# REAL VOLATILITIES AND FINANCIAL POLICIES AROUND THE WORLD

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**Abstract**

Even though developing economies are more volatile, firms in developed countries hold more cash and less debt. We show (1) Despite greater aggregate stability, the performance and characteristics of individual firms in developed countries are more volatile. (2) In developing countries, market imperfections insulate incumbent firms from competitive risk. Cross-country differences in firm rivalry and in cash flow risk are larger in technology-intensive, external-finance-dependent, and large-firm-dominated industries where we expect greater market imperfections. (3) Firms in developed countries are more responsive to shocks. Most of the adjustments come from cash balance. Firms in developing countries select financial policies to accommodate lower real risk, and not just in response to market imperfections.

JEL Classification: G15, G31, G32

Key Words: International Cash Holding, International Capital Structure, Firm Risk, Volatility, Financial Development

## 1. Introduction

Financial structures of firms in developed and developing countries differ greatly. Although some dissimilarities can be explained by cross-country differences in legal and political institutions, trade patterns, and by access to financial markets, others remain puzzling. Thus, while at the aggregate and industry levels developing economies are more volatile, firms in developed countries appear to have more conservative liquidity and capital structure policies. For instance, average cash holding scaled by total assets is 25% in Australia and 21% in the U.S. while an average Indian and Russian firm only holds 6.8% and 8.8% in cash, respectively.[1]

The higher cash holdings in developed countries are at first sight puzzling in view of the widespread perception that that developing economies are risker than developed economies. Starting with the 1988 seminal work of Robert E. Lucas, numerous authors have documented that developed countries tend to exhibit stable output growth over extended periods of time, while developing countries are more prone to sharp fluctuations and frequent financial crises.[2] At the industry level, prior studies have shown that poor institutions make financially dependent industries in developing countries more volatile (Raddatz, 2006) and more vulnerable to recessions (Braun and Larrain, 2005). As a result, it would be natural to assume that firms in developing countries are riskier and adopt more conservative financial policies to address the higher risk. In this paper, we show that this intuitive conjecture is not true. We find that, at the firm level, good institutions make incumbent firms more volatile, especially in financially dependent industries.

First, we establish that firms in developed countries indeed do have safer financial structures. Firms in rich countries hold more cash, have lower leverage, use fewer short-term liabilities, and have higher current ratios. We show that these are not driven by difference in firm size or industry compositions across countries.

Second, we find that firms in developed countries have higher risk. Firm-level growth rates in assets, cash, debts, short-term liabilities, sales, profit, and employment are more volatile in developed countries. The cross-sectional dispersions of these variables are also higher in developed countries. However, the firm-level results are reversed at the aggregate levels. After being averaged across firms, the sector- and country-level growth rates are less volatile in developed countries.

Third, we propose that firm-level volatilities in developing countries are lower due to imperfections in capital and product markets. We show that the cross-country difference in operating risk is more pronounced where we expect a higher degree of market imperfections. The difference in firm-level volatilities is greater in technology-intensive, external-finance-dependent, and large-firm-dominated industries. We also show that differences between developing and developed countries in one important source of risk, intensity of competition, are also greater in

[1] See Table 1 for details

[2] See, for example, Lucas (1988), Acemoglu, Johnson, Robinson, and Thaicharoen (2003), Prasad, Rogoff, Wei, and Kose (2006), Aguiar and Gopinath (2007), and Koren and Tenreyro (2007)

those industries. These findings are consistent with the notion that market imperfections act to insulate incumbent firms from risk.

Finally, we link financial structure to risk by examining how firms react to exogenous shocks. Using productivity data from the UNIDO Database, we find that firm-level growth rates in assets, cash, debts, short-term liabilities, sales, and profit are more responsive to shocks in developed countries. Among all types of assets and liabilities, most of the adjustments come from cash balance. Our results suggest that firms devise financial policies to accommodate their firm-level risk. .

Our findings have important implications for our understanding of firms' financial policies. Thus, to study cash holding and leverage of firms across countries, we must consider the difference in cash flow risk, in addition to the traditional factors such as agency costs, taxes, and capital market development. It might be rational for firms in developing countries to hold less cash and have higher leverage because they have lower operating risk.

There is a great amount of literature on the cross-country determinants of a firm's capital structure. Rajan and Zingales (1995), Demirguc-Kunt and Maksimovic (1996, 1998, 1999), Booth, Aivazian, Demirguc-Kunt, and Maksimovic (2001), Giannetti (2003), and Fan, Titman, and Twite (2011) study how institutional structure affects capital structure and debt maturity in different countries. While existing papers tend to study capital structure in isolation or cash in isolation, we study leverage and all other major components of firm assets and liabilities at the same time. Given that operating risk is likely to affect many components of financial structures simultaneously, it is important to study several financial policies at the same time. We show that, besides holding more cash, firms in rich countries also have lower leverage, fewer short-term debts, and hence more conservative financial structures.

Most prior international papers on cash and leverage use panel or cross-sectional regressions and, effectively, study the equilibrium financial structures. In this paper, we also examine firm's reaction to productivity shocks. Studying how firms adjust their cash and other financial structures in response to exogenous shocks is a direct test of our risk-based explanation.[3]

Studies of cash holdings across countries document that firms in rich countries hold more cash, whereas firms in poor countries hold more fixed assets. Pinkowitz, Stulz, and Williamson (2003) suggest that the Keynesian transaction demand for money drives this result. They explain that cash holding can reduce transaction costs. So,

[3] Existing papers have studied the dynamic patterns of investment in fixed assets across countries. McLean, Zhang and Zhao (2012) examine the investment's sensitivity to Tobin's Q and cash flows at the firm-level. Love (2003) estimates investment Euler equation linking capital expenditure to lagged investment, sales, and financial constraints. Wurgler (2000) uses the UNIDO Database to study how industry-level capital formation responds to productivity shocks (measured by value added). In this paper, we study how firm-level asset and liability structures respond to exogenous productivity shocks from UNIDO.

firms in countries with higher cost of labor hold more cash.[4] Caprio, Faccio, and McConnell (2012) suggest that cash can easily be expropriated by politicians and bureaucrats. Therefore, firms in poor countries, where the threat of political extraction is high, have an incentive to hold less cash to shelter their assets from extractions. Pinkowitz, Stulz, and Williamson (2006), as well as Lins and Kalcheva (2007), study the value implications of cash holdings. They both suggest that corporate cash holdings are less valuable in countries with weak shareholders protection. In Section 8, we discuss how our explanation complements these studies and identify predictions which differentiate them.

This paper is also related to recent research on volatilities of stock returns. Morck, Yeung, and Yu (2000) document that idiosyncratic return volatilities are higher in developed countries. Bartram, Brown, and Stulz (2011) suggest that institutional variables like investor protection and stock market development can explain cross-country differences in return volatilities. McLean, Pontiff, and Zhao (2011) show that equity market liberalization is associated with changes in stock return and fundamental volatilities. Comin and Phillipon (2005) document that idiosyncratic volatilities in the U.S. have been decreasing over time. Since return volatilities are computed from stock prices, they are driven by both real factors (such as cash flow risk) and financial factors (such as noise trading). In this paper, we focus on real factors by studying volatilities of the growth in real variables – assets, cash, debts, short-term liabilities, sales, profit, and employment. More importantly, we take a step further to identify the sources of risk. We hypothesize that difference in firm-level risk comes from capital and product market imperfections and show that the volatilities are indeed more different in industries in which we expect a higher degree of market imperfections (technology-intensive, external-finance-dependent, and large-firm-dominated industries).

The rest of this paper is organized as follows. Section 2 outlines the conceptual framework. Section 3 discusses data sources and sample construction. Section 4 studies the cross-country determinants of asset and liability structures. Section 5 studies the cross-country determinants of firm-level risk. Section 6 analyzes firm-level risk in different industries. Section 7 examines firm's response to productivity shocks. Section 8 presents additional tests. Section 9 concludes. Most robustness checks are reported in Appendix A.

## 2. Framework

### Empirical Framework and Key Findings

The paper is structured (1) to document an important puzzle about financial structures of firms in different countries, (2) to propose firm-level risk as a potential explanation, (3) to identify what drive the cross-country difference in firm-level risk, and (4) to examine how financial structures react to exogenous productivity shocks. More precisely, we answer four related questions below:

[4] According to Pinkowitz, Stulz, and Williamson (2003), "With the transaction motive, firms hold cash to economize on the costs of transacting. The transaction motive is a 'shoe leather' theory of money demand: it is cheaper to hold cash than to send somebody to the bank. As a result, cash holdings increase with the cost of labor" (p.3).

1. Are asset and liability structures different across countries?

We first compare financial structures of firms in developed and developing countries. We study the cross-country difference in cash holdings, intangible assets, total liabilities, and short-term liabilities. We scale these variables by total assets and regress them on country dummies (or other institutional factors such as Per Capita GDP and financial development indicators), controlling for size quintile, industry, and year fixed-effects. We find that firms in developed countries, in high-tech industries, as well as firms that are smaller hold more cash while firms in manufacturing industries hold less cash. Firms in rich countries also have lower leverage, use fewer short-term liabilities, and have higher current ratios. Overall, we find that firms in rich countries have more conservative financial structures.

2. Is firm-level risk different across countries?

To study firm-level risk, we examine whether performance and characteristics of individual firms are more volatile in certain countries. We compute volatilities of firm-level growth rates in assets, cash holdings, intangible assets, total liabilities, short-term liabilities, sales, profit, and employment. For consistency with our examination of asset and liability structures, we use reduced form models, regressing our volatility measures on country dummies, controlling for firm size and industry effects. We find that firms in developed countries are more volatile. These volatilities are also higher in high-tech industries, higher among small firms, and lower in manufacturing industries. In addition, we find that cross-sectional dispersions of performance and characteristics of individual firms are higher in developed countries.

For comparison purposes, we examine aggregate risk in different countries. We average the firm-level growth rates within each sector (based on 17 Fama-French industries) and within each country. We then compute the sector- and country-level volatilities. Opposite to the firm-level results, we find that the sector- and country-level volatilities are higher in developing countries. These findings are consistent with the widely-accepted view that developing economies are less stable.

3. What drives the difference in firm-level risk?

We examine whether cross-country difference in firm-level risk is more pronounced in certain industries. We propose that idiosyncratic risk is likely to be influenced by imperfections in product and capital markets as these imperfections can insulate incumbent firms from risk. Detailed arguments are in the discussion below. Following the difference-in-difference methodology in Rajan and Zingales (1998), we regress firm-level volatilities on country dummy, industry characteristics, and the interactions between the two, controlling for firm size. We find that cross-country difference in firm-level volatilities is more pronounced in technology-intensive, financial-dependent, and large-firm-dominated industries. These are the industries where we expect the higher degree of market imperfections.

