-0.009***	-0.007***	-0.010***	0.001	-0.008***	-0.003***	-0.005***	0.002***	-0.010***	-0.004***
	(0.15)	(5.42)	(-9.51)	(-7.84)	(-5.33)	(0.55)	(-12.99)	(-5.62)	(-5.98)	(2.55)	(-11.67)	(-5.49)
CF	-0.070***	-0.020**	-0.111***	-0.133***	-0.096***	-0.065***	-0.051***	-0.011	-0.068***	-0.014*	-0.043***	-0.016
	(-6.53)	(-2.30)	(-7.12)	(-9.43)	(-4.58)	(-4.11)	(-5.16)	(-1.35)	(-6.03)	(-1.63)	(-2.99)	(-1.37)
CPX	-0.375***	-0.227***	-0.245***	-0.182***	-0.366***	-0.150***	-0.309***	-0.223***	-0.303***	-0.177***	-0.381***	-0.281***
	(-19.76)	(-13.15)	(-14.15)	(-11.52)	(-7.78)	(-3.54)	(-21.92)	(-17.28)	(-19.24)	(-12.65)	(-17.24)	(-13.93)
Div	-0.012***	-0.008***	-0.026***	-0.025***	-0.024***	-0.027***	-0.016***	-0.014***	-0.028***	-0.025***	-0.008***	-0.003
	(-3.69)	(-2.57)	(-10.81)	(-11.26)	(-4.00)	(-5.19)	(-6.92)	(-6.60)	(-10.23)	(-10.26)	(-2.60)	(-1.19)

Continued

	Dependent Variable: Cash											
	Small Firms		Large Firms		High-Tech Firms		Non-High-Tech Firms		Young Firms		Old Firms	
	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2
WC	-0.299***	-0.228***	-0.213***	-0.192***	-0.340***	-0.217***	-0.244***	-0.211***	-0.264***	-0.198***	-0.254***	-0.215***
	(-33.52)	(-28.18)	(-22.55)	(-21.31)	(-17.92)	(-13.03)	(-33.15)	(-30.72)	(-30.39)	(-25.63)	(-26.79)	(-24.43)
LTD	-0.306***	-0.235***	-0.161***	-0.130***	-0.322***	-0.238***	-0.211***	-0.161***	-0.262***	-0.198***	-0.202***	-0.150***
	(-34.60)	(-29.60)	(-23.54)	(-20.47)	(-15.49)	(-13.55)	(-35.92)	(-29.57)	(-35.65)	(-30.47)	(-25.02)	(-20.03)
RD	0.286***	0.039***	0.413***	0.133***	0.273***	0.003	0.315***	0.085***	0.313***	0.054***	0.336***	0.059***
	(13.12)	(4.00)	(13.22)	(6.40)	(8.02)	(0.22)	(14.10)	(7.07)	(14.41)	(5.22)	(8.41)	(3.46)
Acquisitions	-0.418***	-0.221***	-0.278***	-0.193***	-0.562***	-0.305***	-0.289***	-0.172***	-0.354***	-0.195***	-0.336***	-0.211***
	(-27.51)	(-16.19)	(-24.32)	(-19.36)	(-20.96)	(-13.29)	(-29.11)	(-18.87)	(-27.31)	(-17.44)	(-24.69)	(-17.39)
Intercept	0.240***	0.130***	0.246***	0.210***	0.364***	0.179***	0.250***	0.184***	0.248***	0.177***	0.254***	0.179***
	(16.07)	(8.76)	(22.11)	(19.77)	(17.55)	(10.03)	(28.90)	(22.39)	(18.22)	(14.07)	(23.73)	(17.76)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	44,689	44,689	44,662	44,662	14,170	14,170	75,181	75,181	39,292	39,292	50,059	50,059
Adjusted R^2	37.08	53.27	38.43	46.75	35.44	53.79	35.60	47.32	41.55	56.76	33.16	45.37

Table 3.7 The UK vs. Other Developed European Countries: Explain Cash Difference in Subsamples

This table reports regression results for explaining corporate cash difference between the UK and other developed European countries in subsamples. Firms are assigned into subsamples based on firm size, firm age, and industries. GB is a dummy variable taking value of one for companies incorporated and listed in the UK. Cash is the ratio of cash and marketable securities to assets. Intangible is intangible capital measured as the sum of knowledge capital, organization capital, and information capital scaled by net assets (Falato et al., 2022). Industry Sigma is the arithmetic average of standard deviations of corporate cash flows over 10 years for firms in the same two-digit SIC industry. MB is the book value of assets less the book value of equity plus the market value of equity divided by assets. Size is the log of real (adjusted by CPI) assets. CF is the corporate cash flow measured as the ratio of operating income before depreciation less interest less dividends less taxes to assets. CPX is capital expenditures divided by assets. Div is a dummy variable for dividend-paying firms. WC is net working capital calculated without cash divided by assets. LTD is the ratio of long-term debt to assets. RD is the research and development expenditures divided by sales. Acquisitions is the cash outflow relating to acquisition scaled by assets. Industry and year dummies are included in all regressions. Standard errors are clustered at firm level for all samples. The t-statistics are reported in parentheses. The p-values are: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$. The Adjusted R^2s are in percentage. The sample period is 1997-2020.

	Dependent Variable: Cash											
	Small Firms		Large Firms		High-Tech Firms		Non-High-Tech Firms		Young Firms		Old Firms	
	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2
GB	-0.026***	-0.063***	-0.021***	-0.025***	-0.034***	-0.091***	-0.024***	-0.037***	-0.026***	-0.050***	-0.026***	-0.027***
	(-4.07)	(-9.38)	(-5.27)	(-4.39)	(-3.32)	(-7.63)	(-5.87)	(-7.70)	(-4.98)	(-9.50)	(-5.68)	(-4.26)
Explained	**not applicable**		**not applicable**		**not applicable**		**not applicable**		**not applicable**		**not applicable**	
Intangible		0.159***		0.087***		0.142***		0.138***		0.169***		0.136***
		(21.62)		(7.15)		(13.49)		(14.99)		(22.48)		(13.73)
GB*Intangible		0.034***		0.009		0.039***		0.021**		0.021***		-0.006
		(4.07)		(0.59)		(3.26)		(1.97)		(2.61)		(-0.48)
Industry Sigma	0.246*	-0.175	0.335***	0.268***	0.356	-0.033	0.266***	0.094	0.295***	-0.022	0.355***	0.150
	(1.76)	(-1.50)	(3.20)	(2.53)	(0.77)	(-0.09)	(2.85)	(1.11)	(2.60)	(-0.23)	(2.53)	(1.16)
MB	0.028***	0.021***	0.026***	0.023***	0.022***	0.018***	0.030***	0.024***	0.027***	0.020***	0.027***	0.020***
	(19.09)	(16.47)	(13.32)	(12.36)	(12.50)	(11.12)	(19.56)	(17.24)	(19.56)	(17.12)	(13.47)	(10.40)
Size	-0.007***	0.001	-0.005***	-0.004***	-0.014***	-0.008***	-0.006***	-0.003***	-0.005***	-0.000	-0.008***	-0.003***
	(-2.89)	(0.41)	(-4.12)	(-3.13)	(-5.87)	(-3.54)	(-6.63)	(-3.28)	(-3.61)	(-0.10)	(-7.68)	(-3.17)
CF	-0.103***	-0.052***	-0.136***	-0.154***	-0.117***	-0.070***	-0.091***	-0.054***	-0.111***	-0.043***	-0.065***	-0.060***
	(-6.30)	(-4.03)	(-4.89)	(-5.95)	(-4.55)	(-3.60)	(-5.49)	(-3.73)	(-6.64)	(-3.35)	(-2.69)	(-2.96)
CPX	-0.294***	-0.214***	-0.148***	-0.152***	-0.312***	-0.215***	-0.238***	-0.216***	-0.229***	-0.177***	-0.285***	-0.262***
	(-9.91)	(-7.76)	(-5.25)	(-5.53)	(-4.66)	(-3.53)	(-10.28)	(-9.65)	(-9.09)	(-7.51)	(-7.92)	(-7.52)
Div	-0.001	-0.007	-0.016***	-0.017***	-0.012*	-0.017***	-0.005	-0.007**	-0.020***	-0.023***	0.009**	0.012***
	(-0.14)	(-1.62)	(-4.20)	(-4.58)	(-1.66)	(-2.77)	(-1.48)	(-2.11)	(-4.89)	(-6.15)	(2.11)	(3.04)

Continued

	Dependent Variable: Cash											
	Small Firms		Large Firms		High-Tech Firms		Non-High-Tech Firms		Young Firms		Old Firms	
	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2
WC	-0.221***	-0.173***	-0.158***	-0.145***	-0.234***	-0.169***	-0.186***	-0.157***	-0.192***	-0.143***	-0.191***	-0.163***
	(-17.26)	(-14.15)	(-13.21)	(-11.79)	(-10.45)	(-7.77)	(-17.87)	(-15.03)	(-15.56)	(-12.51)	(-15.35)	(-12.69)
LTD	-0.289***	-0.243***	-0.138***	-0.119***	-0.336***	-0.290***	-0.186***	-0.151***	-0.267***	-0.221***	-0.155***	-0.123***
	(-18.38)	(-16.75)	(-12.06)	(-10.73)	(-12.13)	(-11.42)	(-17.79)	(-15.37)	(-20.65)	(-18.44)	(-11.59)	(-9.76)
RD	0.371***	0.110***	0.479***	0.248***	0.400***	0.080***	0.376***	0.161***	0.385***	0.106***	0.389***	0.093**
	(15.68)	(6.31)	(12.14)	(6.61)	(10.30)	(2.79)	(14.98)	(8.11)	(16.36)	(6.06)	(8.34)	(2.35)
Acquisitions	-0.283***	-0.114***	-0.186***	-0.144***	-0.395***	-0.164***	-0.190***	-0.111***	-0.259***	-0.121***	-0.231***	-0.156***
	(-13.32)	(-5.83)	(-13.44)	(-10.89)	(-13.43)	(-6.04)	(-13.62)	(-8.21)	(-14.76)	(-7.75)	(-13.23)	(-9.10)
Intercept	0.257***	0.234***	0.168***	0.128***	0.297***	0.219***	0.234***	0.203***	0.248***	0.229***	0.202***	0.130***
	(12.02)	(12.05)	(10.02)	(7.98)	(9.77)	(8.05)	(17.99)	(16.00)	(14.19)	(13.98)	(12.24)	(7.95)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	17,463	17,463	17,442	17,442	6,548	6,548	28,357	28,357	15,897	15,897	19,008	19,008
Adjusted R^2	32.94	47.51	29.66	33.60	33.11	48.65	31.43	40.70	36.17	49.93	26.10	35.29

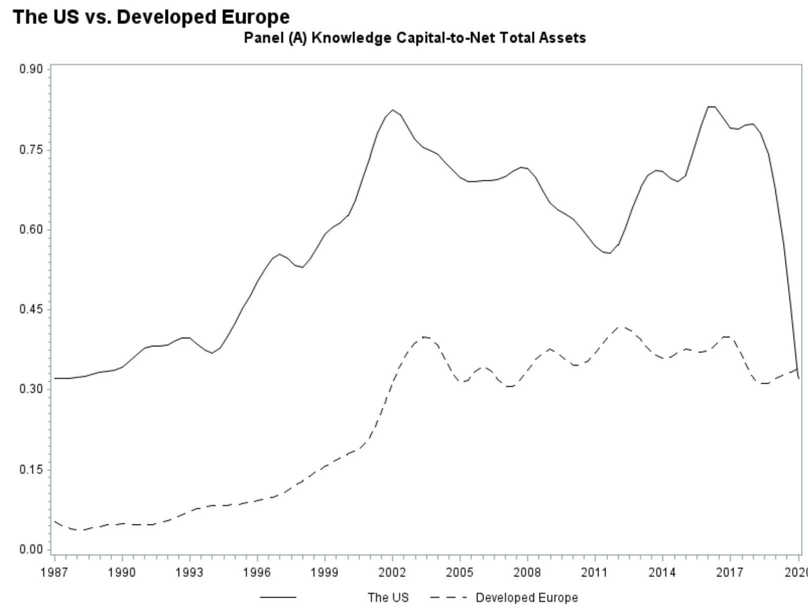
3.5 Discussion

Since the difference in intangible capital of the two regions can explain their cash difference and intangible capital includes three types of capital accumulated through intangible investments (knowledge capital, organizational capital, and informational capital), we further investigate which type of capital contributes the biggest portion of the intangible capital difference between the US and developed Europe datasets. We breakdown the intangible capital ratio into two ratios (relative to the assets net of cash) for knowledge capital and organizational capital, and depict these ratios in Figure 3.2. For most countries in our sample, informational capital data are available from 1996 in OECD. Furthermore, Falato, Kadyrzhanova, Sim, and Steri (2022) finds that knowledge and organizational capital are behind the rise in intangible capital. More importantly, the conclusion of our regression results in Section 3.4 has little change if we exclude information capital. Therefore, the ratio of informational capital is not plotted in this paper. Figure 3.2 illustrates that knowledge capital (R&D-related) accounts for a significant portion of the difference in intangible capital between the US and developed Europe, particularly for years after 1996.

Figure 3.3 depicts the time series of above ratios for firms in the UK and firms in other developed European countries. Consistent with what we find in Section 3.4, Panel A exhibits a not evident cash difference between the UK and other developed European countries. Overall, the UK firms show a slightly higher cash level. However, the intangible capital ratio of the UK firms is evidently higher than that of their counterparts (Panel B). Interestingly, the main portion of this intangible capital difference among developed European countries is from organization capital (Panels C and D).