4. How do a firm's assets and liabilities change in response to exogenous productivity shocks?

We link cross-country difference in financial structure to the underlying firm-level risk by examining how firms react to real shocks. To avoid reverse causality, we measure productivity shocks as growth rate of domestic value added from UNIDO Database as opposed to Tobin's Q or cash flow shocks at the firm level. (Shocks to Cash flows and Q can be driven by change in firm's financial policies.) We regress growth rates in assets, cash holdings, current assets, intangible assets, total liabilities, short-term liabilities, sales, profit, and employment on these productivity shocks. We find that firms in developed countries are more responsive to exogenous real shocks. Across all types of assets and liabilities, most of the adjustments come from cash balance. Our results suggest that firms devise financial policies to accommodate their firm-level risk.

We illustrate how market imperfections in developing countries can lead to lower risk at the firm level, with a stylized model of real volatilities. An economy is endowed with fixed supply of capital K. For simplicity, we assume that there are two firms, A and B, competing for the capital. The economy lasts T periods and capital stock never depreciates. Firms have a linear production function: $F(e_{i,t}, K_{i,t}) = e_{i,t} K_{i,t}$ where $i=\{A,B\}$ and $t=\{0,\ldots,T\}$. The distribution of productivity shocks $e_i$ is identical and independent across time. We assume that the shocks are binomial: $e_A = H$ and $e_B = L$ with probability ½ and $e_A = L$ and $e_B = H$ with probability ½. Also, $H-L = d$ and $d > 0$. The parameter d represents the true difference in firm-level productivities which is similar across countries. From this set-up, the first best allocation of capital is $K_{A,t} = K$ and $K_{B,t} = 0$ if $e_{A,t} > e_{B,t}$ and $K_{A,t} = 0$ and $K_{B,t} = K$ if $e_{A,t} < e_{B,t}$.

The key assumption here is that goods and capital markets might be less than fully efficient. Specifically, we assume that it is costly to reallocate resources across firms. To move $K_{A,t} - K_{A,t-1}$ units of capital from firm A to firm B, the adjustment cost $C(K_{A,t}, K_{A,t-1})$ must be incurred. Examples of adjustment cost C(.) include external financing cost of the expanding firms or the cost associated with asymmetric information in the market for corporate assets. These costs are expected to be high in developing countries.

With costly adjustment, the allocation of capital must solve the Bellman's equation below:

$V(K_{A,t-1}) = \max_{KA,t} e_{A,t} K_{A,t} + e_{B,t} K_{B,t} - C(K_{A,t}, K_{A,t-1}) + E[V(K_{A,t})]$ where $K_{B,t} = K - K_{A,t}$ and $V(K_{A,T}) = 0$. Following Hayashi (1982), we use quadratic adjustment cost: $C(K_{A,t}, K_{A,t-1}) = c/2 (K_{A,t} - K_{A,t-1})^2$. The adjustment cost parameter c directly captures the degree of market imperfections.

For simplicity, we further assume that the initial endowment is $K_{A,0} = K/2$ and $K_{B,0} = K/2$ and that adjustment cost is large enough, $c > 2dT/K$, so neither firms will be allocated all the capital K (i.e., corner solutions) before time T.

Using the first order condition and the envelope theorem, the policy function is $K_{A,t} = K_{A,t-1} + (e_{A,t} - e_{B,t})/c$. This policy implies that $K_{A,t} = K_{A,t-1} + d/c$ and $K_{B,t} = K_{B,t-1} - d/c$ if $e_{A,t} > e_{B,t}$ and $K_{A,t} = K_{A,t-1} - d/c$ and $K_{B,t} = K_{B,t-1} + d/c$ if $e_{A,t} < e_{B,t}$. Compared to the first-best allocation where the most productive firm receives all the capital, the most productive firm here only receives some of the capital (d/c) due to costly adjustment.[5]

[5] See details in the Appendix B

Given the binomial nature of the shocks, there will be $2^T$ sample paths. We define firm-level volatility for each sample path as $\sqrt{1/T \times \sum_{t=1..T}((K_{i,t} - K_{i,t-1})/(K_{i,0}))^2}$. In every node of the binomial tree, capital will increase by d/c with probability ½ and decrease by d/c with probability ½. Therefore, the average volatility across all possible paths is 2d/cK. From this formula, it is clear that firm-level volatility is decreasing in degree of market imperfection, c. Thus, we would expect that firms in countries with higher costs of adjustment capital across firms are subject to lower firm-level risk. More specifically, firms in developing countries where financial market imperfections do slow the reallocation of capital will be subject to smaller volatility.

**3. Data and Sample Construction**

In this section we describe the data and present sample statistics at the country, industry, and individual firm levels. The sample statistics show that asset and financial structures characteristics differ between firms in developed and developing countries.

**3.1 Firm-Level Data**

Our main source for firm-level data is WorldScope, which covers over 95% of the world market capitalization. It provides financial statement information on firms around the world. We construct a 1988-2008 annual dataset of all the public firms available in 46 countries (25 developed and 21 developing countries). Among the 46 countries, WorldScope provides full coverage of the listed firms in 31 countries, 10 of which are developing countries. WorldScope also provides targeted coverage (all listed firms with the market capitalization higher than 100 million dollars) for 15 countries. The list of these countries and their coverage is available in the Appendix C. All the variables are measured in USD. Following the existing literature, we exclude all financial firms and regulated utilities (primary SIC 4900- 4999, 6000- 6999, and above 9000). We also exclude all observations with zero or negative total assets. In order to ensure that our results are not driven by the difference in size distribution across countries, we create a control for size by constructing the size quintile variable based on the global distribution of the total assets of all firms in WorldScope.

We use six measures to study firm assets and liabilities structures: firm size (natural log of total assets), cash/total assets, intangible assets/total assets, total liabilities/total assets, short-term liabilities/total liabilities, and short-term liabilities/short-term assets. To reduce the risk that our results may be driven by outliers or any mistakes in the original dataset, we winsorize all the variables at 1%. Table 1 Panel A reports the number of firm-year observations and average assets and liabilities structures country by country. Table 1 Panel B compares asset and liability structures in developed and developing countries.

[INSERT TABLE 1 HERE]

From the size column in Table 1 Panel A, firms in developed countries are slightly larger than firms in developing countries. From Table 1 Panel B, firm size (the average natural log of total assets in USD) is 4.77 in developed countries and 4.75 in developing countries. Since WorldScope constructs their sample based on market

capitalization, the size distribution of firms is not very different across countries. This means that the difference between developed and developing countries in our latter analysis is not likely to be driven by firm size.

Cash holdings vary greatly across countries. It is apparent that firms in rich countries hold more cash than firms in poorer countries. For example, Table 1 Panel A shows the countries with the lowest cash-to-total-assets ratios are Colombia (6.88%), India (6.8%), and Peru (6.17%). The countries with the highest cash-to-total-assets ratios are Australia (25.07%), Israel (25.51%), and the United States (21.18%). From Table 1 Panel B, firms in developed countries have the average cash-to-assets ratio of 18% while firms in developing countries have the average cash ratios of 11.94%. The 6.77% difference yields t-statistics of 82.79. These statistics are in line with the descriptive statistics in Caprio, Faccio, and McConnell (2012).

Intangible assets are also very different across countries. As expected, firms in developed countries have more intangible assets relative to total assets. For example, in Table 1 Panel A, the countries with the lowest intangible-to-total-assets ratios are Brazil (1.83%), Indonesia (1.57%), and Venezuela (1.34%). The countries with the highest intangible-to-total-assets ratios are Ireland (14.19%), Sweden (15.79%), and the United States (15.24%). From Table 1 Panel B, firms in developed countries have an average intangible-to-total-assets ratio of 9.73% while firms in developing countries have average ratios of 3.38%. The 6.35% difference yields t-statistics of 98.74.

Leverage is relatively similar across countries but maturity structures are very different. Leverage is slightly lower in developed countries. From Table 1 Panel B, average total-liabilities-to-total-assets ratio is 26.08 in developed countries and 28.44 in developing countries. Firms in developing countries have much higher short-term liabilities relative to their total liabilities. For example, from Table 1 Panel A, the countries with the highest short-term-to-total-liabilities ratios are China (80.13%), Malaysia (65.13%), and Turkey (68.22%). The countries with the lowest short-term-to-total-liabilities ratios are Finland (34.18%), Norway (27.99%), and Sweden (35.3%). The average short-term-liabilities ratio in the United States is 37.51%. From Table 1 Panel B, firms in developed countries have an average short-term-to-total-liabilities ratio of 46.42% while firms in developing countries have an average ratio of 61.27%. The -14.85% difference yield t-statistics of -100.86. These findings are consistent with Demirguc-Kunt and Maksimovic (1999) as well as Fan, Titman, and Twite (2011).

Our descriptive statistics and univariate analysis show that firms in developed and developing countries have drastically different asset and liability structures. Firms in developed countries seem to have more conservative financial policies (more cash, slightly lower leverage, and fewer short-term liabilities). Firms in developed countries also have more intangible assets relative to their total assets. Thus, the sample characteristics of our firms are in accord with the prior literature.

Next, we compute the growth rate of each firm financial structure (total assets, cash, intangible assets, total debts, and short-term liabilities) as well as the outcome variable (sales, profit, and employment). Growth rate is defined as the difference in natural log. We winsorize all of the original variables at 1% before computing the growth rates. Then, we compute volatilities (time-series standard deviations) of the growth rates and use them as a measure of risk. Table 2 Panel A reports the number of firms and firm-level risk country by country. Table 2 Panel B reports

the average firm-level risk in developed and developing countries. For comparison purposes, Table 2 Panel C reports the average growth rates in developed and developing countries.

[INSERT TABLE 2 HERE]

Table 2 Panel A shows that firms in developed countries are more volatile than firms in developing countries. The difference in volatilities is present in all of the variables except intangible assets. For example, countries with the most volatile sales growth are Australia (0.76), Canada (0.6), and Norway (0.55). Countries with the most volatile assets growth are Australia (0.62), Canada (0.57), and the United States (0.55). Countries with the most volatile cash holdings are Canada (1.57), United Kingdom (1.39), and Ireland (1.39). The least volatile countries are all emerging markets. Countries with the least volatile sales growth are Colombia (0.23), Egypt (0.21), and India (0.26). Countries with the least volatile assets growth are Chile (0.21), Egypt (0.21), and Mexico (0.22). Countries with the least volatile cash holdings are China (0.84), Egypt (0.83), and Lithuania (0.84). We observe similar patterns for profit, total liabilities, current liabilities, and employment.

From Table 2 Panel B, the univariate comparison confirms that firms in developed countries have higher firm-level risk. Average volatilities of sales growth is 0.432 in developed countries and 0.388 in developing countries. Total assets volatility is 0.436 in developed and 0.347 in developing countries. Cash holding volatility is 1.113 in developed and 1.092 in developing countries. Profit volatility is 0.639 in developed and 0.593 in developing countries. Total liabilities volatility is 0.873 in developed and 0.718 in developing countries. Short-term liabilities volatility is 1.162 in developed and 0.97 in developing countries. Employment volatility is 0.317 in developed and 0.257 in developing countries. The differences between developed and developing countries are statistically significant at the 1% level for total assets, intangible assets, total debts, and short-term liabilities, sales, profit, and employment. The difference in volatilities of cash holding is statistically significant at 10%.

One might be concerned that firms with high average growth rates will automatically have high volatilities and that our volatilities difference is the by-product of growth rates difference. We report the average firm growth rates in developed and developing countries in Table 2 Panel C. It turns out that, despite lower volatilities, firms in developing countries have higher or similar average growth rates. In other words, if we measure firm-level risk as volatilities of firm growth scaled by average firm growth, the difference between developed and developing countries will be even larger than those presented here.

Next, we compare volatilities of different variables. From global average column in Table 2 Panel B, cash and short-term liabilities are more volatile, compared to other components of firm financial structures. Intangible assets and total liabilities are less volatile. Average volatilities of cash holding and short-term liabilities growth are estimated at 1.107. Average volatility of intangible assets growth is 0.83 and average volatility of total liabilities growth is 0.802. Among the outcome variables, profit growth is the most volatile; sales growth is the second, and employment growth is the least volatile. Their average volatilities are estimated at 0.624, 0.419, and 0.304 respectively.

Overall, our descriptive statistics and univariate analyses suggest that firms in developed and developing countries have different levels of real risks. Volatilities of sales, assets, cash holding, profit, total debts, current liabilities, and employment growth rates are higher in developed countries.

### 3.2 Industry-Level Data

To control for industry characteristics, we include 2-digit SIC dummies in our regressions. When we analyze how industry characteristics affect our results, we replace the industry dummies with various industry indicators. The manufacturing dummy is equal to one if the firm is in SIC codes 2000-3999, also defined as tradable industries by Aguiar and Gopinath (2005). The high-tech dummy is equal to one if the firm is in the high-tech industry according to the American Electronic Association. The external finance dependent indicator is from Rajan and Zingales (1998). The small-firm-dominated industry indicator is from Beck, Demirguc-Kunt, Laeven, and Levine (2008).

We construct a measure of foreign entry using M&A data from Thomson's Securities Data Corporation (SDC) database. Our sample covers all deals announced and completed between 1989 and 1998. To avoid reverse causality when we study the impacts of foreign entry on firm volatilities, the measure of foreign entry is computed from 1989-1998 data and the firm-level volatilities are computed from the non-overlapping period of 1999-2008 (as opposed to the full 1989-2008 sample in other specifications). For each sector (one of the 17 Fama-French industries) in each country, we construct foreign entry by aggregating all inward cross-border M&As and scaling them by all (domestic and inward foreign) M&As during 1989-1998. We also compute the aggregate volume of all outward cross-border M&As scaled by the volume of all (domestic and outward foreign) M&As for a robustness check.

We use the United Nations' General Industrial Statistics database (UNIDO's INDSTAT-4 2011) to construct productivity shocks. This database reports gross fixed capital formation, value added, output, establishments, employment, fixed capital, and sales data for up to 4-digit ISIC manufacturing industries. There are 127 ISIC industries in the dataset. Following Wurgler (2000), we define productivity shock as the percentage change in value added. We also use percentage growth in domestic output and percentage growth in labor productivity (output per worker) as alternative measures for productivity shocks. In each country and year, the shocks are constructed at the 4-digit ISIC level. We match each firm in WorldScope to the ISIC industry (or industries) based on its primary SIC code.

### 3.3 Country-Level Data

Our developed country indicator is based on the World Bank's Atlas method classification.[6] The developed dummy takes the value of one if the country is classified as a high-income economy and zero if the country is classified as a

[6] http://data.worldbank.org/about/country-classifications

middle-income economy or lower. The list of all developed and developing countries is available in Appendix C.[7] Our alternative measure of country characteristic is 1980 per capital GDP from the World Bank's World Development Indicator (WDI) database. We chose the year 1980 to avoid reverse causality because our sample starts in 1988. In section 8's additional tests, we examine nine other alternatives for institutional variables -- Judiciary Efficiency, Rule of Law, Corruption, Accounting Standard from La Porta et. al (1998), 1980 Stock Market Capitalization per GDP from Rajan and Zingales (1998), Ease of Doing Business Rank from the World Bank's doing business indicator[8], investment sensitivity, share issue sensitivity, and debt issue sensitivity to Tobin's Q from McLean, Zhang, and Zhao (2012).

**4. Asset and Liability Structures**

In this section, we examine whether country-level characteristics or industry characteristics explain the financial structures of firms in different countries. In addition to regressing the firm characteristics on the developed country dummy variable, we include indicators for firm size and two industry classifications discussed above: whether the firm produces in an industry classified as manufacturing and whether it is in a high-tech industry. The manufacturing industry indicator picks up firms that are likely to have fixed assets that may serve as collateral. Similarly, firms in high-tech industries may be exposed to technological risks. Both may affect cash and the choice of financial structures. Our basic specification is:

$$Y_{i,t} = b_0 + b_1 \text{ Developed Country Dummy}_i + b_2 \text{ Manufacturing Dummy}_i + b_3 \text{ High-Tech Dummy}_i + b_4 \text{ Size Quintile}_{i,t} + \text{Year Fixed Effects} + e_{i,t}$$

The dependent variable $Y_i$ is a measure of firm i's assets and liabilities structures. Our Ys are firm size (natural log of total assets), cash/total assets, intangible assets/total assets, total liabilities/total assets, short-term liabilities/total liabilities, and short-term liabilities/current assets. Size Quintile is excluded in the regression where Y is firm size. The results are reported in Table 3.

[INSERT TABLE 3 HERE]

[7] We report the results using developed country dummy as the main country characteristic for several reasons. First, the coefficient on developed country dummy lends itself to easy interpretation. Especially for difference-in-difference analysis in section 6 and the reaction to shocks in section 7, the interaction terms between developed country dummy and other variables can be interpreted directly as a difference of slopes/sensitivities between two groups of population. Second, using the dummy illustrates that our findings are apparent even when we use a very broad measure of institutional differences.

[8] http://www.doingbusiness.org

We find that firms in developed countries hold more cash than firms in developing countries. In the Cash/Total Assets column, the coefficient on developed country dummy is estimated at 6.609. From Table 1 Panel B, the average cash-to-total-assets ratio is 17.32% globally. Therefore, the 6.609% difference is economically large.

Leverage is slightly lower in developed countries but debt maturity is much shorter in developing countries. In the Total Liabilities/Total Assets column, the coefficient on the developed country dummy is estimated at -1.874%. In the Short-Term Liabilities/Total Liabilities column, the coefficient on the developed country dummy is estimated at -12.384%. For comparison purposes, average leverage is 26.57% and average short-term liabilities ratio is 49.66% in Table 1 Panel B. So, firms in developing countries have much higher short-term liabilities relative to their total liabilities. In the Current Liabilities/Current Assets column, the coefficient on the developed country dummy is -12.183%, suggesting that firms in rich countries have more conservative liquidity positions.

Developed country firms are slightly larger than developing country firms in our sample. In the Size column, the coefficient on the developed country dummy is 0.047. As expected, firms in developed countries have more intangible assets relative to total assets. In the Intangible Assets/Total Assets column, the coefficient on the developed country dummy is estimated at 6.582%.

Next, we focus on the industry effects. We find that firms in manufacturing industries hold less cash, have higher leverage, and have more short-term debts. The high-tech dummy is equal to one if the firm is in the high-tech industry according to the American Electronic Association. High-tech firms can be found in various sectors, including high-tech manufacturing, engineering services, and software development. We find that firms in high-tech industries hold more cash and have lower leverage.

We include size quintile as a control variable. Size quintile is constructed based on the global distributions of a firm's total assets in USD in that year. We find that larger firms hold less cash, have lower leverage, and have fewer short-term liabilities, but more intangible assets.

Overall, our regression analysis show that firms in developed and developing countries have significantly different asset and liability structures. Although developed countries have better financial system and lower levels of country and industry risk, we find that firms in developed have more conservative financial policies (more cash, slightly lower leverage, and fewer short-term liabilities). We also find that, small firms, high-tech firms, and non-manufacturing firms also have more cash relative to their total assets.

**5. Firm-Level Risk**

In this section, we examine firm-level risk, both in cross-section and in time-series in developing and developed countries. We also examine the relation between firm-level, sector-level, and country level risk. Since we are exploring the relation between financial structures and risk we adopt a similar reduced form specification for both.

**5.1 Volatility**

We first estimate the following cross-sectional regressions:

$V_i = b_0 + b_1$ Developed Country Dummy $_i + b_2$ Manufacturing Dummy $_i + b_3$ High-Tech Dummy $_i + b_4$ Size Quintile $_i + e_i$

We define annual growth rate $G_{i,t}$ as $\ln(X_{i,t}) - \ln(X_{i,t-1})$ where X represents firm characteristics and performance. The firm-level volatility, $V_i$, is defined as the time-series standard deviation of the annual growth rate $G_{i,t}$, $\sqrt{\frac{\sum t(G\,i,t-\bar{G}\,i)^2}{n-1}}$, where n is the number of years in which the data on growth rate $G_{i,t}$ are available. $\bar{G}i$ is the average growth rate over the years. In each year, we divide firms into the size quintiles based on their total assets that year. Since we are estimating a cross-sectional regression, the variable Size Quintile is the time-series average of size quintiles across all years. Instead of studying risk using a single variable, we use the volatilities of eight variables. Our Xs include firm financial structures: total assets, cash, intangible assets, total liabilities, and short-term liabilities as well as other outcome variables: sales, profit, and employment. Using eight different variables ensures that our results are robust. Each variable has its own strengths and weaknesses. For example, volatility of profits is a more precise measure of firm performance variability but volatility of sales is less likely to be biased by earnings manipulation. The results are reported in Table 4.