Figure 3.2 Long-Run Trends in the US and Developed Europe: Knowledge and Organization

This figure plots the long-run trends in the knowledge capital ratio (relative to the assets without cash) in Panel A and the organization capital ratio (relative to the assets without cash) in Panel B. The ratios are plotted as equal-weighted averages across all firms in each year for each of the two samples (the US firms and the firms in developed Europe). Each sample includes firm-year observations from 1987 to 2020 for firms incorporated and listed in the corresponding region. Financial firms (SIC: 6000-6999) and utilities (SIC: 4900-4999) are excluded from the sample.



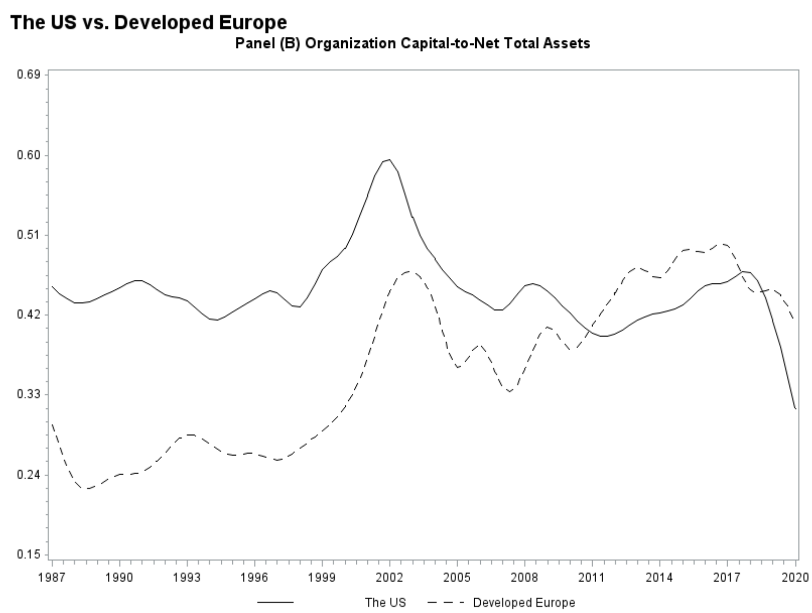
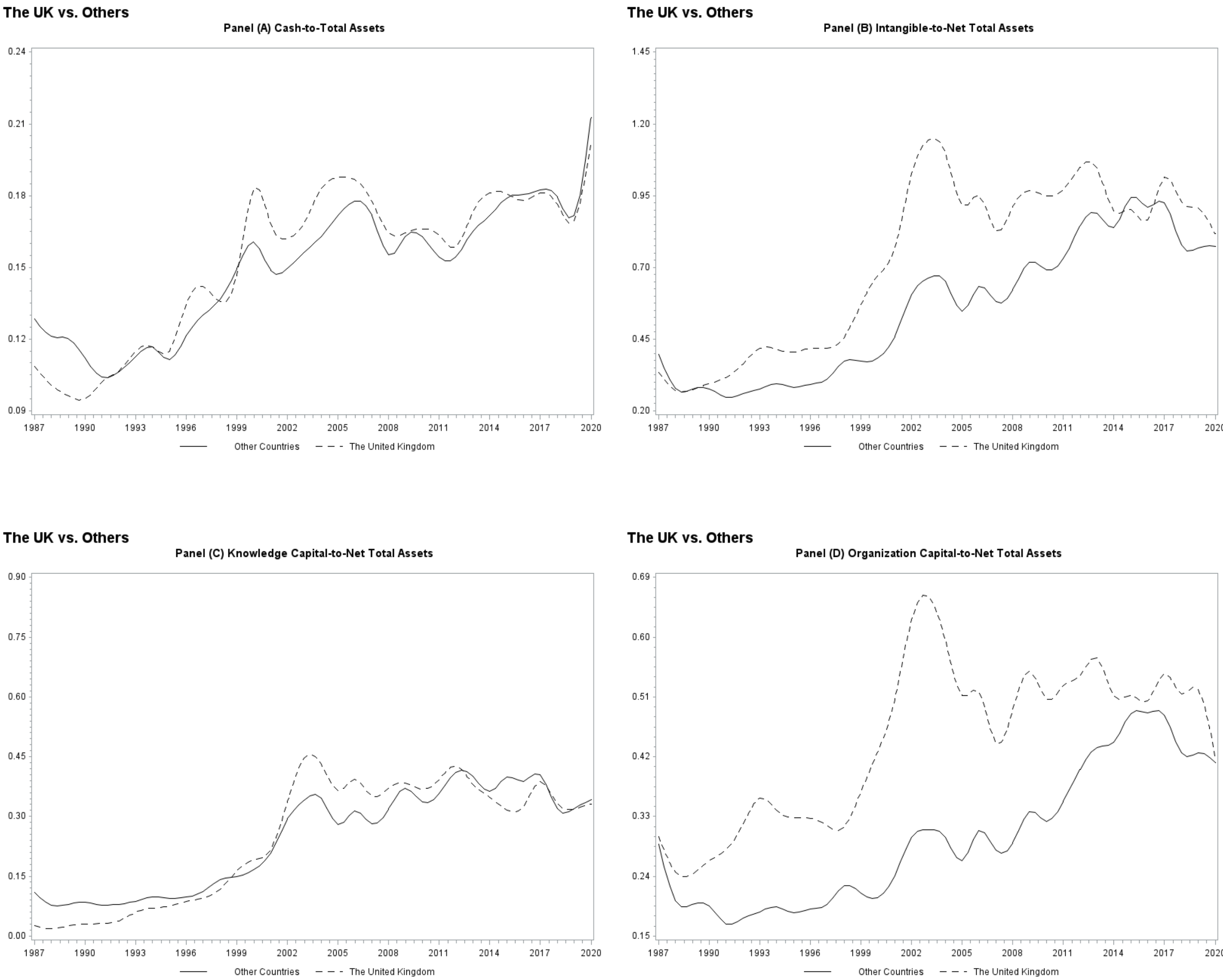


Figure 3.3 Long-Run Trends in Developed Europe (the UK vs. Other Developed European Countries)

This figure plots the long-run trends in the cash ratio (relative to total assets) in Panel A, the intangible capital ratio (relative to the assets without cash) in Panel B, the knowledge capital ratio (relative to the assets without cash) in Panel C, and the organization capital ratio (relative to the assets without cash) in Panel D. The ratios are plotted as equal-weighted averages across all firms in each year for each of the two samples (the UK firms and the firms in other developed European countries). Each sample includes firm-year observations from 1987 to 2020 for firms incorporated and listed in the corresponding region. Financial firms (SIC: 6000-6999) and utilities (SIC: 4900-4999) are excluded from the sample.



Based on the Figures 3.1 and 3.2, we understand that there is an evident difference in cash between the US firms and developed European firms and that the difference in intangible capital of the two regions is mainly due to the knowledge capital. In the following step, we focus on this R&D related capital between the US and developed Europe.

Moncada-Paternò-Castello, Ciupagea, Smith, Tübke, and Tubbs (2010) demonstrate that the lower overall corporate R&D performance of European firms results from sector specialization. US firms exhibit a stronger sectoral specialization in high R&D intensity sectors, and the US has a higher number of R&D investing firms within these sectors. Consequently, the corporate R&D performance gap between the US and developed Europe is widened by sector specialization, particularly in high R&D intensity sectors.

To substantiate this notion, we categorize sectors into four R&D intensity groups: High R&D intensity group, Medium-high R&D intensity group, Medium-low R&D intensity group, and Low R&D intensity group. These four groups align with the classifications of Moncada-Paternò-Castello, Ciupagea, Smith, Tübke, and Tubbs (2010), who divide Industry Classification Benchmark (ICB) sectors into four groups based on their average R&D intensity. The Industry Classification Benchmark is a hierarchical four-level system that categorizes companies according to their main activities. It is operated and managed by FTSE Russell.

Specifically, relying on the descriptions of the ICB sectors, we assign the ICB sectors to the following four groups:

Group 1: High R&D intensity industries, including pharmaceuticals & biotechnology, health-care equipment & services, technology hardware & equipment, software & computer services, and leisure goods.

Group 2: Medium-high R&D intensity industries, comprising automobiles & parts, aerospace & defence, electronics & electrical equipment, industrial engineering & machinery, chemicals, personal goods, household goods, general industrials, support services, travel & leisure.

Group 3: Medium-low R&D intensity industries, consisting of food producers, media, oil equipment, general retailers, tobacco, mobile and fixed line telecommunications.

Group 4: Low R&D intensity industries, encompassing oil & gas, industrial metals, banks, construction & materials, food & drug retailers, beverages, industrial transportation, mining, electricity, multiutilities.

We then illustrate the ratios related to cash and intangible capital for each group of firms in both regions. Figure 3.4 reveals a distinct pattern, highlighting that the significant differences in cash, intangible capital, and knowledge capital (R&D related) between the US and developed Europe primarily stem from the High R&D intensity group. This aligns with our expectations that the corporate R&D performance gap is predominantly observed in high R&D intensity sectors. Panel A of Figure 3.4 further reinforces the explanatory power of intangible assets in accounting for the regional cash differences. It demonstrates that the primary distinction in cash between the two regions also originates from the High R&D intensity group.

In Figure 3.5, we follow the same procedure within developed European countries. However, our findings differ from those depicted in Figure 3.4. Given the association of sector specialization with R&D intensity, one might argue that the cash difference between the US and developed Europe is explained by R&D intensity rather than intangible capital. Referring to the regression models in Section 3.4, we conduct regressions of corporate cash on intangible capital and control variables, including R&D intensity (RD). Even after accounting for the influence of

R&D intensity, our results remain consistent with and supportive of our hypotheses. This reinforces the primary conclusion of our analysis. In summary, the sector specialization is the underlying mechanism explaining the explanatory power of intangible assets on regional cash differences.

Figure 3.4 The US vs. Developed Europe - Long-Run Trends by Groups

This figure plots the long-run trends in the cash ratio (relative to total assets) in Panel A, the intangible capital ratio (relative to the assets without cash) in Panel B, the knowledge capital ratio (relative to the assets without cash) in Panel C, and the organization capital ratio (relative to the assets without cash) in Panel D. The ratios are plotted as equal-weighted averages across all firms in the group in each year for each of the two samples (the US firms and the firms in developed Europe). We categorize the ICB sectors into four R&D intensity groups: High R&D intensity group, Medium-high R&D intensity group, Medium-low R&D intensity group, and Low R&D intensity group. Each sample includes firm-year observations from 1987 to 2020 for firms incorporated and listed in the corresponding region. Financial firms (SIC: 6000-6999) and utilities (SIC: 4900-4999) are excluded from the sample.

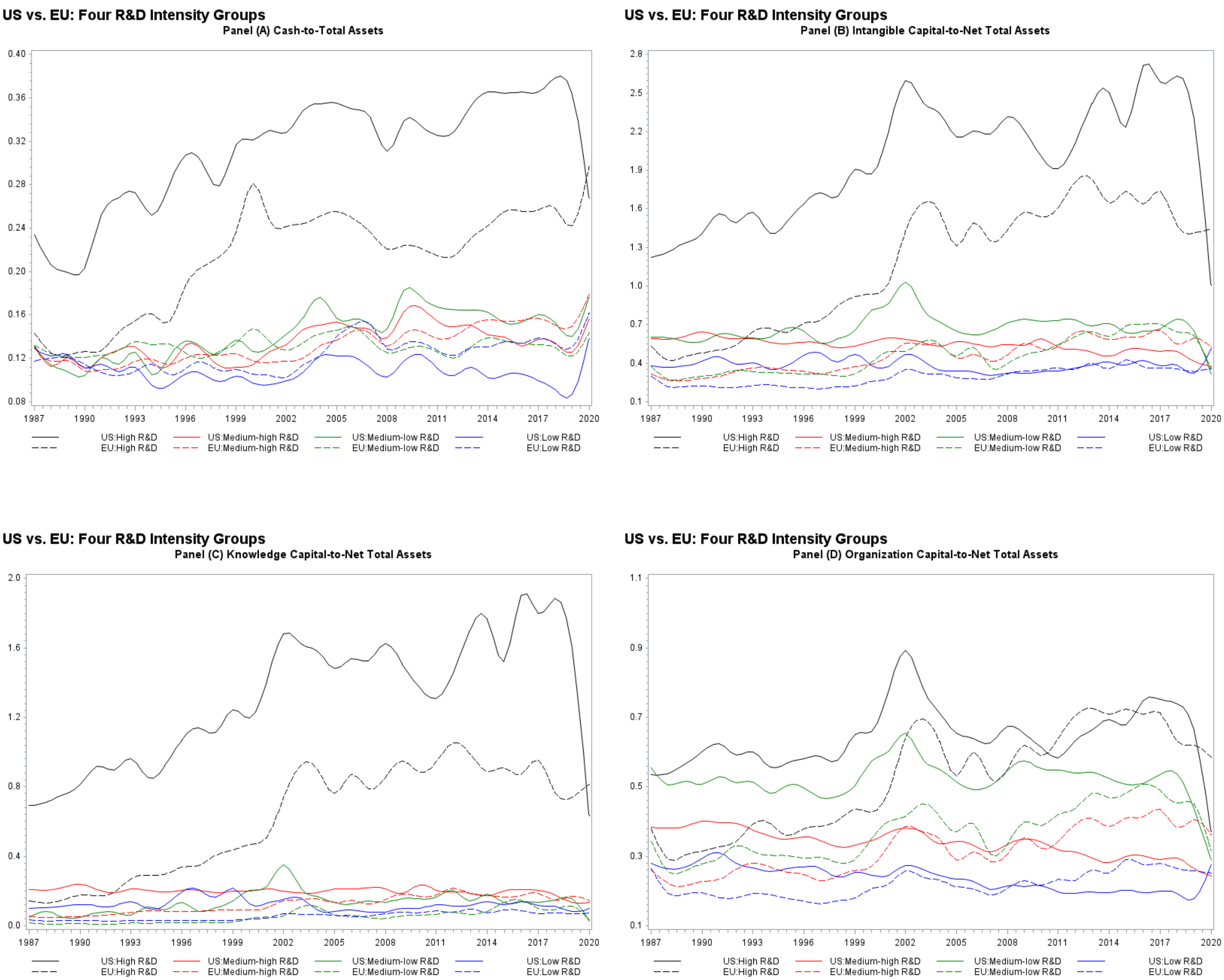
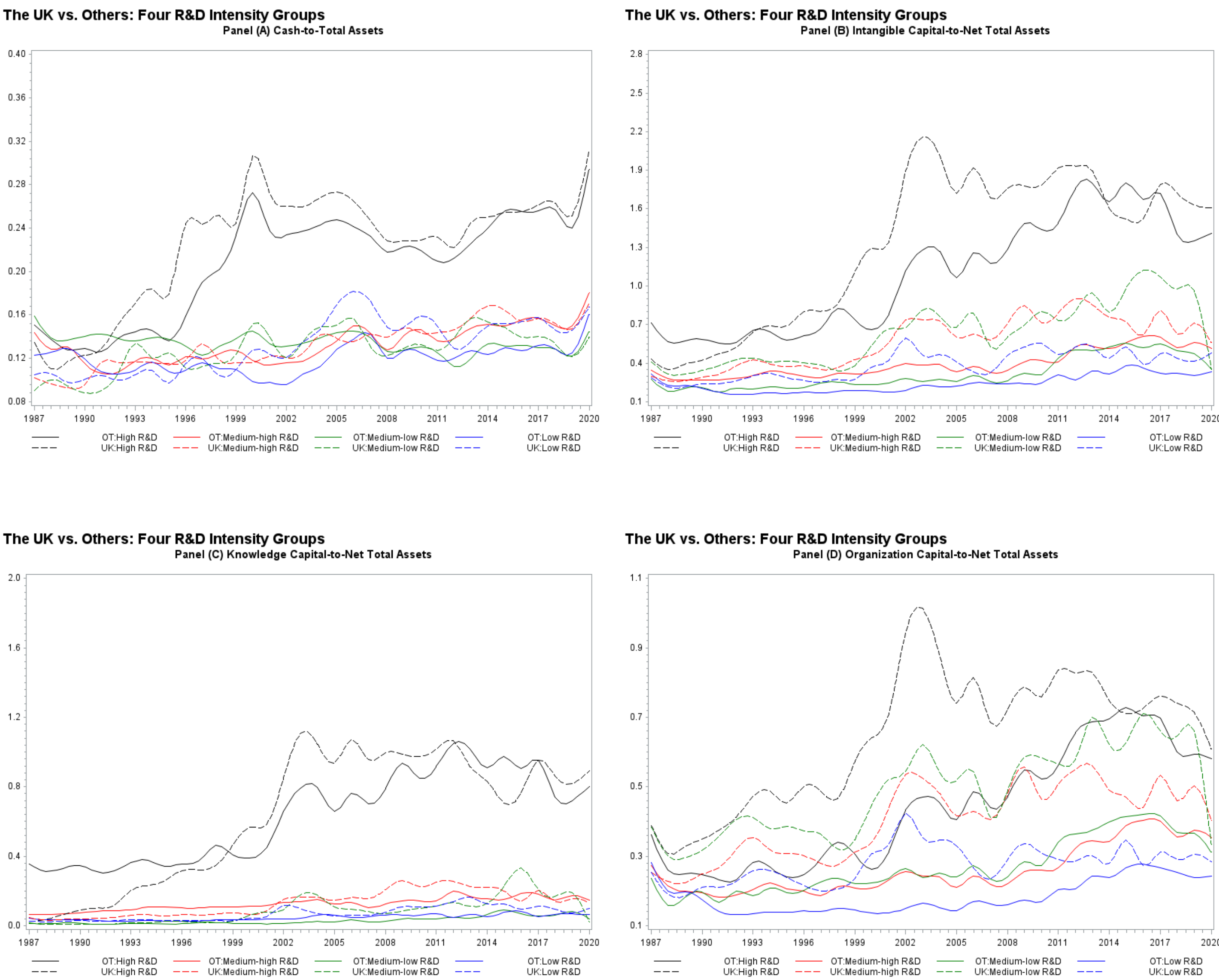


Figure 3.5 The UK vs. Other Developed European Countries - Long-Run Trends by Groups

This figure plots the long-run trends in the cash ratio (relative to total assets) in Panel A, the intangible capital ratio (relative to the assets without cash) in Panel B, the knowledge capital ratio (relative to the assets without cash) in Panel C, and the organization capital ratio (relative to the assets without cash) in Panel D. The ratios are plotted as equal-weighted averages across all firms in the group in each year for each of the two samples (the UK firms and the firms in other developed European countries). We categorize the ICB sectors into four R&D intensity groups: High R&D intensity group, Medium-high R&D intensity group, Medium-low R&D intensity group, and Low R&D intensity group. Each sample includes firm-year observations from 1987 to 2020 for firms incorporated and listed in the corresponding region. Financial firms (SIC: 6000-6999) and utilities (SIC: 4900-4999) are excluded from the sample.



3.6 Robustness Tests

There may be a concern that the results are biased because of an endogeneity problem. For example, it is possible that companies with high levels of cash may have high levels of intangible assets just because these companies have more internal funds to invest in intangible assets. To address this endogeneity concern, we adopt two methods. First, we utilize a two-stage least squares (2SLS) regression model by using the instruments to cleanse the endogeneity from intangible assets and leave us the exogenous part of its variation. In the first stage, we use the instrumental variables to determine the exogenous part of intangible assets, and in the second stage, we use an OLS regression model for corporate cash ratios that includes the exogenous part of intangible assets calculated from the estimates of the first stage. Second, to some extent, we mitigate the reverse causality concern by lagging the independent variables. Overall, with the above two methods to address concerns of endogeneity, our results remain unchanged.

Tables 3.8 and 3.9 report results of 2SLS regressions. Table 3.8 tests the relationship between corporate cash holdings and intangible capital. Table 3.9 concentrates on explaining regional cash difference. We need to find an instrument that is strongly correlated with intangible capital and only influences cash through intangible capital. Panel A of these two tables uses the R&D related instrument: the annual country-level implied R&D tax subsidy rate (R&DSub). The tax subsidy rates are collected from the OECD. We choose it as our instrument for knowledge capital (R&D related capital) because Wilson (2009) finds that R&D tax credit significantly affects R&D investments. Panel B of Tables 3.8 and 3.9 uses the SG&A related instrument: the industry-level organization capital ratio (Osga_ind). The ratio of organization capital to net assets is computed for each firm-year. We then average these ratios over 3-SIC industries and each year. Hasan and Cheung (2018) suggest that firms in same industries tend to have similar level of organizational capital. Thus, our firm-level organization capital is likely to be strongly correlated with industry-level organization capital. Marwick, Hasan, and Luo (2020) mentions that this industry-level organization capital is unlikely to influence firm-level cash holdings. Taken together, we decide to use industry-level organization capital as an instrument of organizational capital.

The 2SLS regression results still support our conclusion. In Table 3.8, Panel A shows that the instrument (R&DSub) negatively influences our firm-level knowledge capital (Krd). Krd is knowledge capital divided by net assets. In the Second Stage, we regress cash holdings on the predicted values of knowledge capital ($\widehat{Krd}$) obtained from the First Stage. The exogenous component of knowledge capital still remains its positive effects on corporate cash holdings (Cash). The coefficient of $\widehat{Krd}$ is 0.575 for the US dataset and 0.872 for developed Europe dataset. There might be confusions regarding the negative influence of R&DSub on Krd. Generally, an implied R&D tax subsidy rate refers to the effective tax incentive provided by a government to encourage R&D activities in a country. This subsidy is intended to stimulate innovation and investment in knowledge capital. The First Stage of Panel B results indicate instrument (Osga_ind) has a strong positive effect on firm-level organization capital (Osga). Osga is organization capital divided by net assets. Second Stage shows the exogenous component of Osga ($\widehat{Osga}$) also remains positive influence on firm-level cash holdings (Cash). Table 3.9 results support our conclusion in which intangible capital explains a large portion of cash difference between the US and developed Europe. In the 2SLS regressions, intangible capital remains its explanatory power. The coefficient of EU shrinks 85% in Panel A and 69% in Panel B. The coefficient of EU in Regression (3) of Panel A even becomes insignificant. It seems to us that knowledge capital has stronger explanatory power on regional cash difference than organizational capital does. We are not surprised with this finding as in Section 3.5 we already find that knowledge capital contributes a larger portion of the overall difference in intangible capital between the US and developed Europe.

Table 3.8 2SLS Estimation of the Relation Between Intangible Capital and Cash

This table reports the 2SLS regression results for the US sample and developed European sample. We adopt two instruments in estimation: one for knowledge capital (R&D) in Panel A, and one for organization capital (SG&A) in Panel B. R&DSub is country-level implied R&D tax subsidy rate for every year. Osga_ind is the industry-level organization capital divided by net assets. Krd is knowledge capital divided by net assets and Osga is organization capital divided by net assets. Industry and year dummies are included in all regressions. Standard errors are clustered at firm level for all samples. The t-statistics are reported in parentheses. The p-values are: * p < 0.1, ** p < 0.05, *** p < 0.001. The Adjusted R^2s are in percentage. The sample period is 1997-2020.

	Panel A: Instrument (R&DSub)				Panel B: Instrument (Osga_ind)			
	The US		Developed Europe		The US		Developed Europe	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	Krd	Cash	Krd	Cash	Osga	Cash	Osga	Cash
Regression Stage	1^{st} Stage	2^{nd} Stage	1^{st} Stage	2^{nd} Stage	1^{st} Stage	2^{nd} Stage	1^{st} Stage	2^{nd} Stage
$\widehat{Krd}$		0.575***		0.872**				
		(2.68)		(2.25)				
$\widehat{Osga}$						0.216***		0.324***
						(3.55)		(4.19)
R&DSub	-1.574**		-0.035**					
	(-2.20)		(-2.07)					
Osga_ind					0.219***		0.028***	
					(3.54)		(6.49)	
Industry Sigma	0.349***	0.034	-0.011	0.045**	-0.120**	0.233***	0.004	0.027
	(6.56)	(0.41)	(-0.74)	(2.19)	(-2.20)	(7.60)	(0.12)	(1.38)
MB	0.041***	0.009	0.013***	0.020***	0.027***	0.022***	0.021***	0.021***
	(13.03)	(1.05)	(6.74)	(3.82)	(16.12)	(10.93)	(10.04)	(10.35)
Size	-0.003*	-0.010***	0.007***	-0.012***	-0.033***	-0.005**	-0.028***	0.004
	(-1.69)	(-7.63)	(5.72)	(-3.92)	(-24.34)	(-2.24)	(-17.43)	(1.59)
CF	0.002	-0.026*	0.078***	-0.178***	-0.274***	0.040*	-0.249***	-0.034
	(0.07)	(-1.79)	(4.98)	(-5.31)	(-15.01)	(1.84)	(-10.95)	(-1.45)
CPX	-0.510***	-0.104	-0.090***	-0.147***	-0.480***	-0.281***	-0.323***	-0.134***
	(-14.55)	(-0.95)	(-4.08)	(-3.52)	(-17.64)	(-7.94)	(-9.02)	(-4.20)
Div	-0.037***	-0.000	-0.014***	-0.002	0.013***	-0.022***	0.024***	-0.020***
	(-6.77)	(-0.05)	(-3.45)	(-0.24)	(2.84)	(-7.48)	(4.41)	(-5.56)
WC	-0.179***	-0.225***	-0.002	-0.173***	-0.078***	-0.320***	-0.149***	-0.137***
	(-9.64)	(-5.56)	(-0.17)	(-17.43)	(-4.60)	(-30.73)	(-8.48)	(-9.55)
LTD	-0.164***	-0.140***	-0.109***	-0.120***	-0.168***	-0.192***	-0.180***	-0.153***
	(-12.64)	(-3.82)	(-10.58)	(-2.85)	(-13.74)	(-14.30)	(-9.62)	(-9.15)
RD	1.278***	-0.473*	1.301***	-0.744	0.130***	0.259***	0.174***	0.340***
	(13.02)	(-1.68)	(31.14)	(-1.47)	(6.26)	(10.54)	(4.98)	(13.49)
Acquisitions	-0.465***	-0.210**	-0.120***	-0.164***	-0.554***	-0.299***	-0.407***	-0.127***
	(-15.09)	(-2.05)	(-8.09)	(-3.40)	(-28.94)	(-8.33)	(-18.11)	(-3.79)
Intercept	0.242***	0.201***	0.044***	0.188***	0.386***	0.183***	0.501***	0.062
	(4.61)	(6.33)	(4.53)	(11.73)	(22.91)	(6.74)	(35.47)	(1.56)
Industry & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	44,433	44,433	31,342	31342	54,364	54,364	34,987	34,987
Adjusted R^2	46.78	42.35	49.20	33.55	39.20	43.47	27.74	33.50

Table 3.9 2SLS Estimation: Explaining Cash Difference between Developed Europe and the US

This table reports the 2SLS regression results for explaining corporate cash difference between developed Europe and the US. We adopt two instruments in estimation: one for knowledge capital (R&D) in Panel A, and one for organization capital (SG&A) in Panel B. R&DSub is country-level implied R&D tax subsidy rate for every year. Osga_ind is the industry-level organization capital divided by net assets. Krd is knowledge capital divided by net assets and Osga is organization capital divided by net assets. Standard errors are clustered at firm level for all regressions. The t-statistics are reported in parentheses. The p-values are: * p < 0.1, ** p < 0.05, *** p < 0.001. The sample period is 1997-2020.