[INSERT TABLE 4 HERE]

We find that firms in developed countries are more volatile than firms in developing countries. The coefficients on the developed country dummy are positive and significant in all columns, except the intangible assets'. The coefficients are estimated at 0.038 for sales, 0.073 for total assets, 0.024 for cash, 0.064 for profit, -0.149 for intangible assets, 0.096 for total liabilities, 0.161 for short-term liabilities, and 0.043 for employment. These numbers are large relative to the average volatilities. Across all the dependent variables, the magnitude of the coefficients on developing countries is around 10 to 20% of average volatilities in Table 2 Panel B.

We also find that firms in manufacturing industries are less volatile and firms in high-tech industries are more volatile. The coefficients on the Manufacturing Dummy are negative and significant in all columns. The manufacturing coefficients are estimated at -0.098 for sales, -0.12 for total assets, -0.136 for cash, -0.034 for profit, -0.084 for intangible assets, -0.155 for total liabilities, -0.179 for short-term liabilities, and -0.072 for employment. The coefficients on the high-tech dummy are positive and significant in most columns. The high-tech coefficients are estimated at 0.064 for sales, 0.1 for total assets, -0.01 for cash, 0.05 for profit, 0.113 for intangible assets, 0.211 for total liabilities, 0.169 for short-term liabilities, and 0.02 for employment. It is not surprising that we find higher volatilities in high-tech and lower volatilities in manufacturing industries. High-tech industries, such as software, computer, and biotech, are likely to experience higher degrees of innovation, uncertainty, and dynamism than manufacturing industries which include primitive industries such as food, textile, and other basic goods. The coefficients on size quintile are negative and significant in all columns. So, large firms are less volatile than small firms. This is consistent with the conjecture that smaller, and perhaps younger, firms are riskier.

In sum, our volatility results in Table 4 combined with our cash holding results in Table 3 support our conjecture that firms hold cash to accommodate real risk. From Table 3, firms in developed countries, firms in high-tech/non-manufacturing industries, and small firms have higher cash-to-total-assets ratios. From Table 4, firms in developed countries, firms in high-tech/non-manufacturing industries, and small firms also have higher volatilities.

**5.2 Cross-Sectional Dispersion**

Firm-level volatilities can be driven by both systematic and idiosyncratic components. Thus, firms may have high volatilities just because country-level fundamentals such as inflation are volatile. To test whether this is the case, we complement our volatilities results with cross-sectional dispersions results in this section. We estimate the following panel regressions.[9]

$C_{c,t} = b_0 + b_1$ Developed Country Dummy $_c$ + Year-Fixed Effects + $e_{c,t}$

As usual, we define annual growth rate $G_{i,t}$ as $\ln(X_{i,t}) - \ln(X_{i,t-1})$ where X is firm i's characteristics and performance. The country c's cross-sectional dispersion, $C_{c,t}$, is defined as the cross-sectional standard deviation of the $G_{i,t}$, $\sqrt{\frac{\sum i(G_{i,t} - \bar{G}_{c,t})^2}{n-1}}$ scaled by $\bar{G}c,t$. n is the number of firms in country c at time t in which the data on $G_{i,t}$ are available. $\bar{G}c,t$ is the average growth rate across all firms in country c in year t. The results are reported in Table 5.

[INSERT TABLE 5 HERE]

In Table 5, we find that dispersions of sales growth, assets growth, total debts growth, short-term liabilities growth, and employment growth are higher in developed countries. The coefficients on the developed country dummy are positive in all columns. The coefficients are estimated at 0.317 for sales, 0.256 for total assets, 0.244 for cash, 0.233 for profit, 0.04 for intangible assets, 0.368 for total liabilities, 0.46 for short-term liabilities, and 0.04 for employment. These results are similar to the volatilities results in Table 4.

**5.3 Sector- and Country-Level Volatilities**

We next examine aggregate risk in different countries. We estimate the sector- and country-level version of the following regression.

$V_s = b_0 + b_1$ Developed Country Dummy $_s + b_2$ Manufacturing Fraction $_s + b_3$ High-Tech Fraction $_s + e_s$

$V_c = b_0 + b_1$ Developed Country Dummy $_c + e_c$

[9] Another advantage of using cross-sectional dispersion as a dependent variable is that it is only one observation per country-year. So, all countries are given equal weights in the regressions. This ensures that our results in the previous sections are not just driven by observations from some large countries.

First, we average the firm-level growth rates within each sector s (based on 17 Fama-French industries) or within each country c. We then use the average to compute the sector-level volatilities, $V_s$, or country- level volatilities, $V_c$. Manufacturing Fraction is the fraction of firms in sector s that is a manufacturing firm. High-tech Fraction is the fraction of firms in sector s that is a high-tech firm. The results are reported in Table 6.

[INSERT TABLE 6 HERE]

From Table 6 Panel A, sector-level volatilities are lower in developed countries. The coefficients on the developed country dummy are negative in all columns. The coefficients are estimated at -0.056 for sales, -0.051 for total assets, -0.146 for cash, -0.086 or profit, -0.162 for intangible assets, -0.091 for total liabilities, -0.07 for short-term liabilities, and -0.01for employment. These results are opposite to the firm-level results in Table 4. We find that most coefficients on manufacturing fraction and high-tech fraction are insignificant.

From Table 6 Panel B, country-level volatilities are lower in developed countries. The coefficients on the developed country dummy are negative in all columns. The coefficients are estimated at -0.085 for sales, -0.083 for total assets, -0.1 for cash, -0.107 or profit, -0.294 for intangible assets, -0.15 for total liabilities, -0.158 for short-term liabilities, and -0.008 for employment. Again, these results are opposite to the firm-level results in Table 4.

In sum, while firm-level volatilities are higher in developed countries, we find that the sector- and country-level volatilities are higher in developing countries. These findings are consistent with the widely-accepted view that developing economies are less stable.[10]

**5.4 Competition and Firm-Level Risk**

In this section, we provide an example of the sources of firm-level risk. We hypothesize that product market competition is a key factor driving operating risk. To illustrate this point, we use foreign entry as a proxy for competition and examine how foreign entry affects firm-level volatilities. We augment the basic specification in Table 4 with a new variable, foreign entry. Foreign entry is measured by sector-level inward cross-border M&As. Sectors are defined as 17 Fama-French industries. For each sector in each country, we construct foreign entry by aggregating all inward cross-border M&As and scaling them by all (domestic and inward foreign) M&As. Our sample covers all deals announced and completed from SDC. To avoid reverse causality, the measure of foreign entry is computed from 1989-1998 data while the firm-level volatilities are computed from the non-overlapping period of 1999-2008 (as opposed to the full 1989-2008 sample in other specifications). To ensure that foreign entry does not pick up time-invariant industry characteristics, we also control for the initial volatilities. Initial volatilities are the sector averages of firm-level volatilities computed from 1989-1998 data. The results are reported in Table 7 Panel A.

[INSERT TABLE 7 HERE]

[10] See Lucas (1988), Acemoglu, Johnson, Robinson, and Thaicharoen (2003), Prasad, Rogoff, Wei, and Kose (2006), Aguiar and Gopinath (2007), and Koren and Tenreyro (2007).

We find that the coefficients on foreign entry are positive and significant for all variables (except profit).[11] This means that industries with more foreign entries through cross-border M&As later experience higher firm-level risk. The coefficients on foreign entry are estimated at 0.086 for sales, 0.078 for total assets, 0.161 for cash, -0.063 for profit, 0.124 for intangible assets, 0.129 for total liabilities, 0.171 for short-term liabilities, and 0.046 for employment. For comparison purposes, the average foreign entry is 42% in our sample. The sector with the highest average foreign entry is Machinery (56%) and the sector with the lowest foreign entry is Chemicals (51%).[12] The coefficients on developed country, tradable, high-tech dummies, and size quintile have similar signs as the baseline estimates in Table 4.

One may argue that our foreign entry measure captures something other than the effect of competition, such as market liberalization in certain countries or globalization of supply chains in certain sectors. To address this concern, we replace foreign entry with foreign outflow as a placebo test. Foreign outflow is defined as the aggregate the volume of all outward cross-border M&As scaled by the volume of all (domestic and inward foreign) M&As. The sector with the highest average foreign outflow is Machinery (61%) and the sector with the lowest foreign inflow is Retail (32%). While foreign entry and foreign outflow are positively correlated (34% correlation), the two have very different implications for domestic competition and risk of local firms. The results are reported in Table 7 Panel B. We find that most coefficients on foreign outflow are insignificant. The magnitudes of the outflow coefficients are much smaller than those of the foreign entry.

**6. What Drives Firm-Level Volatilities?**

In this section, we examine whether cross-country difference in firm-level risk is more pronounced in firms and industries more subject to imperfections in financial markets. We propose that idiosyncratic risk is likely to be influenced by capital market imperfections as these imperfections can insulate incumbent firms from risk. Some countries have economic institutions to alleviate these imperfections but others do not. Therefore, we hypothesize that the cross-country difference in risk is more pronounced in technology-intensive, external-finance-dependent, and large-firm-dominated industries where we expect higher degrees of market imperfections. Following the difference-in-difference methodology in Rajan and Zingales (1998), we estimate the following regression.

$V_i = b_0 + b_1$ Developed Country Dummy $_i + b_2$ Industry Indicator $_i + b_3$ Developed Country Dummy $_i$ x Industry Indicator $_i + b_4$ Size Quintile $_i + e_i$

Industry indicators are high-tech dummy, external finance score from Rajan and Zingales (1998), and small firm industry score from Beck, Demirguc-Kunt, Laeven, and Levine (2008). The results are reported in Table 8.

[INSERT TABLE 8 HERE]

[11] A possible explanation for a negative coefficient on profit is that a local firm's profitability tends to decline after foreign firms enter.

[12] Utilities and financial services have lower inflow but they are excluded from our sample.

### 6.1 Technology

Technology intensive industries tend to be heavily affected by market imperfections. For example, stock holders, creditors, and potential buyers in the market for corporate assets tend to be much less informed about a high-tech firm than the insiders. Such imperfections can prevent small firms from expanding and prevent new firms from entering. Therefore, firm-level risk will be lower for high-tech incumbents in a country without good institutions to overcome the information problems. The cross-country difference in firm-level risk should be more pronounced in industries with higher degrees of product and capital market imperfections.

Table 8 Panel A confirms that firms in developed countries and small firms are more volatile. The coefficients on the developed country dummy are positive and significant in all columns, except the intangible assets'. The coefficients on size quintile are negative and significant in all columns. Their magnitudes are in line with those of the base-line models in Table 4.

The key parameters here are the coefficients on the interaction terms between the developed country and high-tech dummies. We find that the interaction coefficients are all positive. The coefficients are estimated at 0.056 for sales, 0.085 for total assets, 0.078 for cash, 0.077 for profit, 0.142 for intangible assets, 0.106 for total liabilities, 0.104 for short-term liabilities, and 0.021 for employment. This means that the volatility difference between developed and developing countries is consistently larger in high-tech industries.