	Panel A: Instrument (R&DSub)			Panel B: Instrument (Osga_ind)		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Cash	Krd	Cash	Cash	Osga	Cash
Regression Stage		1st Stage	2nd Stage		1st Stage	2nd Stage
EU	-0.026***	-0.142***	0.004	-0.026***	0.014	0.008**
	(-10.24)	(-8.44)	(0.70)	(-10.24)	(0.84)	(1.93)
Explained			**85%**			**69%**
$\widehat{Krd}$			0.491***			
			(4.88)			
$\widehat{Osga}$						0.210***
						(3.78)
R&DSub		-1.356***				
		(-5.98)				
Osga_ind					0.222***	
					(3.70)	
EU*$\widehat{Krd}$			-0.022			
			(-1.25)			
EU*$\widehat{Osga}$						-0.099***
						(-5.28)
EU*R&DSub		1.329***				
		(5.76)				
EU*Osga_ind					-0.193***	
					(-3.22)	
Industry Sigma	0.057***	0.093***	0.024	0.057***	-0.004	0.058***
	(3.26)	(4.33)	(1.21)	(3.26)	(-0.15)	(3.32)
MB	0.028***	0.027***	0.020***	0.028***	0.024***	0.024***
	(35.71)	(13.47)	(6.85)	(35.71)	(18.72)	(14.89)
Size	-0.008***	0.004***	-0.009***	-0.008***	-0.032***	-0.003
	(-12.78)	(3.30)	(-11.73)	(-12.78)	(-30.23)	(-1.56)
CF	-0.066***	0.072***	-0.104***	-0.066***	-0.252***	-0.025
	(-7.22)	(4.78)	(-9.24)	(-7.22)	(-17.80)	(-1.42)
CPX	-0.326***	-0.323***	-0.167***	-0.326***	-0.417***	-0.247***
	(-24.04)	(-14.93)	(-4.88)	(-24.04)	(-19.29)	(-8.63)
Div	-0.020***	-0.029***	-0.008**	-0.020***	0.016***	-0.022***
	(-9.20)	(-7.65)	(-2.15)	(-9.20)	(4.44)	(-9.44)
WC	-0.264***	-0.094***	-0.207***	-0.264***	-0.105***	-0.250***
	(-38.08)	(-8.71)	(-17.65)	(-38.08)	(-8.57)	(-28.44)
LTD	-0.233***	-0.154***	-0.159***	-0.233***	-0.173***	-0.196***
	(-40.44)	(-15.74)	(-9.47)	(-40.44)	(-16.78)	(-16.20)
RD	0.325***	1.316***	-0.329**	0.325***	0.140***	0.296***
	(16.56)	(18.92)	(-2.39)	(16.56)	(7.79)	(13.68)
Acquisitions	-0.340***	-0.291***	-0.228***	-0.340***	-0.485***	-0.262***
	(-34.93)	(-17.96)	(-7.47)	(-34.93)	(-32.85)	(-8.84)
Intercept	0.249***	0.132***	0.225***	0.249***	0.317***	0.176***
	(29.46)	(6.84)	(24.19)	(29.46)	(23.81)	(8.50)
Industry & Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	89,351	75,775	75,775	89,351	89,351	89,351
Adjusted R^2	38.59	46.25	37.73	38.59	33.98	38.98

Tables 3.10 and 3.11 reports regression results using lagged independent variables. All independent variables are lagged by one period except the region dummies (EU and GB) occurred in Table 3.11. EU is a dummy variable taking value of one for companies incorporated and listed in developed Europe, whereas GB is a dummy variable taking value of one for companies incorporated and listed in the UK. In Table 3.10, the coefficients of lagged intangible capital are all positive and significant for all samples. In Table 3.11, Panel A reports regression results for explaining cash difference between the US and developed Europe, while Panel B is for explaining cash difference between the UK and other developed European countries. Results are robust. Regressions (1) and (2) indicate a 63% cash difference explained, whereas Regressions (3) and (4) suggest lagged intangible capital does not explain cash difference within developed European countries. Overall, the conclusion of our analysis remains unchanged.

We also do robustness checks for measurement issues. When compute informational capital, we rely on the National Accounts data from the OECD. Due to the data availability, some countries may not be able to cover our entire sample period (1997-2020) and thus reduce our sample size. To make sure our results are robust, we measure intangible capital (exclude information capital). Taken knowledge and organizational capital only, our results are little changed and do not affect our conclusion. Furthermore, we try different depreciation rates in capitalizing expenditures on intangible assets. Results still do not change. In addition, both R&D intensity (RD) and intangible capital (Intangible) use R&D expenditure data in measurement. These two regressors may lead to a multicollinearity problem. To rule out this problem, we re-run all regression models excluding Variable RD. The results lead us to the same conclusion. For brevity, those results are not reported in this paper.

Table 3.10 Panel Data Regressions Using Lagged Independent Variables

This table reports regression results for four different samples: the US firms, developed European firms, Britain firms, and firms in other developed European countries. We test the relation between intangible capital and cash by using lagged regressors. All explanatory variables are lagged by one period. Industry and year dummies are included in all regressions. Standard errors are clustered at firm level for all samples. The t-statistics are reported in parentheses. The p-values are: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$. The Adjusted R^2s are in percentage. The sample period is 1997-2020.

	Dependent Variable: $Cash_t$			
			Developed Europe	
	The US	Developed Europe	The UK	Other Countries
$Intangible_{t-1}$	0.132***	0.124***	0.139***	0.118***
	(35.98)	(21.96)	(19.05)	(14.05)
$Industry\ Sigma_{t-1}$	0.196***	0.010	0.050	0.189
	(6.68)	(0.55)	(0.45)	(1.13)
MB_{t-1}	0.014***	0.019***	0.018***	0.021***
	(13.57)	(15.96)	(12.13)	(10.99)
$Size_{t-1}$	-0.006***	-0.001	-0.000	-0.008***
	(-6.83)	(-1.46)	(-0.10)	(-6.50)
CF_{t-1}	0.030***	-0.086***	-0.062***	-0.087***
	(2.72)	(-6.24)	(-3.53)	(-4.19)
CPX_{t-1}	-0.258***	-0.200***	-0.182***	-0.250***
	(-16.30)	(-9.35)	(-6.86)	(-6.96)
Div_{t-1}	-0.018***	-0.013***	-0.021***	0.003
	(-6.35)	(-4.49)	(-4.59)	(0.80)
WC_{t-1}	-0.240***	-0.119***	-0.090***	-0.182***
	(-25.71)	(-12.45)	(-7.15)	(-12.30)
LTD_{t-1}	-0.170***	-0.144***	-0.155***	-0.126***
	(-25.86)	(-14.62)	(-11.25)	(-9.12)
RD_{t-1}	0.044***	0.158***	0.169***	0.132***
	(3.48)	(7.34)	(5.89)	(4.13)
$Acquisitions_{t-1}$	-0.231***	-0.165***	-0.108***	-0.176***
	(-18.01)	(-12.63)	(-6.95)	(-8.26)
Intercept	0.175***	0.148***	0.067***	0.172***
	(15.39)	(18.15)	(5.84)	(12.75)
Industry & Year FE	Yes	Yes	Yes	Yes
N	49,124	30,501	15,051	15,362
Adjusted R^2	47.39	35.32	37.78	35.80

Table 3.11 Explain Cash Difference by Using Lagged Independent Variables

This table reports regression results for explaining corporate cash difference between developed Europe and the US (Panel A) and the difference between the UK and other developed European countries (Panel B). All explanatory variables (exclude EU and GB) are lagged by one period. EU is a dummy variable taking value of one for companies incorporated and listed in developed Europe, whereas GB is a dummy variable taking value of one for companies incorporated and listed in the UK. Industry and year dummies are included in all regressions. Standard errors are clustered at firm level for all samples. The t-statistics are reported in parentheses. The p-values are: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$. The Adjusted R^2s are in percentage. The sample period is 1997-2020.

	Dependent Variable: $Cash_t$			
	Panel A: The US vs. Developed Europe		Panel B: The UK vs. Other Developed European Countries	
	(1)	(2)	(3)	(4)
EU	-0.024*** (-9.15)	-0.009*** (-3.00)		
GB			-0.026*** (-6.53)	-0.036*** (-7.74)
Explained		**63%**	**not applicable**	
$Intangible_{t-1}$		0.134*** (38.30)		0.124*** (15.79)
$EU*Intangible_{t-1}$		-0.011** (-2.01)		
$GB*Intangible_{t-1}$				0.006 (0.61)
$Industry\ Sigma_{t-1}$	0.061*** (3.32)	0.036** (2.16)	0.309*** (3.12)	0.091 (1.01)
MB_{t-1}	0.024*** (28.09)	0.016*** (20.67)	0.024*** (19.25)	0.019*** (16.06)
$Size_{t-1}$	-0.007*** (-11.53)	-0.003*** (-4.87)	-0.007*** (-7.70)	-0.004*** (-4.52)
CF_{t-1}	-0.046*** (-4.67)	-0.026*** (-2.95)	-0.098*** (-6.22)	-0.074*** (-5.42)
CPX_{t-1}	-0.318*** (-23.01)	-0.230*** (-18.14)	-0.239*** (-10.56)	-0.212*** (-9.83)
Div_{t-1}	-0.021*** (-9.14)	-0.019*** (-9.03)	-0.008*** (-2.64)	-0.010*** (-3.18)
WC_{t-1}	-0.222*** (-30.86)	-0.186*** (-27.70)	-0.159*** (-16.18)	-0.131*** (-13.36)
LTD_{t-1}	-0.213*** (-36.16)	-0.167*** (-30.23)	-0.180*** (-17.42)	-0.146*** (-14.82)
RD_{t-1}	0.304*** (16.07)	0.074*** (6.24)	0.371*** (14.51)	0.156*** (7.30)
$Acquisitions_{t-1}$	-0.305*** (-30.67)	-0.201*** (-21.78)	-0.214*** (-16.33)	-0.137*** (-10.72)
Intercept	0.251*** (28.48)	0.194*** (23.36)	0.243*** (19.11)	0.217*** (17.54)
Industry & Year FE	Yes	Yes	Yes	Yes
N	79,817	79,625	30,426	30,413
Adjusted R^2	33.56	42.43	28.33	36.22

3.7 Conclusion

We examine the relationship between corporate cash holdings and intangible assets for the US firms and developed European firms respectively. We find out a positive relationship and this is a common trend in the two regions. We then show empirical evidence of the significant explanatory power of intangible assets on differences in corporate cash holdings between the US and developed Europe. As the regional differences in intangible capital can be largely attributed to the notion of sector specialization, we argue that sector specialization is the mechanism on why intangible assets can explain cash difference between the US and developed Europe.

Our paper contributes to the literature on corporate cash, intangible assets, and international studies involving the US and developed Europe. Intangible capital, being a crucial indicator of productivity, prompts governments to handle intangible assets with care and establish policies related to intangible capital to boost national productivity. Our research aids policymakers by demonstrating that government policies related to intangible capital not only affect productivity but also influence the overall corporate cash levels (relative to competing countries), which are vital indicators of corporate performance. Policymakers may wish to maintain an optimal balance between intangible assets and corporate cash holdings.

Chapter 4 Corporate Debt Maturity and Cross-Sectional Stock Returns of International Stocks

4.1 Introduction

The literature suggests there are costs associated with using short-term debt versus long-term debt. He and Xiong (2012) argue that short-term debt exposes common shareholders to debt refinancing risk or rollover risk. The reason is that common shareholders claim the residual part of firm's cash flows. Any potential rollover of expiring debt could reduce firm's cash flows and thus cut shareholders' gain. Because shareholders face refinancing risk, Friewald, Nagler, and Wagner (2022) argue that shareholders care about debt maturity and they may price short-term and long-term debt differently. He and Xiong (2012) show that equity risk increases in short-term debt but decreases in long-term debt.

There are also benefits for using short-term debt instead of long-term debt. Probably the most notable benefit is that using short-term debt increases corporate financial flexibility. Financial flexibility plays an important role in mitigating agency conflicts due to debt overhang. When firms have too much debt burden, these firms may make suboptimal investment decisions, increasing agency costs and equity risk (Myers, 1977). Dangl and Zechner (2021) show that short debt maturities commit equity holders to leverage reductions and lower equity risk.