The positive interaction coefficients suggest that poor institutions in developing countries can shield incumbent firms from risk. These interaction terms can be interpreted as second derivatives. For example, in low-tech industries, sales volatilities in rich countries is 0.041 higher than sales volatilities in poor countries, while in high-tech industries, sales volatilities in rich countries is 0.097 (=0.041+0.056) higher than sales volatilities in poor countries. The interaction coefficient of 0.056 is economically large, compared to average sales volatilities of 0.419 from Table 2 Panel B.

### 6.2 External Finance Dependency

A prime example of market imperfections is financial constraints. Firms in financially dependent industries in developing countries may not be able to raise the optimal amount of external capital to compete with rival firms. The effect of this may be to lower cash flow risk in those industries

To examine whether financially dependent firms in developing countries are less risky, we adopt the external finance dependency score from Rajan and Zingales (1998). The score is constructed from external financing usage of listed firms in the United States during the 1980s which is non-overlapped with our sample. Given that capital markets in the US are highly developed, Rajan and Zingales suggest that their score can be considered the natural demand for external funds. For example, the least external dependent industry is tobacco (score = -0.45) and the most external dependent industry is drugs (score = 1.49). The major disadvantage of using this score is that the

scores are only available for each of the 36 ISIC manufacturing industries. The number of observations in external dependency regressions is about 50% of what we have in Table 8 Panel A.

The results on external finance are reported in Table 8 Panel B. As in to Table 8 Panel A, the results here confirm that firms in developed countries and small firms are more volatile. The coefficients on size quintile are negative and significant in all columns. The coefficients on the developed country dummy are generally positive. However, the magnitude and significance are smaller than those of the base-line models in Table 4.

The coefficients on the interactions between the developed country dummy and external finance dependency are positive and statistically significant in all columns. The interaction coefficients are estimated at 0.159 for sales, 0.155 for total assets, 0.078 for cash, 0.188 for profit, 0.181 for intangible assets, 0.254 for total liabilities, 0.228 for short-term liabilities, and 0.037 for employment. This means that the volatility difference between developed and developing countries is consistently greater in external finance dependent industries.

To get a sense of the magnitude, we will follow the example in Rajan and Zingales (1998). Machinery is the industry at the 75th percentile financial dependency (score = 0.45). Beverages is the industry at the 25th percentile dependency (score 0.08). In developing countries, sales volatilities in machinery is 0.0244 = 0.066 x (0.45-0.08) higher than sales volatilities in beverages. In developed countries, sales volatilities in machinery is 0.083 = (0.066+0.159) x (0.45-0.08) higher than sales volatilities in beverages. From Table 2 Panel B, the average sales volatility is 0.419. So, the interaction effect is economically significant.

The positive interaction coefficients are consistent with the notion that underdeveloped capital markets can reduce risk for incumbent firms. In developing countries where small firms and potential entrants face severe financial constraints, existing firms in industries that require a large amount of external finance face lower competition.

**6.3 Small Firm Dominance**

We expect that the effect of financial and institutional development on the intensity of competition to differ across industries. Industries that require economies of scale and have a large optimal firm size are more likely to be affected by poor institutions. By contrast, industries with small firms are likely to be well served by financial and legal systems even in developing countries.

Beck, Demirguc-Kunt, Laeven, and Levine (2008) suggest that certain industries may have a larger share of small firms for technological reasons. We adopt their small-firm-share score. The score is defined as the share of industry's employment by firms with less than 20 employees based on the 1992 United States Census data. Given that institutions in the U.S. are highly developed and that there are few policy distortions, Beck et.al suggest that their scores are based on the natural size distribution of firms. For example, the industries with the least small firm share are paper manufacturing (score = 0.14) and tobacco (score = 0.3). The industries with the highest small firms share is wood (score = 21.37)

The results on small firm industries are reported in Table 8 Panel C. Similar to Table 8 Panel B, the number of observations in small firm dominance regressions is about 50% of what we have in Table 8 Panel A.

The coefficients on the interactions between the developed country dummy and small firm industry are negative in all columns. The interaction coefficients are estimated at -0.01 for sales, -0.01 for total assets, -0.006 for cash, -0.003 for profit, -0.008 for intangible assets, -0.014 for total liabilities, -0.012 for short-term liabilities, and -0.003 for employment. (However, the interactions on cash, profit, and employment are not statistically significant.) This means that the volatility difference between developed and developing countries is generally greater in large-firm dominated industries.

To get a sense of the magnitude, we examine the furniture industry, which is at the 75th percentile small firm share (score = 9.09), and the spinning industry, which is the industry at the 25th percentile small firm share (score 1.91). In developing countries, sales volatilities in furniture is 0.007 = 0.001 x (9.09-1.91) lower than sales volatilities in spinning. In developed countries, sales volatilities in furniture is 0.079 = (0.001+0.01) x (9.09 -1.91) higher than sales volatilities in spinning. From Table 2 Panel B, the average sales volatility is 0.419. So, the interaction effect is economically significant.

The negative interaction coefficients imply that, in developing countries where new entrants suffer more from poor institutions, existing firms in large-firm industries face lower risk. This is consistent with our results on financial dependence since there is a negative correlation between small firm share and external finance dependency and a negative correlation between small firm share and the high-tech dummy in our sample. Small firm industries tend to require less external financing and have lower technological intensity.

In sum, the cross-country difference in firm-level volatilities is more pronounced in industries with real and financial market imperfections. Under the Rajan-Zingales framework, the difference in firm-level volatilities between developed and developing countries is more pronounced in technology-intensive, financial-dependent, and large-firm-dominated industries.

**6.4 Market Imperfections and Product Market Competition**

In this section we provide more direct evidence of a channel through which ease of access to financial markets and industry characteristics affect firm volatility. We show that high technology industries, industries that are dependent on external financing, and small firm dominated industries exhibit relatively less product market competition in developing countries than in developed countries. This is consistent with the hypothesis that financial market frictions slow the allocation of resources and thereby our measure of product market competition is market share volatilities of industry leaders.[13]

[13] Comin and Phillipon (2005) also use this indicator to measure changes in product market intensity in developed countries over time.

By construction, market share captures the rivalry effect – one firm's market share always grows at the expense of others'. We focus on the industry leaders because the coverage of WorldScope and other international databases varies over time. Studying the market share of the largest firms helps us mitigate the effects of such changes in data coverage. In each year, we identify the largest two firms in a four-digit SIC industry in each country. Then, we track the size of these largest two firms over the next five years and compute the volatilities of market share based on total assets of these two firms.

$V_{i,t} = b_0 + b_1$ Developed Country Dummy $_i + b_2$ Industry Indicator $_i + b_3$ Developed Country Dummy $_i$ x Industry Indicator $_i + b_4$ Year $_t + e_{i,t}$

$V_{i,t}$ is the market share volatility of the largest firm in year t. Market share is defined as Total Assets of the Largest Firm/ (Total Assets of the Largest Firm+ Total Assets of the Second Largest Firm). $V_{i,t}$ is computed from the market share from year t to t+5. We regress market share volatilities, $V_{i,t}$, on developed country dummy, industry indicators (high-tech, external finance, and small firm industries), and the interactions between developed country dummy and industry indicators. Since our sample consists of only the largest firms which generally have complete historical data, we are able to include year as an explanatory variable to examine how these volatilities evolve over time.

To ensure that our results are robust to the way we calculate market share volatilities, we also use market shares among the top five firms (Total Assets of the Largest Firm/ (Sum of Total Assets of the Largest Five Firms)) instead of the top two firms. The results are reported in Table 8 Panel D. The first three columns report the results from the top two firms' market shares. The last three columns report the results from the top five firms' market shares.

We find that market shares are less volatile in developing countries. The reduction is the greatest in high-tech, in financially dependent industries, and in industries that dominated by large firms. We also find that volatilities increase over time.

**7. Reaction to Shocks**

In this section, we connect cross-country difference in financial structure in Section 4 to the underlying firm-level risk in Section 5 by examining how firms in developed and developing countries react to real shocks to industry productivity. Following Wurgler (2000), we define productivity shocks as the percentage growth in value added.

We construct our measure of productivity from the UNIDO Database. Wurgler (2000) studies the relationship between growth in capital formation and growth in value added at the three-digit ISIC level (28 manufacturing industries However, UNIDO recently published a more detailed dataset (INDOSTAT-4 2011) at the four-digit ISIC level (127 manufacturing industries). So, we define our productivity shocks at the four-digit ISIC level.[14]

[14] Our matching procedure is as follows. First, we compute productivity shocks for each 4-digit ISIC industry. Then, we match each firm to the appropriate ISIC industry (or industries) based on its 4-digit SIC code. Given that

There are several advantages to using productivity shocks from UNIDO. First, the reverse causality problem will be less severe. Compared to Tobin's Q or cash flow shocks at the firm level, UNIDO shocks are more exogenous. It is obvious that changes in a firm's financial policies can affect its own cash flow and Tobin's Q. UNIDO data come from surveys and registries which cover both public and private firms both inside and outside of our WorldScope sample. So, it is less likely that financial policies of one individual firm will affect our value added measure. Second, since our paper focuses on firm-level risk, studying the reaction to micro shocks will be more relevant than studying the reaction to macro shocks. Unlike shocks to GDP or stock market indices which are the same to all firms in a country, there are 127 shocks for manufacturing firms in UNIDO.

Our regression is as follows:

$G_{i,t} = b_0 + b_1$ Productivity Shock $_{i,t} + b_2$ Developed Country Dummy $_i$ x Productivity Shock $_{i,t}$ + Firm Fixed Effects + $e_{i,t}$

We define annual growth rate $G_{i,t}$ as $\ln(X_{i,t}) - \ln(X_{i,t-1})$ where X represents the following firm characteristics and performance: assets, cash holdings, current assets, intangible assets, total liabilities, short-term liabilities, sales, profit, and employment. Since we focus on the coefficient of interaction term $b_2$, we include firm-fixed effects to absorb other country and industry characteristics.

[INSERT TABLE 9 HERE]

Table 9 reports the regression results. We find that firms in developed countries are more responsive to exogenous real shocks. All the coefficients on productivity shocks are positive and significant. The coefficient $b_1$ can be interpreted as developing country firm's sensitivity to productivity shocks. For example, if value added changes by 1%, firms in developing countries will experience 0.123% change in sales, 0.09% change in assets, 0.128% change in cash, 0.216% change in profits, 0.094% change in intangible assets, 0.056% change in total debts, 0.081% change in short-term debts, and 0.06% change in employment. All interaction coefficients except the one in the employment regression[15] are positive, which suggests that firms in developed countries are more responsive to shocks. The sum of coefficients $b_1$ and $b_2$ can be interpreted as a developed country firm's sensitivity to

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the 4-digit SIC to 4-digit ISIC correspondence is not one-to-one, we use the average productivity shocks across all corresponding ISICs when there is more than one ISIC assigned to one 4-digit SIC. The limitation of UNIDO is that it only covers some manufacturing industries. We can only use about 30% of our firm-year observations in this section.

[15] Productivity shocks have ambiguous impacts on employment. If productivity increases come from improvement in production technology, firms may employ fewer workers to produce the same or higher levels of outputs. On the other hand, if increases in productivity come from higher demands, firms may have to employ more workers in order to meet the needs.

productivity shocks. If value added changes by 1%, firm in developed countries will experience 0.264 (= 0.123+0.141) % change in sales, 0.24 (= 0.09+0.15)% change in assets, 0.383 (= 0.128+0.255) % change in cash, 0.47 (= 0.216+0.254) % change in profits, 0.244 (= 0.094+0.15) % change in intangible assets, 0.164 (= 0.056+0.108) % change in total debts, 0.158 (= 0.081+0.077) % change in short-term debts, and 0.053 (= 0.06-0.007) % change in employment.

Across all types of assets and liabilities, most of the adjustments (the largest $b_1$ and $b_2$) come from cash balance. This result suggests that firms hold cash to accommodate their firm-level risk. Firms use cash as a buffer asset. During expansion periods, firms accumulate cash. During contraction periods, firms mitigate bad shocks by spending cash disproportionately. This is also consistent with the finding in Sections 4 and 5 that firms in developed countries face higher risk and hence hold more cash. Theoretically, firms can borrow more (especially short-term) to mitigate bad shocks instead of using cash. We do not find such evidence in our manufacturing firm sample. Both total and short-term debts respond positively to productivity shocks. In other words, debt is mostly used to finance growth rather than to relieve financial distress.

In sum, we show that firms in developed countries are more responsive to shocks. Across all types of assets and liabilities, most of the adjustments come from cash balance. Our results suggest that operating risk is an important determinant of a firm's financial policies.

## 8. Additional Tests

### 8.1 Industry Analysis for Cash Holdings

In this section, we examine whether cash holdings are consistent with our findings on firm-level risk. We regress cash ratio (cash holding scaled by total assets) on dependent variables similar to those in Tables 7 Panels A-B and 8 Panels A-C. Since we have a panel dataset on cash ratios, the year fixed effects are included in all regressions. The results are reported in Table 10.

We find that the cross-country differences in cash holdings are more pronounced in high-tech, external-finance-dependent, and large-firm-dominated industries. Firms in sectors with more foreign entries during 1989-1998 hold slightly more cash after 1999 while firms in sectors with more foreign outflows during 1989-1998 hold less cash after 1999. These results are consistent with the notion that cash ratios are chosen to accommodate firm-level risk.

[INSERT TABLE 10 HERE]

In the first column, the interaction term between the developed country and the high-tech dummy is positive and significant. This means that the cash ratio differences between developed and developing countries are larger in high-tech industries. Consistent with results in section 4, we find that firms in developed countries, high-tech industries, and small firms hold more cash.

In the second column, the interaction term between the developed country dummy and the external finance dependency score is positive and significant. In the third column, the interaction term between the developed

country dummy and the small firm dominance score is negative and significant. These results suggest that the cross-country difference in cash ratio is larger in external-finance-dependent and large-firm-dominated industries.

In the fourth and fifth columns, we restrict our sample to cash ratios in after 1999 since our foreign inflow and outflow measured are constructed during 1989-1998. We find that the coefficient on foreign inflow is positive and significant. Foreign inflow raises cash holding while foreign outflow lowers cash holding in the next decade. Consistent with results in section 4, we find that firms in developed countries, high-tech industries, and small firms hold more cash. Firms in manufacturing industries hold less cash.

In sum, our difference-in-difference analysis for cash holdings yields results consistent with the difference-in-difference analysis for firm-level risk.

**8.2 Alternative Measures for Country Characteristics**

Institutions in developing and developed countries differ on many dimensions, only some of them relevant to financial markets. In this section we examine whether our results are driven by institutional differences which have been found to be associated with a well-functioning financial market. In particular, as shown by Wurgler (2000), there exist major differences in the response of corporate investment and financing to market signal across countries. We investigate whether there is a relation between the responsiveness to market signals in an economy and the riskiness of the firms' cash flows, and cash holdings. We do this directly, using measures developed by McLean, Zhang, and Zhao (2012). They argue that investment and external finance in countries with better institution increase more strongly with Tobin's Q which captures investment opportunities. They provide country-level estimates of the sensitivity of investment, share issuances and debt issuances to Tobin's Q as a measure of inter-firm resource allocation efficiency. However, since these sensitivities may itself be endogenous, and depend on product market characteristics in different economies, we also consider six additional institutional variables found to be associated with efficient financial systems: Judiciary Efficiency, Rule of Law, Corruption, Accounting Standard from La Porta et. al (1998), 1980 Log of Per Capita GDP from World Development Indicator Database, 1980 Stock Market Capitalization per GDP from Rajan and Zingales (1998), and a direct measure of the cost of competing in each country- the Ease of Doing Business Rank from the World Bank's doing business indicator.

[INSERT TABLE 11 HERE]

First, we estimate the effects of institutional variables on cash holding by replacing developed country dummy in section 4 with institutional variables. The results are reported in Table 11 Panel A.

We confirm that firms in countries with better institutions hold more cash. The coefficients on institutional variables are estimated at -0.068 for Ease of Doing Business Rank[16], 1.697 for Judiciary Efficiency, 1.715 for Rule of Law, 1.624 for Corruption, 0.122 for Accounting Standard, 1.87 for Log of Per Capita GDP in 1980, 4.466 for

[16] Lower rank means better institution.

Stock Market Capitalization/GDP in 1980, 27.77 for Investment-Q Sensitivity, 10.31 for Share Issue-Q Sensitivity, and 9.32 for Debt Issue-Q Sensitivity. All coefficients are statistically significant at the 1% level. These estimates imply that one standard deviation improvement in institutional variables is associated with an increase in cash-to-total-assets by 3.18% for Ease of Doing Business Rank, 3.68% for Judiciary Efficiency, 4.26% for Rule of Law, 3.63% for Corruption, 2.27% for Accounting Standard, 2.49% for Log of Per Capita GDP in 1980, 1.52% for Stock Market Capitalization/GDP in 1980, 1.36% for Investment-Q Sensitivity, 1.72% for Share Issue-Q Sensitivity, and 1.87% for Debt Issue-Q Sensitivity. The coefficients on other control variables are similar to the ones in the regressions with the developed country dummy.

Next, we estimate the effects of institutional variables on firm-level risk. We use sales growth volatility as a proxy for firm-level risk, $V_i$. (In unreported regressions, volatilities of other variables yield qualitatively similar results.) We replace developed country dummy in section 5.1 with institutional variables. The results are reported in Table 11 Panel B.

We confirm that firms in countries with better institutions have higher volatilities. The coefficients on institutional variables are estimated at -0.001 for Ease of Doing Business Rank, 0.014 for Judiciary Efficiency, 0.03 for Rule of Law, 0.025 for Corruption, 0.004 for Accounting Standard, 0.027 for Log of Per Capita GDP in 1980, 0.115 for Stock Market Capitalization/GDP in 1980, 1.98 for Investment-Q Sensitivity, 0.57 for Share Issue-Q Sensitivity, and 0.43 for Debt Issue-Q Sensitivity. All coefficients are statistically significant at the 1% level. These estimates imply that one standard deviation improvement in institutional variables is associated with an increase in sales growth volatility by 0.047 for Ease of Doing Business Rank, 0.03 for Judiciary Efficiency, 0.075 for Rule of Law, 0.056 for Corruption, 0.074 for Accounting Standard, 0.067 for Log of Per Capita GDP in 1980, 0.039 for Stock Market Capitalization/GDP in 1980, 0.1 for Investment-Q Sensitivity, 0.097 for Share Issue-Q Sensitivity, and 0.088 for Debt Issue-Q Sensitivity. The coefficients on other control variables are similar to the ones in the regressions with the developed country dummy.

When compared across measures, Rule of Law yields the highest R-squared and t statistic in the cash holding regressions. Resource allocation efficiency yields the highest R-squared and t statistic in the volatility regressions. However, the estimates are comparable for all institutional variables. These results suggest that real and financial market imperfections tend to be correlated with allocative inefficiency. It is likely that both types of imperfections lead to less cash and lower firm-level risk.

**8.3 Effects of Volatilities on Cash Holding**

We next examine the relation between cash holding and firm-level risk directly. One of the reasons that firms hold cash is to respond to unforeseen operating cash flow shortfalls. For the U.S., existing literature has provided evidence for this precautionary demand for cash by showing a positive relation between firms' cash holdings and the cash flow volatility of the industry in which the firm operates. A generalization would suggest that firms in developing countries should hold more cash. This is not the case, as seen above. Lower cash holdings in developing countries might suggest that either the precautionary demand theory of demand for cash is not robust, or

that other factors, such as differences in agency costs are sufficiently great to overcome the effect of higher operating risks. We consider another possibility: that the precautionary demand theory of cash holdings is correct but that the natural estimates of the risks facing the firm are confounded by the inverse relation between firm and industry cash flow risk across the world.

[INSERT TABLE 12 HERE]

In Table 12 Panel A, we augment our cash holding regressions in section 4 with different measures of volatilities: country-level aggregate volatility, sector-level aggregate volatility, and firm-level volatility. Country-level volatility is defined as the standard deviation of average sales growth in one country. Sector-level volatility is defined as the standard deviation of average sales growth in one sector.[17] These definitions come from section 5. Firm-level volatility is defined as the standard deviation of firm-level sales growth. To alleviate the endogeneity problem, we average firm-level volatilities across all firms in one sector before including them in a regression.

In the first two columns, we restrict the sample to firms in the U.S. for comparison purposes. In other columns, we use the full sample of international firms. In Column 1, the coefficient on sector-level volatility is estimated at 5.63 with the t statistic of 2.07. In Column 2, the coefficient on firm-level volatility is estimated at 29.17 with the t statistic of 45.28. These results show that sector- and firm-level volatilities lead to more cash holding in the U.S. and that firm-level volatility has a larger impact on cash holding.

In the next two columns, we use country- and sector-level aggregate volatilities as proxies for risk in cross-country regressions. In the third column, the coefficient on country-level aggregate volatility is estimated at -3.99. In the fourth column, the coefficient on sector-level volatility is estimated at -2.18. These negative coefficients imply that firms in countries and sectors with higher aggregate volatilities appear to hold less cash. We argue that these counter-intuitive results arise because countries with low aggregate volatilities generally have higher firm-level risk.