Short-term and long-term debts are different in terms of benefits and costs brought to shareholders. Therefore, Friewald, Nagler, and Wagner (2022) point out that shareholders may not price short-term debt and long-term debt equally and that researchers should jointly test the effects of financial leverage and debt maturity in examining the leverage effects on the cross-sectional stock returns. They focus on the US firms and find that short-term debt is associated with positive equity risk premium whereas long-term debt is not. Friewald, Nagler, and Wagner (2022) interpret the results as evidence that short-term debt increases exposure of equity to systematic risk.

The US and international countries are different in many aspects, it is unclear whether the same pattern holds in international context. Therefore, we focus on the maturity effects of short-term debt and examine the relation between debt refinancing and cross-sectional equity returns using two datasets include firms in developed Europe and emerging Asia.

Firms in developed markets are considered as having better corporate governance, fewer agency conflicts, and better investor protection than those in developing markets. Pinkowitz, Stulz, and Williamson (2006) shows that Western European countries, the United States, and Canada have high values for the indices of rights enforcement, whereas the countries with poor indices of rights enforcement are generally located in Asia and South America. Therefore, in developed markets, the higher debt rollover risk and equity risk associated with short-term debt may play a more important role in the relation between short-term debt maturity and cross-sectional stock returns. In contrast, the benefit of short-term debt in terms of alleviating agency issues and reducing equity risk may be more prominent in emerging markets. Thus, we hypothesize that the relation between debt refinancing and equity risk premium is positive in developed Europe but not distinct in emerging Asia.

By using international data from Datastream and Worldscope over the sample period of 1996 to 2020, we test the relationship between corporate debt refinancing and cross-sectional equity returns in developed European and emerging Asian countries, respectively. Specifically, we run monthly cross-sectional regressions of equity excess return on debt refinancing and financial leverage as well as a set of control variables that may affect stock returns. In the empirical results, we find that the relation between debt refinancing and equity returns is significantly positive in developed European markets, suggesting that the studies of leverage effects should incorporate the short-term debt maturity effects in these markets. Consistent with our hypothesis, we find no significant results in emerging Asian markets.

We further allow for more heterogeneity across firms by examining how information asymmetry affects the relation between debt refinancing and equity risk premium. In both developed Europe and emerging Asia, firms with high information asymmetry should have high agency risks. Therefore, information asymmetry may have a negative moderating role on the relation between debt refinancing and equity risk premium because short-term debt should be more important in reducing agency costs and agency-related risk for firms with high information asymmetry. In other words, in firms with high information asymmetry, more short-term debt may be associated with lower agency risks, thus shareholders may demand lower stock return premium. This may offset the higher return premium that investors may demand for the higher refinancing risk associated with more short-term debt. We indeed find this moderating effect in developed Europe but not in emerging Asia. A possible explanation is that given the weak investor protection in emerging Asia, higher information asymmetry may be associated with higher refinancing risk.

This paper contributes to the corporate finance and asset pricing literature: First, we incorporate the maturity structure of short-term debt in investigating the leverage effects on the cross-section of equity returns in non-US markets. We provide out-of-sample tests for the positive relationship of debt refinancing and cross-sectional equity risk premium as documented in Friewald, Nagler, and Wagner (2022). Specifically, we show that this positive relationship holds in developed European countries but disappear in developing Asian countries where shareholders care more about the agency conflicts. Second, our results suggest that future studies of leverage effects in corporate finance and asset pricing in developed markets should consider the short-term debt maturity structure and that this consideration may not be applicable to emerging markets. We provide evidence that short-term debt maturity matters in explaining the cross-section of equity returns for developed European markets. We also show that short-term debt maturity effects are insignificant in emerging Asia. Third, we show that information asymmetry negatively affects the debt refinancing-equity risk premium relationship in developed Europe but has no moderating role in emerging Asia. This finding suggests that when the overall governance in a region is weak, high information asymmetry makes the situation even worse. In that situation, short-term debt loses its benefits in reducing agency costs.

The rest of paper is organized as follows: Section 4.2 reviews literature and construct hypotheses; Section 4.3 describes sample construction and analyzes descriptive statistics; Sections 4.4 and 4.5 performs regression analysis and discuss the empirical results; Section 4.6 provides robustness check; and Section 4.7 concludes paper.

4.2 Literature and Hypotheses

The leverage effects in the cross-section of equity returns have been well studied. Theoretically, financial leverage exposes shareholders to equity risk. Consequently, there should be a compensation for the exposure of equity. Expected stock returns should increase with financial leverage. However, the exact relationship between leverage and cross-sectional equity returns is still unclear. For instance, Bhandari (1988) indeed shows that the expected common stock returns are positively related to the ratio of debt to equity after controlling for beta and firm size. However, Penman, Richardson, and Tuna (2007) decompose book-to-market factor into operating and leverage components and show evidence of a negative relation between this leverage component and future stock returns. George and Hwang (2010) criticize that the choice of financial leverage is affected by distress costs. Firms with high distress costs choose low leverage and this leads to an endogenous negative relation between leverage and equity returns.

Friewald, Nagler, and Wagner (2022) argue that the reason of this unclear relationship between leverage and equity returns is that we did not consider the maturity structure of debt. Short-term debt (maturing in one year) and long-term debt (maturing in more than one year) could bring in different types of benefits and costs in different magnitudes. Therefore, shareholders may price short-term and long-term debts differently. On the one hand, short-term debt may lead to debt rollover risk but long-term debt mitigates the concerns of debt refinancing (He and Xiong, 2012). This suggests that expected returns increase in short-term debt because equity holders require extra premium to compensate debt rollover risk but decrease in long-term debt because of the reduced risk in refinancing. On the other hand, short-term debt increases corporate financial flexibility and thus mitigates agency problems, whereas long-term debt does not (Dangl and Zechner, 2021). This mechanism suggests that firms with more short-term debt have more financial flexibility to adjust firms' capital structure and thus reduce equity risk. Therefore, expected returns decrease in short-term debt but increase in long-term debt. Regardless of which mechanism is correct, short-term debt and long-term debt affect the cross-sectional equity returns in opposite directions. Therefore, the overall effect of financial leverage on equity returns is unclear. This emphasizes the importance of including debt maturity into corporate finance and asset pricing implications.

Friewald, Nagler, and Wagner (2022) incorporate the debt maturity effects in explaining the cross-section of equity returns. They focus on the US stocks over the 1976 to 2019 sample period and find out a strong positive relationship between short-term debt and equity risk premium in supportive of the debt rollover risk mechanism. Moreover, they find insignificant results for long-term debt.

In current paper, we do not prove which mechanism is valid. Instead, we argue that both mechanisms are valid but that one may dominate the other one in certain circumstances. In particular, we argue that debt rollover risk mechanism dominates financial flexibility mechanism in developed markets. Firms in developed markets are considered as having better corporate governance, fewer agency conflicts, and better investor protection than those in developing markets. Pinkowitz, Stulz, and Williamson (2006) shows that Western European countries, the United States, and Canada have high values for the indices of rights enforcement, whereas the countries with poor indices of rights enforcement are generally located in Asia and South America. Developed markets are generally in circumstance with good governance, shareholders and creditors investing in those markets are more likely to be concerned with debt refinancing risk over governance issues. Consequently, they might be more taken notice of the costs of short-term debt over its benefits. Therefore, in developed markets, the higher debt rollover risk and equity risk associated with short-term debt may play a more important role in the relation between short-term debt and cross-sectional stock returns. In other words, debt rollover risk mechanism dominates financial flexibility mechanisms in developed markets and investors require extra premium to compensate debt rollover risk. If this is true, we expect a positive relation between debt refinancing and equity risk premium in developed European countries.

Hypothesis I: The relation between debt refinancing and equity risk premium is positive in developed Europe.

In contrast, emerging markets are generally in circumstance with weak governance. In this environment, probably the top priority for firms is to confront the governance-related issues. Shareholders in this environment are not protected well and thus they might be more desired to mitigate agency-related risk, instead of debt refinancing risk. Therefore, the benefit of short-term debt in terms of alleviating agency issues and reducing equity risk may be more prominent in emerging markets. Namely, financial flexibility mechanism dominates debt rollover risk mechanism in emerging markets and this weakens the investors' incentive to require extra premium for compensating debt rollover risk. Thus, we hypothesize that the relation between debt refinancing and equity risk premium is not distinct in emerging Asia. This hypothesis is presented below.

Hypothesis II: The relation between debt refinancing and equity risk premium is not distinct in emerging Asia.

The aforementioned theory posits that the relationship between debt refinancing and the equity risk premium is contingent upon the overarching regional context. Subsequently, we introduce additional heterogeneity across firms by considering other firm-specific characteristics and contend that the impact of these characteristics on the debt refinancing-equity risk premium relationship is also dependent on the broader regional circumstances. Specifically, we incorporate the aspect of information asymmetry into our analysis. The reason for choosing this firm characteristic is that higher level of information asymmetry leads to more severe agency problems, regardless of in which overall circumstance the firms are incorporated and listed. However, shareholders investing in developed Europe and emerging Asia may react differently to certain levels of information asymmetry, because of the significant difference in overall governance circumstance between the two regions. In particular, we argue that the moderating effect of information asymmetry exists in developed European markets but disappears in emerging Asian markets. As we discussed earlier, the use of short-term debt mitigates agency conflicts. Custodio, Ferreira, and Laureano (2013) show that corporate use of long-term debt has decreased in the US over the past three decades and that this decrease in debt maturity was generated by firms with higher information asymmetry. In developed markets, short-term debt can alleviate agency costs when information asymmetry is high, reducing the agency-related risk for shareholders. Therefore, we expect a negative moderating effect of information asymmetry on the positive relation between debt refinancing and equity risk premium. When information asymmetry is low, on the other hand, agency-related risk is low to begin with, thus the risk-decreasing role of short-term debt is not significant. Instead, the debt refinancing risk associated with short-term debt dominants and thus there is no moderating effect. To sum up, we expect to observe a certain negative moderating effect of information asymmetry on the relationship between debt refinancing and cross-sectional equity risk premium in developed European countries.

Hypothesis III: In developed Europe, information asymmetry negatively affects the relation between debt refinancing and equity risk premium for firms with higher information asymmetry.

In emerging Asia, the above theory may not hold. Given the poor investor protection in emerging Asia, if information asymmetry is higher, investors will be more concerned about not being able to get their money back and may be less willing to refinance short-term debt. This increases the refinancing risk associated with short-term debt and stock investors may demand more risk premium for firms with more short-term debt. The higher risk premium may offset the lower risk premium that comes from the reduction in agency risks, thus it is not clear how the relation between short-term debt and equity risk premium change with information asymmetry in emerging Asian markets.

4.3 Sample Construction

In this section, we present data sources, measurement of variables, and summary statistics of selected characteristics for developed Europe and emerging Asia.

4.3.1 Data

We collect stock data from Datastream. Specifically, we download monthly stock return index, stock price adjusted, and market capitalization at the stock level. We obtain accounting data from Worldscope. To measure corporate debt refinancing and financial leverage, we need the maturity structure of debt. One of the main variables is the amount of debt maturing in one year and this variable is available from year 1996 in Worldscope. Therefore, our sample period covers from 1996 to 2020. All dollar amount variables are downloaded in the US currency. Financial firms (SIC: 6000-6999) and unlevered firms are excluded. Firms with nonpositive assets, book equity, and market equity are also excluded (Friewald, Nagler, and Wagner, 2022). We focus on firms having debt with an original maturity at issuance of more than one year and require all debt variables to be nonnegative. Following Friewald, Nagler, and Wagner (2022), we assume investors learn and react to financial statements at least 6 months after fiscal year end. Hence, we merge financial variables with monthly stock returns by setting a 6-month lag.

Our sample comprises firms listed on top stock exchanges. In the US study, Friewald, Nagler, and Wagner (2022) covers firms listed on top three stock exchanges (NYSE, Nasdaq, and Amex). In current study, we construct sample by mimicking the monthly portion of the top three US stock exchanges' market capitalizations to the overall market capitalization in the US market. For every month, we calculate country-exchange level market equity and sort this market equity variable in descending order. For every exchange observation, we then calculate the sum of market equity of current row and preceding rows in the same month at the same country. This aggregate market equity is divided by the total country-level market capitalization in that month. We keep exchanges with top market capitalization until the monthly portions of international countries and the US are approximately the same. The rest of exchanges are excluded. The resulting sample accounts for about 99% of overall market capitalization in developed Europe and emerging Asia, respectively.

Our final sample includes 12,643 firms from 16 developed European markets and 9 emerging Asian markets. The developed Europe dataset includes 3,987 firms from following countries: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Israel, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and United Kingdom. The emerging Asia dataset includes 8,656 firms from the following markets: China, India, Indonesia, South Korea, Malaysia, Pakistan, Philippines, Taiwan, and Thailand. The above market lists follow the classifications used by Morgan Stanley Capital International (MSCI) in Year 2021. We end up with 889,669 monthly return observations, including 408,976 observations from developed Europe and 480,693 observations from emerging Asia.

4.3.2 Variables

Since we are interested in the effects of corporate debt maturity on stock returns. Our dependent variable (EXRET) is the monthly stock excess returns. Following Datastream, we measure the total stock return as the percentage change in the return index every month. Unlike the Center for Research in Security Prices (CRSP) database reports no data for delisted firms, Datastream keeps report stock data for delisted firms and repeats the last valid data point (Ince and Porter, 2006). This leads to invalid zero-returns. We delete all of those invalid records by using the adjusted stock price (P#S) which is available only for traded stocks.

The independent variables include debt refinancing (RI), financial leverage (LEV), market beta (Beta), book-to-market ratio (BM), market capitalization (ME), investment-to-assets ratio (IOA), return on equity (ROE), and operating profitability (OP). RI is debt refinancing intensity measured as the ratio of debt maturing in one year to total debt. In this paper, debt is defined as the debt with original maturity at issuance of more than one year. LEV is financial leverage measured as the ratio of total debt to the sum of total debt and market value of equity. Beta is estimated from the market model regression. For every month, we regress a stock's excess returns on market excess returns over the last 60 months (at least 24 months). BM is book-to-market ratio measured as in Davis, Fama, and French (2000). ME is the log of market value of equity. IOA is the investment-to-assets ratio, measured as capital expenditure plus acquisitions less sale of property, plant, equipment scaled by total assets. ROE is return on equity defined as income before extraordinary items divided by one-year lagged book equity (Hou, Xue, and Zhang, 2015). OP is operating profitability measured as annual revenues minus cost of goods sold, interest expenses, and selling, general, and administrative expenses, all divided by book equity (Fama and French, 2015).

The information asymmetry measures are bid-ask spread and Amihud illiquidity based on literature (Derrien and Kecskes, 2013; Amihud, 2002). We download monthly bid and ask prices and trading volume data from Datastream. The Bid-ask spread is measured as the monthly ask price minus bid price all divided by the mean of the ask price and the bid price in that month. The Amihud illiquidity is the monthly absolute value of stock return divided by the dollar value of trading volume. Datastream reports monthly trading volume by adding up daily trading volume of all trading days in a month. So, the downloaded trading volume is an aggregate number of all trading volume in a month. To get the trading volume at the last trading day of a month, we divide the downloaded trading volume by the number of trading days in every month.

4.3.3 Summary Statistics and Correlations

The Panel A of Table 4.1 reports mean (Mean) and standard deviation (SD) of our variables. Emerging Asia shows a higher level of refinancing intensity (0.272 vs 0.167) and a higher level of financial leverage (0.241 vs 0.220) than developed Europe, suggesting that emerging Asia may on average face higher debt rollover risk but more financial flexibility. The average of market capitalization in developed Europe (8.479 billion) is about 6 times of that in emerging Asia (1.399 billion). All of these differences between the two regions are significant except the equity returns. The averages of variable EXRET in two regions are not significantly different from each other. Shareholders in emerging Asia do not require higher extra premium for debt refinancing risk, although their firms use significantly higher level of refinancing intensity than developed European firms, suggesting that they are also obtaining potential benefits from the use of short-term debt.

Panel B shows the correlations of RI and LEV with each other and with other variables. Consistent with Friewald, Nagler, and Wagner (2022), we find negative relationship between RI and LEV in both samples. The highest correlation in Panel B is the relationship between LEV and BM (0.535 in developed Europe and 0.517 in emerging Asia). This strong positive correlation is consistent with that in US firms (Friewald, Nagler, and Wagner, 2022) and supports literature in which firms with high BM ratio are more likely to choose higher financial leverage.

Panel C reports market-level descriptive statistics for selected characteristics and sample coverage. Markets in emerging Asia seem to rely on the use of short-term debt more heavily than markets in developed Europe, supporting the notion that without good internal monitoring firms may rely much on the external monitoring through short-term debt. In developed Europe, United Kingdom and Germany contribute the largest portion of observations with proportion of 24.57% and 19.15% respectively. In emerging Asia, China and South Korea account for 33.92% and 30.69% respectively.

The Panel D of Table 4.1 lists the top stock exchanges on which firms are listed for each market. The percentage of market capitalization contributed by each stock exchange is reported in parentheses. In this paper, we focus on the whole regions developed Europe and emerging Asia. Therefore, we allow for firms cross-listed in the same region. For example, we allow for a UK firm cross-listed in other developed European countries as these markets are in the same region. The regional cross-listing phenomenon is very prevalent in the region of developed Europe. In contrast, firms in emerging Asia are unlikely to cross-list in other developing Asian markets.

In Table 4.2, we show empirical evidence that developed Europe has stronger governance than emerging Asia. Table 4.2 reports the governance difference between developed Europe and emerging Asia and the corresponding t-statistics. We download governance-related data from the World Bank. Its Worldwide Governance Indicators project reports annual country-level governance data over our sample period of 1996-2020 for 6 dimensions of governance. The 6 dimensions are control of corruption, government effectiveness, political stability/no violence, regulatory quality, rule of law, and voice and accountability. For each dimension, the estimate of governance ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance. The higher value of estimate indicates stronger governance. At the bottom row of Table 4.2, we take the sum of the 6 estimates for developed Europe and emerging Asia respectively. The overall estimate and the estimates of 6 dimensions in developed Europe are all significantly greater than those in emerging Asia. This evidence confirms that on average developed Europe has stronger governance than emerging Asia, indicating that the overall internal monitoring in emerging Asia is weak.

Table 4.1 Summary Statistics

This table reports the summary statistics (Panel A) and correlations (Panel B) for variables of interest in the two samples: Developed Europe and Emerging Asia. The mean (Mean) and standard deviation (SD) of each variable in each sample are reported in Panel A. Market-level summary statistics are reported in Panel C. Panel D lists the top stock exchanges on which firms are listed for each market. The percentage of market capitalization contributed by each stock exchange is reported in parentheses in Panel D. EXRET is monthly excess stock return in percentage. LEV is financial leverage measured as the ratio of total debt to the sum of total debt and market value of equity. Debt is defined as the debt with original maturity at issuance of more than one year. RI is debt refinancing intensity measured as the ratio of debt maturing in one year to total debt. Beta is estimated from the market model regression. For every month, we regress a stock's excess returns on market excess returns over the last 60 months (at least 24 months). BM is book-to-market ratio measured as in Davis, Fama, and French (2000). ME is market value of equity in billions. IOA is measured as capital expenditure plus acquisitions less sale of property, plant, equipment scaled by total assets. ROE is return on equity defined as income before extraordinary items divided by one-year lagged book equity (Hou, Xue, and Zhang, 2015). OP is operating profitability measured as annual revenues minus cost of goods sold, interest expenses, and selling, general, and administrative expenses, all divided by book equity (Fama and French, 2015). Both samples cover levered and nonfinancial firms, and are constructed at a monthly frequency. The sample period is from 1996 to 2020.

Panel A: Summary Statistics

	Developed Europe		Emerging Asia		Difference (Europe-Asia)	
	Mean	SD	Mean	SD	Mean	t-statistic
EXRET (%)	0.520	12.763	0.707	14.297	-0.199	-0.54
LEV	0.220	0.195	0.241	0.206	-0.020***	-2.66
RI	0.167	0.238	0.272	0.290	-0.103***	-29.38
Beta	1.199	0.750	1.041	0.738	0.159***	10.05
BM	0.640	0.508	1.057	0.830	-0.411***	-14.06
ME ($ Billion)	8.479	23.376	1.399	7.194	7.074***	52.76
IOA	0.060	0.068	0.053	0.056	0.006***	6.13
ROE	0.106	0.265	0.078	0.185	0.027***	8.43
OP	0.324	0.386	0.167	0.215	0.157***	46.65
Observations	408,976		480,693			
Firms	3,987		8,656			

Panel B: Correlations				
	Developed Europe		Emerging Asia	
	LEV	RI	LEV	RI
LEV	1.000	-0.094	1.000	-0.088
RI	-0.094	1.000	-0.088	1.000
Beta	0.084	0.009	0.049	-0.014
BM	0.535	0.028	0.517	-0.002
ME	-0.077	-0.045	-0.023	-0.043
IOA	-0.019	-0.078	-0.016	-0.131
ROE	-0.172	-0.068	-0.191	-0.083
OP	0.072	-0.068	0.001	-0.092

Panel C: Market-Level Summary Statistics							
Market	EXRET (%)	LEV	RI	ME ($ Billion)	No. of Firms	No. of Obs.	% of Obs.
Austria	0.477	0.302	0.176	2.191	54	9,628	2.35
Belgium	0.510	0.248	0.175	6.973	60	8,968	2.19
Denmark	0.607	0.196	0.173	2.974	92	10,613	2.60
Finland	0.917	0.210	0.160	13.266	104	13,684	3.35
France	0.790	0.258	0.161	13.627	287	38,206	9.34
Germany	0.670	0.217	0.149	14.535	594	78,299	19.15
Ireland	0.659	0.278	0.102	2.032	40	4,547	1.11
Israel	0.802	0.310	0.198	1.222	222	13,856	3.39
Italy	0.666	0.300	0.170	6.412	290	31,004	7.58
Netherlands	0.850	0.218	0.134	10.102	140	19,090	4.67
Norway	0.243	0.356	0.113	4.856	152	13,010	3.18
Portugal	0.348	0.262	0.201	5.892	6	810	0.20
Spain	0.575	0.222	0.222	3.488	68	6,002	1.47
Sweden	1.144	0.175	0.159	11.379	311	27,226	6.66
Switzerland	0.725	0.171	0.148	15.554	217	33,534	8.20
United Kingdom	0.188	0.177	0.183	10.643	1,350	100,499	24.57
China	0.794	0.135	0.283	2.046	2,644	163,028	33.92
India	2.229	0.233	0.163	2.094	1,507	57,040	11.87
Indonesia	-0.568	0.211	0.276	4.478	25	882	0.18
Malaysia	0.151	0.209	0.295	1.594	360	15,068	3.13
Pakistan	0.721	0.188	0.283	0.411	107	4,710	0.98
Philippines	0.065	0.281	0.151	3.137	35	2,071	0.43
South Korea	1.373	0.326	0.310	0.869	2,158	147,512	30.69
Taiwan	0.641	0.164	0.274	1.310	1,624	80,619	16.77
Thailand	0.991	0.249	0.229	3.385	196	9,763	2.03

Panel D: Top Stock Exchanges	
Market	Top Stock Exchanges
Austria	Wiener Boerse AG(41), Boerse Frankfurt(37), XETRA(15), Boerse Berlin(4), SEAQ International(2), Boerse Stuttgart(1), London SE(1)
Belgium	Euronext Brussels(41), Boerse Frankfurt(31), XETRA(14), Wiener Boerse AG(5), Borsa Italiana(3), Brussels Terme(2), Euronext Paris(1), Boerse Stuttgart(1), SEAQ International(1)
Denmark	NASDAQ Copenhagen(44), Boerse Frankfurt(33), XETRA(12), Wiener Boerse AG(6), Boerse Berlin(2), Six Swiss Exchange(2)
Finland	NASDAQ Helsinki(31), Boerse Frankfurt(26), XETRA(11), Euronext Paris(10), London SE(5), Borsa Italiana(4), NASDAQ Stockholm(4), SWX Europe(4), Six Swiss Exchange(2), Wiener Boerse AG(1), Boerse Berlin(1), SEAQ International(1)
France	Euronext Paris(34), Boerse Frankfurt(26), XETRA(15), Borsa Italiana(8), London SE(5), Wiener Boerse AG(4), Euronext Brussels(3), SWX Europe(2), Euronext Amsterdam(1), BME Exchange(1), Six Swiss Exchange(1)
Germany	Boerse Frankfurt(28), XETRA(27), Borsa Italiana(10), Six Swiss Exchange(9), London SE(7), Wiener Boerse AG(5), Euronext Amsterdam(4), Euronext Paris(3), SWX Europe(3), BME Exchange(2), Brussels Terme(1), Euronext Brussels(1), Boerse Hamburg(1), BX Swiss(1), SEAQ International(1)
Ireland	London SE(36), Euronext Dublin(31), Boerse Frankfurt(28), XETRA(4), Boerse Berlin(1), Boerse Stuttgart(1)
Israel	Tel Aviv SE(89), Boerse Frankfurt(7), Boerse Stuttgart(2), Boerse Berlin(1)
Italy	Borsa Italiana(38), Boerse Frankfurt(28), XETRA(15), London SE(7), Wiener Boerse AG(4), Boerse Berlin(2), Boerse Stuttgart(2), Euronext Amsterdam(2), Euronext Paris(1), SEAQ International(1)
Netherlands	Euronext Amsterdam(37), Boerse Frankfurt(26), XETRA(13), Wiener Boerse AG(5), Euronext Brussels(4), Borsa Italiana(3), Six Swiss Exchange(3), Euronext Paris(2), BME Exchange(2), SWX Europe(1), London SE(1), London SE MTF(1), SEAQ International(1)
Norway	Oslo Bors(38), Boerse Frankfurt(31), XETRA(11), NASDAQ Stockholm(11), Euronext Paris(2), Six Swiss Exchange(2), London SE(2), Boerse Berlin(1), Boerse Stuttgart(1), SWX Europe(1), SEAQ International(1)
Portugal	SEAQ International(53), Euronext Lisbon(27), Boerse Frankfurt(19), Boerse Stuttgart(1), XETRA(1)

Spain	BME Exchange(34), Boerse Frankfurt(28), XETRA(12), London SE(10), Wiener Boerse AG(4), Euronext Amsterdam(4), Euronext Paris(3), Borsa Italiana(3), Boerse Stuttgart(1)
Sweden	NASDAQ Stockholm(44), Boerse Frankfurt(29), XETRA(8), London SE(6), NASDAQ Helsinki(3), Six Swiss Exchange(3), Euronext Paris(2), Boerse Berlin(1), Boerse Stuttgart(1), SWX Europe(1), SEAQ International(1)
Switzerland	Six Swiss Exchange(38), Boerse Frankfurt(31), XETRA(18), London SE(6), Euronext Paris(3), NASDAQ Stockholm(2), SEAQ International(1)
United Kingdom	London SE(39), Boerse Frankfurt(27), XETRA(10), Six Swiss Exchange(6), Euronext Paris(5), Euronext Amsterdam(4), London SE MTF(2), Wiener Boerse AG(1), Euronext Brussels(1), Boerse Berlin(1), Boerse Stuttgart(1), Euronext Dublin(1), NASDAQ Stockholm(1), SWX Europe(1)
China	Shanghai SE(39), Shenzhen SE(30), SH-HK Connect(20), SZ-HK Connect(12)
India	National SE(99), BSE Ltd.(1)
Indonesia	Indonesia SE(99), Jakarta FB(1)
Malaysia	Bursa Malaysia(100)
Pakistan	Pakistan SE(100)
Philippines	Philippine SE(100)
South Korea	Korea Exchange(100)
Taiwan	Taiwan SE(91), Taipei Exchange(9)
Thailand	Thailand SE(86), Thailand SE FB(14)

Table 4.2 Developed Europe vs. Emerging Asia: Governance

This table reports the governance difference between developed Europe and emerging Asia and the corresponding t-statistics. The World Bank reports annual country-level governance data (Worldwide Governance Indicators) over the sample period of 1996-2020 for 6 dimensions of governance. For each dimension, the estimate of governance ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance. The higher value of estimate indicates stronger governance.