In the fifth column, we use firm-level volatility as a proxy for risk. The coefficient on firm-level volatility is estimated at 10.1 with the t-statistic of 56.04. This confirms that the cross-country (inverse) relationship between aggregate and firm-level risk drives the results in Columns 3 and 4.

Finally, we address the concern that volatilities and cash holding are computed from the same time period by splitting the sample in half. Then, we compute the firm-level volatilities from the data from 1989-1998 and use the sample to cash ratios from the non-overlapping period of 1999-2008 for the regressions. The result is reported in Column 6. The coefficient on non-overlapping firm-level volatility is still significant at the 1% level.

In sum, Table 12 Panel A highlights that the distinction between aggregate- and firm-level risks has a crucial implication for the study of international cash holding. Sector- and country-level volatilities should not be used as a proxy for firm-level risk in the cross-country context. The misspecification not only underestimate the effect of risk

[17] Sectors are defined as the 17 Fama-French industries in one country.

on cash holding but the negative correlations between aggregate and firm-level volatilities also lead to a coefficient with the wrong sign.

In Table 12 Panel B, we add the firm characteristics to the cash holding regressions with firm-level volatilities.

Following prior literature on the determinants of cash holding, we include lagged Leverage, Dividend Dummy, Capital Expenditure/Total Assets, Acquisitions/Total Assets, R&D/Total Assets, and Tobin's Q as explanatory variables. All additional data are from the WorldScope. We find that firms with lower leverage, dividend, capital expenditure, and acquisition hold more cash. Firms with more R&D and higher Tobin's Q hold more cash. The signs and magnitudes of the coefficients on firm characteristics are consistent with prior work. The coefficients on firm-level volatility, developed country dummy, high-tech dummy, manufacturing dummy, and size quintile remain large and statistically significant at 1% level. Firm characteristic that has the largest impact on cash holding is R&D intensity. Clearly, R&D may capture the effects of firm-level risk itself.

Table 12 Panel B confirms that firm-level volatility is an important determinant of cash holding. Even after we control for the arguably endogenous firm-level variables, firm-level volatility constructed at the sector level is still statistically significant.

**8.4 Alternative Explanations**

While our explanation of international cash holding is not mutually exclusive with transaction demand explanation (Pinkowitz, Stulz, and Williamson, 2003) and political extraction explanation (Caprio, Faccio, and McConnell, 2012), it is unlikely that our results will be subsumed by alternative stories. First, if facilitating business transaction is the primary reason why a firm holds cash, we should observe that cash holdings decline over time. Technological improvement in financial service industries should allow business transactions to be completed more efficiently. So, firms do not have to hold a large cash balance. However, we find no evidence that cash holdings decline over time. Second, compared to manufacturing firms whose output can be exported overseas, non-manufacturing firms (such as transportation and telecommunication) are more likely to be involved with domestic governments. Non-manufacturing firms are also more likely to rely on government services and be subjected to government regulations. Therefore, these firms should be more likely to be affected by political rent extraction. However, we find that non-manufacturing firms hold more cash, compared to manufacturing firms.

One concern might be that our cross-country variation in cash holding is driven by interest rate differentials between developed and developing countries. However, cost of capital alone is not the overriding determinant of cash holding. We find that small firms and firms in external finance dependent industries hold more cash even though these firms are likely to face the highest cost of capital. This result is more consistent with our operating risk explanation. To test this further, we explicitly include lending rates and interest rate spreads from the World Development Indicator Database in all regressions from Tables 3 and 4. We find that firms in low-interest-rate countries have more cash, more current assets, more current liabilities, and slightly higher firm-level risk. However,

the magnitude and significance of other coefficients remain largely unchanged. We also find a negative correlation between per capita GDP and lending rate (-10%). This finding supports the notion that the lending rate itself can be considered a financial development indicator. (For instance, a narrow lending spread means the banking sector is well-functioning. Countries that allow free capital flow are likely to have a lower risk free rate.) Low interest rates may encourage entries and facilitates competitions among incumbents. So, firms in low-interest-rate countries have to hold more cash to accommodate product market risks.

Dittmar, Mahrt-Smith, and Servaes (2003) document that firms in countries with poorer shareholder right protection tend to hold more cash. To verify that our results are not confounded with shareholder protection, we include shareholder protection index from La Porta et. al (1998) in all regressions from Tables 3 and 4. We find that all our existing coefficients remain highly significant. Interestingly, our results that firms in developed countries hold more cash are not in direct conflict with Dittmar et.al (2003)'s results that firms in poorer governance countries hold more cash. In fact, we find that the correlations between shareholder protection and developed country dummies as well as the correlations between shareholder protection and other institutional indictors are low or negative. For example, some developed countries such as Denmark, Germany, and Switzerland are classified as low shareholder right countries while some developing countries such as Colombia and India are classified as high shareholder right countries.

Taxes in different countries may affect financial structures and firm's attitude towards risk. For example, Caprio, Faccio, and McConnell (2012) suggest in their robustness section that foreign investors from high-tax countries may want firms in low tax countries to hold a large amount of cash to avoid repatriation taxes. Therefore, we control for corporate tax rates explicitly in all regressions from Tables 3 and 4. The data on tax rates are from KPMG Corporate Tax Survey. First, we find that on average developed countries have higher corporate tax rates than developing countries. The correlation between per capita GDP and tax rate is positive (29%). Second, we find that firms in high-tax countries hold more cash. We also find that firms in high-tax countries have slightly higher leverage. Third, firms in high-tax countries have slightly higher volatilities, compared to firms in low-tax countries. Thus, we find no evidence that our findings are driven by tax considerations.

**9. Conclusion**

While developing economies are more volatile, several authors show that firms in developed countries hold more cash. In this paper, we propose a new explanation for this relation.

We find that performance and characteristics of individual firms in developed countries are more volatile despite the fact that sector- and country-level averages are less volatile in developed countries.

Idiosyncratic risk is likely to be influenced by imperfections in product and capital markets as these imperfections can insulate incumbent firms from risk because they reduce the ability of competitors to take contest product markets by aggressive investment. We find that cross-country difference in firm-level volatilities and the intensity of product market competition are more pronounced in technology-intensive, financial-dependent, and large-firm-

dominated industries. These are the industries where we expect the higher level of market imperfections in developing countries. Consistent with this, entry into markets by foreign competitors is associated with increased volatility.

Finally, we link cross-country difference in financial structure to the underlying firm-level risk by examining how firms react to real shocks. We find that firms in developed countries are more responsive to exogenous real shocks. Across all types of assets and liabilities, most of the adjustments come from cash balances.

The differences between firm level and industry level operating risk in developing and developed countries have economically significant implications for cash policy. In the U.S. there is a clear positive relation between industry volatility and cash holdings. However, when this relation is estimated across the world, there appears to be a negative significant relationship. We show that this can be explained by an inverse relation between industry and firm operating risk across countries. When we focus on firm-level operating risk we establish a consistent positive relation between risk and cash holdings across the world, consistent with precautionary motives for holding cash.

Our results have implications for the understanding of comparative volatilities and international financial structure. Prior studies have, almost unanimously, shown that aggregate volatility is greater in the developing world. Paradoxically, we find that firm-level risk in developing countries is lower, even though the industry and macro-risks in those countries are higher. Thus, the differences in the firms' financial policies across countries are not only a direct effect of differences in access to financial markets, but also occur because firms in those countries, especially firms in financially dependent industries, face lower operating risk as an indirect result of financial imperfections.

More broadly, we show that the cross-country difference in cash flow risk is an important factor that must be taken into consideration in order to understand the effects of institutional factors such as agency costs, taxes, and capital market development. Our results suggest that as economic institutions in developing countries strengthen, there will be increases in firm-level operating volatility, putting additional pressure on corporate governance in these countries, and requiring adjustments to financial policies and governance structures.

**References**


Acemoglu, D., Johnson, S., Robinson, J., Thaicharoen, Y., 2003, Institutional causes, macroeconomic symptoms, volatility, crises and growth, *Journal of Monetary Economics* 50, 49–123.

Aguiar, Mark, and Gita Gopinath, 2005, Fire-sale foreign direct investment and liquidity crises, *Review of Economics and Statistics* 87, 439–452.

Aguiar, Mark, and Gita Gopinath, 2007, Emerging market business cycles: The cycle is the trend, *Journal of Political Economy*, 115, 69-102.

Bartram, Söhnke M., Gregory Brown, and René M. Stulz, 2011, Why are U.S. stocks more volatile?, Working paper, The Ohio State University.

Beck, Thorsten, Asli Demirguc-Kunt, Luc Laeven, and Ross Levine, 2008, Finance, firm size, and growth, *Journal of Money, Credit and Banking* 40, 1380-1405.

Booth, Laurence, Varouj Aivazian, Asli Demirguc-Kunt, and Vojislav Maksimovic, 2001, Capital structures in developing countries, *Journal of Finance* LVI, 87-130.

Braun, M., and Larrain, B., 2005. Finance and the business cycle: international inter-industry evidence, *Journal of Finance* 60, 1097–1128.

Caprio, Lorenzo, Mara Faccio, and John J. McConnell, 2011, Sheltering corporate assets from political extraction, *Journal of Law, Economics, & Organization*, 1-23.

Comin, Diego, and Thomas Philippon, 2005, The rise in firm-level volatility: Causes and consequences, *NBER Macroeconomics Annual* 20, 167-201.

Demirguc-Kunt, Asli, and Vojislav Maksimovic, 1996, Stock market development and financing choices of firms, *The World Bank Economic Review* 10, 341-369.

Demirguc-Kunt, Asli, and Vojislav Maksimovic, 1998, Law, finance, and firm growth, *Journal of Finance* LIII, 2107-2137.

Demirguc-Kunt, Asli, and Vojislav Maksimovic, 1999, Institutions, financial markets, and firm debt maturity, *Journal of Financial Economics* 54, 295-336.

Dittmar, Amy, and Ran Duchin, 2012, The Concentration of Cash: Cash Policies of the Richest Firms, Working Paper, University of Michigan.

Dittmar, Amy, Jan Mahrt-Smith, and Henri Servaes, 2003, International corporate governance and corporate cash holdings, *Journal of Financial and Quantitative Analysis* 38, 111-133.

Fan, Joseph P.H., Sheridan Titman, and Garry Twite, An international comparison of capital structure and debt maturity choices, *Journal of Financial and Quantitative Analysis.*

Gaiannetti, Mariassunta, 2003, Do better institutions mitigate agency problems? Evidence from corporate finance choices, *Journal of Financial and Quantitative Analysis* 38, 185-212.