Dimension	Developed Europe	Emerging Asia	Difference (Europe – Asia)
Control of corruption	1.680	0.128	1.553***
			(129.98)
Government effectiveness	1.583	0.623	0.961***
			(62.51)
Political stability/no violence	0.694	0.030	0.665***
			(32.51)
Regulatory quality	1.529	0.398	1.134***
			(81.02)
Rule of law	1.576	0.381	1.197***
			(83.30)
Voice and accountability	1.333	-0.072	1.407***
			(59.62)
Overall	8.394	1.488	6.918***
			(89.12)

4.4 Debt Refinancing and Cross-Sectional Equity Returns

To investigate the relationship between debt refinancing and equity returns, we use Fama-Macbeth (1973) regression technique. Specifically, we run monthly cross-sectional regression of stock excess returns (EXRET) on debt refinancing intensity (RI) and control for financial leverage (LEV) and a set of variables that may affect stock returns. All standard errors are corrected by using Newey and West (1987) method with optimal truncation lag suggested by Andrews (1991). Table 4.3 reports regression results. Models (3) include both RI and LEV whereas Models (1) and (2) include LEV and RI, respectively. We obtain a positive and significant relationship between debt refinancing and excess returns in developed Europe but insignificant relationship in emerging Asia. Although we control for leverage, the coefficient of RI in Model (3) of developed Europe is still significant at 5% level (coefficient = 0.473, t-statistics = 2.44). This result indicates that excess return (EXRET) will increase by 0.11% (0.238*0.473) per month for each one standard deviation increase in debt refinancing intensity (RI). Without controlling for leverage, the estimate of RI is more economically and statistically significant (coefficient = 0.555, t-statistics = 2.74). In table 4.4, We exclude microcap stocks defined as the stocks smaller than the 20th percentile of market capitalization for each sample (Friewald, Nagler, and Wagner, 2022). Results are robust.

Table 4.3 Fama-Macbeth Regression

This table reports results of monthly cross-sectional regression in which we regress excess returns on financial leverage (LEV) and debt refinancing intensity (RI) as well as a set of control variables that could affect stock returns. Control variables include market beta (Beta), book-to-market ratio (BM), the log of market capitalization (ME), investment-to-asset ratio (IOA), return on equity (ROE), and operating profitability (OP). Regressions are conducted for two distinct samples: Developed Europe and Emerging Asia. The reported coefficients are the means of time-series estimates. The corresponding t-statistics are presented in parentheses. The standard errors are corrected by using Newey and West (1987) method with optimal truncation lag suggested by Andrews (1991). The p-values are: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$. The average adjusted R^2s are in percentage. Both samples cover levered and nonfinancial firms, and are constructed at a monthly frequency. The sample period is from 1996 to 2020.

	Dependent Variable: EXRET (%)					
	Developed Europe			Emerging Asia		
	(1)	(2)	(3)	(1)	(2)	(3)
LEV	-0.692**		-0.584*	-0.173		-0.069
	(-2.07)		(-1.83)	(-0.30)		(-0.12)
RI		0.555***	0.473**		0.410	0.483
		(2.74)	(2.44)		(1.15)	(1.48)
Beta	0.156	0.157	0.166	-0.262*	-0.222	-0.251
	(1.22)	(1.24)	(1.32)	(-1.66)	(-1.33)	(-1.59)
BM	0.605***	0.491***	0.577***	0.818***	0.743***	0.803***
	(5.92)	(4.23)	(5.51)	(5.79)	(5.05)	(5.81)
ME	0.340***	0.351***	0.351***	0.722***	0.709***	0.727***
	(9.78)	(10.26)	(10.20)	(7.25)	(7.02)	(7.54)
IOA	-1.463***	-1.474***	-1.438***	-2.410***	-1.929**	-1.997**
	(-3.09)	(-3.03)	(-3.02)	(-2.89)	(-2.05)	(-2.42)
ROE	0.043	0.012	0.024	-0.602*	-0.622*	-0.519*
	(0.63)	(0.15)	(0.31)	(-1.83)	(-1.90)	(-1.71)
OP	0.033	0.038	0.059	-0.052	-0.064	-0.096
	(0.45)	(0.51)	(0.71)	(-0.26)	(-0.28)	(-0.46)
Intercept	-2.226***	-2.475***	-2.407***	-3.628***	-3.775***	-3.878***
	(-4.28)	(-4.72)	(-4.72)	(-5.23)	(-5.32)	(-5.64)
Observations	408,976	408,976	408,976	480,693	480,693	480,693
Adjusted R^2	4.0	3.7	4.0	7.2	6.5	7.2

Table 4.4 Fama-Macbeth Regression: Excluding Microcaps

This table reports results of monthly cross-sectional regression in which we regress excess returns on financial leverage (LEV) and debt refinancing intensity (RI) as well as a set of control variables that could affect stock returns. Control variables include market beta (Beta), book-to-market ratio (BM), the log of market capitalization (ME), investment-to-asset ratio (IOA), return on equity (ROE), and operating profitability (OP). Regressions are conducted for two distinct samples: Developed Europe and Emerging Asia. We exclude microcap stocks defined as the stocks smaller than the 20th percentile of market capitalization for each sample (Friewald, Nagler, and Wagner, 2022). The reported coefficients are the means of time-series estimates. The corresponding t-statistics are presented in parentheses. The standard errors are corrected by using Newey and West (1987) method with optimal truncation lag suggested by Andrews (1991). The p-values are: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$. The average adjusted R^2s are in percentage. Both samples cover levered and nonfinancial firms, and are constructed at a monthly frequency. The sample period is from 1996 to 2020.

	Dependent Variable: EXRET (%)					
	Developed Europe			Emerging Asia		
	(1)	(2)	(3)	(1)	(2)	(3)
LEV	-0.927***		-0.853***	-0.419		-0.304
	(-2.90)		(-2.65)	(-0.63)		(-0.46)
RI		0.440***	0.341**		0.380	0.426
		(2.68)	(2.12)		(0.97)	(1.17)
Beta	0.181	0.174	0.188	-0.294*	-0.255	-0.277
	(1.33)	(1.29)	(1.41)	(-1.65)	(-1.37)	(-1.56)
BM	0.714***	0.533***	0.690***	0.928***	0.823***	0.904***
	(5.99)	(3.67)	(5.70)	(6.27)	(5.08)	(6.19)
ME	0.241***	0.248***	0.251***	0.719***	0.711***	0.723***
	(6.45)	(6.48)	(6.67)	(7.27)	(7.43)	(7.56)
IOA	-1.078**	-1.168**	-1.090**	-3.009***	-2.422**	-2.676***
	(-2.28)	(-2.23)	(-2.28)	(-3.05)	(-2.25)	(-2.73)
ROE	-0.107	-0.106	-0.125	-0.894**	-0.870**	-0.794**
	(-1.07)	(-0.96)	(-1.16)	(-2.55)	(-2.57)	(-2.42)
OP	0.052	0.059	0.087	0.295*	0.259	0.231
	(0.79)	(0.77)	(1.09)	(1.83)	(1.23)	(1.26)
Intercept	-1.549***	-1.751***	-1.696***	-3.669***	-3.876***	-3.886***
	(-2.82)	(-3.15)	(-3.12)	(-5.40)	(-5.48)	(-5.67)
Observations	356,400	356,400	356,400	390,649	390,649	390,649
Adjusted R^2	4.20	3.90	4.20	7.80	7.10	7.90

4.5 Moderation Effect of Information Asymmetry

In the previous section, we provide evidence of the positive effects of short-term debt on cross-sectional equity returns by using a dataset comprising of all firms in developed Europe. Next, we enrich our study to allow for more heterogeneity across firms. Specifically, we test whether the positive relation between short-term debt and cross-sectional equity risk premium holds across developed European firms with different levels of information asymmetry. In addition, we investigate whether there is a moderation effect of information asymmetry in emerging Asia.

For every month, we assign firms into Low and High groups based on their levels of information asymmetry (Bid-ask spread) for developed Europe and emerging Asia datasets respectively. High group (Low group) includes firms above (below) the median of information asymmetry. We then perform the same regression technique as what we did in Table 4.3 for High and Low groups. In Table 4.5, the reported coefficients are the means of time-series estimates. The corresponding t-statistics are presented in parentheses. Panel A of Table 4.5 reports regression results for developed Europe dataset. In High group, the coefficients of debt refinancing (RI) are insignificant (coefficient = 0.458, t-statistics = 1.23 in Model (3)). This is consistent with the hypothesis that information asymmetry negatively affects the relationship between debt refinancing and equity risk premium for firms with above median level of information asymmetry in developed Europe (Hypothesis III). When information asymmetry is low, agency-related risk is low to begin with, thus the risk-decreasing role of short-term debt is not significant. Instead, debt refinancing risk associated with short-term debt dominants and thus information asymmetry has no moderating effect for firms with below level of information asymmetry. This theory is supported by the regression results in Low group. The coefficients of RI are both positively significant (coefficient = 0.642, t-statistics = 3.30 in Model (3)).

Panel B of Table 4.5 reports regression results for emerging Asia dataset. The results are opposite to those in developed Europe. The coefficients of RI are both positively significant in High group (coefficient = 0.744, t-statistics = 2.18 in Model (3)), whereas they are insignificant in Low group (coefficient = 0.384, t-statistics = 1.39 in Model (3)). This evidence suggests that when information asymmetry is high shareholders require extra premium for bearing the risks associated with short-term debt. As we mentioned earlier, because of poor investor protection in emerging Asia, there may be higher debt rollover risk for emerging Asian firms with higher information asymmetry. Not surprisingly, the results in Low group are insignificant. Although excessive use of short-term debt is a common phenomenon in emerging Asia, firms with low information asymmetry may have both low agency-related risk and low refinancing risk to begin with.

To make sure our results are robust, we use an alternative measure of information asymmetry (Amihud illiquidity) and perform an interaction regression analysis. For both regions, we regress excess returns (EXRET) on financial leverage (LEV), debt refinancing intensity (RI), information asymmetry (Amihud), and an interaction term of RI and Amihud as well as a set of control variables that could affect stock returns. The results are reported in Table 4.6. In developed Europe, we find a negative interaction effect of information asymmetry (Amihud) on the relation of debt refinancing (RI) and equity risk premium (EXRET). The interaction term's coefficients are negatively significant (coefficient = -1.161, t-statistics = -2.06 in Model (2)). As the level of information asymmetry increases, shareholders consider short-term debt as more useful and thus less likely to require extra premium. From this analysis, we can observe that at least a certain moderating effect of information asymmetry exists in developed Europe. On the other hand, we find no moderating effect at all in emerging Asia. The coefficients of interaction term are insignificant (coefficient = -0.470, t-statistics = -0.38 in Model (2)). Overall, the interaction results are consistent with Hypotheses III.

Table 4.5 Fama-Macbeth Regression: Information Asymmetry (Bid-Ask Spread)

This table reports results of monthly cross-sectional regression in which we regress excess returns on financial leverage (LEV) and debt refinancing intensity (RI) as well as a set of control variables that could affect stock returns. Control variables include market beta (Beta), book-to-market ratio (BM), the log of market capitalization (ME), investment-to-asset ratio (IOA), return on equity (ROE), and operating profitability (OP). For every month, we assign firms into Low and High groups based on their levels of information asymmetry (Bid-ask spread). High group (Low group) includes firms above (below) the median of information asymmetry. The reported coefficients are the means of time-series estimates. The corresponding t-statistics are presented in parentheses. The standard errors are corrected by using Newey and West (1987) method with optimal truncation lag suggested by Andrews (1991). The p-values are: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$. The average adjusted R^2s are in percentage. Both samples cover levered and nonfinancial firms, and are constructed at a monthly frequency. The sample period is from 1996 to 2020.

	Dependent Variable: EXRET (%)					
	Panel A: Developed Europe					
	Low Information Asymmetry			High Information Asymmetry		
	(1)	(2)	(3)	(1)	(2)	(3)
LEV	-0.908***		-0.808**	-1.228***		-1.084***
	(-2.68)		(-2.37)	(-3.15)		(-3.12)
RI		0.703***	0.642***		0.577	0.458
		(3.65)	(3.30)		(1.51)	(1.23)
Beta	0.181	0.180	0.189	0.169	0.160	0.175
	(1.20)	(1.18)	(1.25)	(1.29)	(1.22)	(1.33)
BM	0.655***	0.398*	0.638***	0.922***	0.703***	0.909***
	(3.54)	(1.93)	(3.45)	(6.31)	(4.68)	(6.46)
ME	0.125***	0.129***	0.133***	0.451***	0.453***	0.458***
	(3.18)	(3.29)	(3.38)	(10.21)	(10.62)	(10.47)
IOA	-0.849*	-0.806	-0.750	-1.609**	-1.699***	-1.587**
	(-1.66)	(-1.59)	(-1.47)	(-2.56)	(-2.74)	(-2.54)
ROE	-0.372*	-0.311	-0.372*	0.344	0.425*	0.345
	(-1.80)	(-1.44)	(-1.81)	(1.38)	(1.68)	(1.37)
OP	0.137	0.014	0.135	0.218	0.095	0.209
	(0.98)	(0.09)	(0.99)	(1.49)	(0.62)	(1.41)
Intercept	-0.414	-0.581	-0.603	-3.116***	-3.324***	-3.285***
	(-0.79)	(-1.14)	(-1.17)	(-5.37)	(-5.70)	(-5.70)
Observations	175,788	175,788	175,788	175,633	175,633	175,633
Adjusted R^2	5.5	5.3	5.6	4.3	4.3	4.5

	Dependent Variable: EXRET (%)					
	Panel B: Emerging Asia					
	Low Information Asymmetry			High Information Asymmetry		
	(1)	(2)	(3)	(1)	(2)	(3)
LEV	0.518		0.420	-0.975**		-1.066**
	(0.59)		(0.46)	(-2.08)		(-2.36)
RI		0.269	0.384		0.591*	0.744**
		(1.06)	(1.39)		(1.80)	(2.18)
Beta	-0.299	-0.287	-0.323	-0.331	-0.365*	-0.342
	(-1.42)	(-1.19)	(-1.52)	(-1.51)	(-1.73)	(-1.56)
BM	1.283***	1.276***	1.252***	0.939***	0.955***	1.160***
	(4.78)	(4.56)	(4.38)	(6.51)	(7.16)	(6.54)
ME	0.483***	0.394***	0.499***	0.778***	0.754***	0.784***
	(5.14)	(3.04)	(5.46)	(6.99)	(7.11)	(6.90)
IOA	-2.823*	-1.513	-3.158*	-5.946***	-5.689***	-5.730***
	(-1.71)	(-0.81)	(-1.68)	(-3.34)	(-2.65)	(-3.01)
ROE	-1.468*	-1.957***	-1.283	-0.469	-0.044	0.264
	(-1.81)	(-3.38)	(-1.24)	(-0.62)	(-0.05)	(0.28)
OP	0.255	0.925	0.260	0.965*	1.144***	0.898
	(0.36)	(1.08)	(0.31)	(1.66)	(2.80)	(1.51)
Intercept	-2.018***	-1.668**	-2.173***	-4.185***	-4.431***	-4.601***
	(-2.87)	(-2.11)	(-3.14)	(-5.71)	(-5.72)	(-5.74)
Observations	238,891	238,891	238,891	238,666	238,666	238,666
Adjusted R^2	10.3	9.5	10.2	7.7	7.5	7.9

Table 4.6 Fama-Macbeth Regression: Information Asymmetry (Amihud Iliquidity)

This table reports results of monthly cross-sectional regression in which we regress excess returns on financial leverage (LEV), debt refinancing intensity (RI), information asymmetry (Amihud), and an interaction term of RI and Amihud as well as a set of control variables that could affect stock returns. Control variables include market beta (Beta), book-to-market ratio (BM), the log of market capitalization (ME), investment-to-asset ratio (IOA), return on equity (ROE), and operating profitability (OP). The reported coefficients are the means of time-series estimates. The corresponding t-statistics are presented in parentheses. The standard errors are corrected by using Newey and West (1987) method with optimal truncation lag suggested by Andrews (1991). The p-values are: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$. The average adjusted R^2s are in percentage. Both samples cover levered and nonfinancial firms, and are constructed at a monthly frequency. The sample period is from 1996 to 2020.

Dependent Variable: EXRET (%)				
	Developed Europe		Emerging Asia	
	(1)	(2)	(1)	(2)
LEV		-0.855***		-0.139
		(-2.80)		(-0.23)
RI	0.689**	0.601**	0.471	0.505
	(2.59)	(2.31)	(1.10)	(1.27)
Amihud	-0.098**	-0.100**	-0.515	-0.552
	(-2.05)	(-2.11)	(-0.87)	(-0.94)
RI*Amihud	-1.106**	-1.161**	-0.731	-0.470
	(-2.07)	(-2.06)	(-0.58)	(-0.38)
Beta	0.171	0.186	-0.235	-0.269*
	(1.23)	(1.34)	(-1.37)	(-1.68)
BM	0.604***	0.792***	0.650***	0.723***
	(3.82)	(5.97)	(3.74)	(4.39)
ME	0.312***	0.317***	0.638***	0.658***
	(9.17)	(9.22)	(6.33)	(6.80)
IOA	-1.281***	-1.196**	-1.791*	-1.890**
	(-2.73)	(-2.54)	(-1.87)	(-2.34)
ROE	0.130	0.071	-0.715**	-0.620**
	(0.65)	(0.36)	(-2.21)	(-2.06)
OP	0.088	0.185*	-0.113	-0.134
	(0.73)	(1.74)	(-0.44)	(-0.58)
Intercept	-2.291***	-2.280***	-3.216***	-3.319***
	(-4.53)	(-4.51)	(-4.52)	(-4.84)
Observations	351,421	351,421	450,820	450,820
Adjusted R^2	5.3	5.5	7.4	8.0

4.6 Robustness Check

Researchers may concern that markets of China and South Korea are relatively developed, comparing with other Asian markets. So, firms and investors in the two markets might be more likely to behave as what corporations and shareholders do in markets of developed Europe. The regression results for emerging Asia including China and South Korea may not represent for the real story of emerging markets. Similar concern occurs for developed Europe dataset. Its sample includes the UK, Germany, and France which are more developed than other markets in developed Europe. What's more, they account for about a half of sample size in this dataset. Therefore, researchers may question that the strong positive relationship between debt refinancing and equity returns might be driven by observations in these three markets, and that the regression results may not represent for the story in other developed European markets.

To address these concerns, we remove observations of China and South Korea from emerging Asia dataset and exclude observations of the UK, Germany, and France in developed Europe dataset. We then repeat the regression analysis as what we did in Table 4.3. The regression results are reported in Table 4.7. We find a strong positive influence of debt refinancing on equity returns in developed Europe while no significant pattern in emerging Asia. Overall, empirical results are robust.

Table 4.7 Fama-Macbeth Regression: Robustness Check

This table reports results of monthly cross-sectional regression in which we regress excess returns on financial leverage (LEV) and debt refinancing intensity (RI) as well as a set of control variables that could affect stock returns. Control variables include market beta (Beta), book-to-market ratio (BM), the log of market capitalization (ME), investment-to-asset ratio (IOA), return on equity (ROE), and operating profitability (OP). Regressions are conducted for two distinct samples: Developed Europe (excluding the UK, Germany, and France) and Emerging Asia (excluding China and South Korea). The reported coefficients are the means of time-series estimates. The corresponding t-statistics are presented in parentheses. The standard errors are corrected by using Newey and West (1987) method with optimal truncation lag suggested by Andrews (1991). The p-values are: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$. The average adjusted R^2s are in percentage. Both samples cover levered and nonfinancial firms, and are constructed at a monthly frequency. The sample period is from 1996 to 2020.

	Dependent Variable: EXRET (%)					
	Developed Europe			Emerging Asia		
	(1)	(2)	(3)	(1)	(2)	(3)
LEV	-0.852*		-0.807*	-1.154*		-1.102
	(-1.88)		(-1.75)	(-1.81)		(-1.61)
RI		0.612**	0.529**		0.055	-0.085
		(2.54)	(2.23)		(0.10)	(-0.14)
Beta	0.090	0.089	0.104	-0.123	-0.147	-0.117
	(0.69)	(0.70)	(0.81)	(-0.61)	(-0.75)	(-0.60)
BM	0.757***	0.492***	0.730***	1.076***	0.885***	1.041***
	(4.33)	(3.29)	(4.18)	(5.08)	(5.90)	(5.04)
ME	0.329***	0.335***	0.334***	0.849***	0.850***	0.842***
	(6.98)	(6.81)	(6.84)	(8.35)	(8.40)	(9.08)
IOA	-1.743**	-1.913**	-1.704**	-0.962	-0.693	-0.644
	(-2.35)	(-2.54)	(-2.27)	(-0.94)	(-0.63)	(-0.62)
ROE	-0.609*	-0.603*	-0.646*	-0.878*	-0.479	-0.789*
	(-1.90)	(-1.77)	(-1.95)	(-1.78)	(-1.29)	(-1.86)
OP	0.069	-0.008	0.093	0.659**	0.344	0.577*
	(0.22)	(-0.02)	(0.29)	(1.99)	(1.17)	(1.93)
Intercept	-1.904***	-2.033***	-2.026***	-5.092***	-5.253***	-5.096***
	(-3.27)	(-3.44)	(-3.53)	(-5.78)	(-5.82)	(-5.54)
Observations	191,972	191,972	191,972	170,153	170,153	170,153
Adjusted R^2	6.0	5.5	6.0	7.2	6.6	7.3

4.7 Conclusion

We examine whether the positive effects of debt refinancing on equity returns hold in international context. Our analysis focus on two regions: developed Europe and emerging Asia. We find that the positive influences of short-term debt on stock excess returns still hold in the context of developed Europe. However, this short-term debt effect is insignificant in emerging Asia. We extend Friewald, Nagler, and Wagner's study in international samples and suggest that the maturity effects of short-term debt matter in asset prices in developed markets. Furthermore, we also examine how the information asymmetry influences the relationship between short-term debt and cross-sectional equity returns. Our results show that the moderating effect of information asymmetry exists in developed Europe.

Chapter 5 General Conclusion

This thesis includes three topics on corporate finance: (1) the relation between corporate excess cash and future stock returns; (2) the difference in corporate cash holdings between the US and developed Europe; and (3) the relation between corporate debt maturity and cross-sectional equity risk premium. In Chapter 2, we hypothesize that the positive relation between excess cash and future stock returns holds in developed Europe but not holds in emerging Asia as a result of the heterogeneity in governance and investor protection across regions. Using data from the Datastream and Worldscope over the 1997-2020 sample period, we find supportive results. Our findings contribute to the literature by showing that the positive relation between excess cash and stock returns exists in developed countries but disappears in developing countries. This finding is consistent with Simutin's theory which states that the positive relation is induced by the link of excess cash and risky growth options. This link gets weaken in countries with poor investor protection and governance and thus excess cash has no effects on stock returns in those countries. This sheds light on international studies of cash effects on corporate finance implications. For future research, we may investigate macroeconomic factors that may contribute to the observed differences between developed Europe and emerging Asia, and explore how factors such as regulatory environments or market conditions impact the relationship between excess cash and future stock returns. Additionally, we may conduct a more granular analysis within the category of emerging markets to examine whether there are variations in the relationship between excess cash and future returns among different emerging market clusters or regions.

In Chapter 3, we study the difference in corporate cash between the US and developed Europe. We provide evidence that intangible assets account for a large portion of this difference. Our results show that the difference in intangible assets between the US firms and developed

European firms is mainly caused by sector specialization. This finding confirms the literature that US firms outperform European firms in high R&D intensity sectors. In addition, we examine the relation between corporate cash holdings and intangible assets in developed European markets and we contribute out-of-sample tests for the positive relation of cash and intangible assets as documented in study of Falato, Kadyrzhanova, Sim, and Steri (2022). Our research contributes to the policy makers by showing them that governments' intangible capital-related policies affect not only their productivity but also their overall corporate cash level (relative to their competing countries) which is also an important indicator of corporate performance. Policy makers may want to maintain an optimal balance between intangible assets and corporate cash holdings. For future research, we would like to deepen the understanding of sector-specific differences in cash holdings within developed Europe and the US by investigating whether there are sectors where developed European firms outperform their US counterparts in terms of cash management.

In Chapter 4, we incorporate the maturity structure of debt in investigating the leverage effects on the cross-section of equity returns in non-US markets. We provide out-of-sample tests for the positive relationship of debt refinancing and cross-sectional equity risk premium as documented in Friewald, Nagler, and Wagner (2022). Specifically, we show that this positive relationship holds in developed European countries but disappear in developing Asia countries where shareholders care about more on agency-related risk. Our results suggest that future studies of leverage effects in corporate finance and asset pricing in developed markets should consider the debt maturity structure and that this consideration may not be applicable to emerging markets. Furthermore, we examine how the relationship between short-term debt and cross-sectional equity returns changes with information asymmetry. Results show that a negative moderating effect of information asymmetry exists in developed Europe. In this paper, we focus on short-term debt. For future research, we may explore research questions like: What is the role of corporate long-term debt in explaining the cross-sectional equity risk premium for international stocks; Whether investors demand higher returns to compensate for long-term debt in international context; And what is the optimal balance of long-term and short-term debts for firms in non-US market.

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