Gupta, N., 2005, Partial privatization and firm performance, *Journal of Finance* 60, 987–1015.

Kalcheva, Ivalina, and Karl V. Lins, 2007, International evidence on cash holdings and expected managerial agency problems, *Review of Financial Studies* 20, 1087-1112.

Koren, Miklos, and Silvana Tenreyro 2007. Volatility and Development. *Quarterly Journal of Economics*, 122, 243-287.

La Porta, Lopez-de-Silanes, Shleifer and Vishny, 1998, Law and Finance, *Journal of Political Economy*, 106.

Love, Inessa, 2003, Financial development and financing constraints: International evidence from the structural investment model, *Review of Financial Studies* 16, 765-791.

Lucas, Robert E. Jr 1998, On the Mechanics of Economic Development. *Journal of Monetary Economics*, XXII , 3–42.

Morck, Randall, Bernard Yeung, and Wayne Yu, 2000, The information content of stock markets: Why do emerging markets have synchronous stock price movements?, *Journal of Financial Economics* 58, 215-260.

McLean, R. David, Jeffrey Pontiff, and Mengxin Zhao, 2011, Equity Market Liberalization, Fundamental Volatility, and Capital Raising, Working Paper, University of Alberta and Boston College

McLean David, Tianyu Zhang, and Mengxin Zhao, 2012, Why does the law matter? Investor Protection and Its Effects on Investment, Finance, and Growth, Journal of Finance LXVII, 313-350.

Prasad, E., Rogoff, K.,Wei, S.-J., Kose, A., 2006, Financial globalization, growth and volatility in developing countries. *In: Harrison, A. (Ed.), Globalization and Poverty*, University of Chicago Press.

Pinkowitz, Lee, Rene M. Stulz, and Rohan Williamson, 2003, Do firms in countries with poor protection of investor rights hold more cash?, Working paper, National Bureau of Economic Research.

Pinkowitz, Lee, Rene Stulz, and Rohan Williamson, 2006, Does the contribution of corporate cash holdings and dividends to firm value depend on governance? A cross-country analysis, *Journal of Finance* LXI, 2725-2751.

Raddatz, Claudio, 2006, Liquidity Needs and Vulnerability to Financial Underdevelopment, *Journal of Financial Economics* 80: 677-722.

Rajan, Raghuram G., and Luigi Zingales, 1998, Financial dependence and growth, *The American Economic Review* 88, 559-586.

Wurgler, Jeffrey 2000, Financial markets and the allocation of capital, *Journal of Financial Economics* 58, 187-214.

**Appendix A: Robustness Tests**

In this appendix, we summarize the results from additional robustness checks. The sections in the appendix correspond to the sections in the main article where the robustness checks belong.

**4. Asset and Liability Structures**

***Alternative Specifications***

We examine several variations of the asset and liability structure regressions in Table 3. To fully control for industry effects, we replace manufacturing and high tech dummies with 2-digit SIC industry fixed effects. To check whether our country dummy captures the degree of economic and institutional development, we use per capita GDP in 1980 instead of a developed country dummy. Our findings hold in all these robustness checks.

***Controls for Size and Age***

In addition to Total Assets, we also use market capitalization as alternative proxy for firm size. Market capitalization is computed from number of shares outstanding x year-end equity price in USD. The size quintile constructed from market capitalization is highly correlated with our original measure constructed from total assets. All existing results still hold.

One might be concerned that size quintile is not an adequate control for firm size. To address these issues, we replace size quintile with the exact firm size (natural log of total assets), the size relative to other firms in its country (the firm's total assets scaled by its country's average total assets) and the size relative to other firms in its local sector (the firm's total assets scaled by its local sector's average total assets) where a local sector is defined as one of the 17 Fama-French industries in the firm's country. Our main results hold for alternative measures– developed country firms hold more cash, have more intangible assets, have lower leverage, and fewer short-term debts. Large firms have less cash, more intangible assets, and less short-term debts.

To address the concern that observations in developed and developing countries are not comparable because firms in different countries decide to go public at different stages in their life cycles, we control for firm age. We define firm age as current year less incorporation year. A caveat is that WorldScope data on firm's age is very limited -- fewer than half of our observations have data on firm age. The existing results still hold. Developed country firms hold more cash, have more intangible assets, have lower leverage, and have fewer short-term debts. Firms in developing countries are generally older than firms in developed countries. Age is highly correlated with size and most effects of age on financial structures are similar to size. Like larger firms, older firms have less cash, lower leverage, and fewer short-term debts. The only difference is intangible assets – larger firms have more intangible assets but older firms have less.

***Standard Errors***

First, we compute heteroscedasticity robust standard errors using the Huber-White sandwich estimators. In addition to robust standard errors, we estimate the standard errors with clusters on country and industry where each industry is defined as a two-digit SIC group. We also cluster standard errors by firm. The statistical significance is largely unaffected.

## 5. Firm-Level Risk

### 5.1 Volatility

***Alternative Specifications***

We examine a number of variations of the firm-level volatility regressions in Table 4. As alternative controls for industry effects, we replace manufacturing and high-tech dummies with 2-digit SIC industry fixed effects. To check whether our country dummy captures the degree of economic and institutional development, we use per capita GDP in 1980 instead of a developed country dummy. One might be concerned that firms with high average growth rates will automatically have high volatilities. So, we scale volatilities by means before running the regressions. To address the concern that the annual data we use to compute volatilities are less complete in certain countries, for each firm, we count the number of years in which the data are available and explicitly control for them in the regressions. To ensure that our results are not just driven by firms from some large developed countries, we exclude countries with the most observations such as U.S., U.K., Japan, and Canada. Our findings remain strong in all these robustness checks.

***Quality of WorldScope Data***

A concern is that the quality of financial statement information may vary across countries. However, we study volatilities of growth rates. So, any fixed discrepancies in accounting standards have already been differenced away. Yet another concern is that fundamentals of firms in emerging markets are in fact very volatile but their financial statements do not reflect the true fundamentals. For example, the accounting literature suggests that firms may deliberately manipulate their earnings so that the numbers are stable instead of having years with exceptionally good or bad earnings. To alleviate this concern, we study volatilities of eight different variables including sales and employment which are more difficult to manipulate. Furthermore, we try subtracting increase in accounts receivable from sales growth to eliminate the possibility of credit sales manipulation. We still find that firms in developed countries are more volatile.

The survival rates of firms in WorldScope (measured by the likelihood that a firm with financial statement information in year t will exist in WorldScope in year t+i) differ across countries. We find that firms in developed countries have lower survival rates for all i in {1,2,3,4,5}. This is consistent with our main findings that firms in developed countries are riskier.

***Controls for Exchange Rate Volatilities***

We use firm characteristics from WorldScope that are denominated in U.S. dollars. Intuitively, it is unlikely that our results are driven by exchange rate volatilities: we find that firms in developed countries are more volatile despite the fact that exchange rate volatilities tend to be higher in developing countries. To formally address this concern, we compute firm-level risk in local currencies. We define growth rate in local currency as $G_{i,t} + \ln(e_{c,t}) - \ln(e_{c,t-1})$ where $G_{i,t}$ is firm growth rate in USD. $e_{c,t}$ is the exchange rate in local currency/USD and $\ln(e_{c,t}) - \ln(e_{c,t-1})$ is percentage depreciation of local currency. Our exchange rate is the annual average of daily exchange rates from Bloomberg. During the sample period, a number of countries such as Argentina, Mexico, and the Eurozone countries switched their currencies. Since new currencies are sometimes introduced because of high inflation, we use depreciation rate of the old currency for the transition year to capture large revaluation.

Our existing results still hold. Volatilities in local currencies are higher in developed countries. Volatilities in local currencies are not very different from volatilities in USD because exchange rate volatilities are much smaller than the volatilities of firm performance and characteristics. This is even true in developing countries. We also find a positive correlation between firm growth and appreciation of local currency.

***Alternative Measure of Profitability***

Percentage growth (log difference) in profits is not defined when earnings are less than zero. So, observations with negative earnings are automatically omitted from the calculation of profit growth volatilities. To solve this problem, we use an alternative measure of variation in profitability: we compute the volatilities of ROAs instead of changes in profits. The results are qualitatively similar.

***Controls for Size and Age***

We also use market capitalization as alternative proxy for firm size. Market capitalization is computed from number of shares outstanding x year-end equity price in USD. The size quintile constructed from market capitalization is highly correlated with our original measure constructed from total assets. All existing results still hold.

One might be concerned that size quintile constructed from a global distribution might not be an adequate control for firm size and that total assets might not be comparable across countries. For example, a certain level of total assets that are considered small in large countries should be considered large in small countries because it is larger than other firms in its own country. To address these issues, we replace size quintile with the exact firm size (natural log of total assets), the size relative to other firms in its country (the firm's total assets scaled by its country's average total assets), and the size relative to other firms in its local sector (the firm's total assets scaled by its local sector's average total assets) where a local sector is defined as one of the 17 Fama-French industries in the firm's country. Our main results hold for all alternative measures – firms in developed countries and smaller firms have higher volatilities.

To address the concern that observations in developed and developing countries are not comparable because firms in different countries decide to go public at different stages in their life cycles, we control for firm age (averaged across all years the firm is present in the sample). Our existing results still hold. Firms in developed countries also have higher volatilities. Older firms also have lower volatilities. However, the interpretation of this result is not clear as survival of older firms can be considered a measure of market imperfection itself.

***Standard Errors***

First, we compute heteroscedasticity robust standard errors using the Huber-White sandwich estimators. In addition to robust standard errors, we estimate the standard errors with clusters on country and industry where each industry is defined as a two-digit SIC group. All the main results are still statistically significant.

**5.2 Cross-Sectional Dispersion**

We estimate several variations of the cross-sectional dispersion regressions in Table 5. First, we replace year-fixed effects with GDP growth rates and find that dispersions tend to be higher during bad times (year with lower GDP growth rate). We also compute cross-sectional dispersion within a sector instead of within a country. Sector is defined as one of the 17 Fama-Frech Industries within a country. We find that sector-level dispersions of sales growth, asset growth, total debt growth, short-term liability growth, and employment growth across firms within an industry are higher in developed countries. The sectors with more high-tech firms have higher cross-sectional dispersions. The sectors with more manufacturing firms have lower cross-sectional dispersions.

**5.4 Competition and Firm-Level Risk**

***Alternative Measures of Competitions***

In addition to foreign entry, we also use two other proxies for international competitions. We examine the volatilities of cross-listed and export-oriented firms. It is likely that cross-listed and export-oriented firms have more exposure to global competitions. We collect the data on ADRs from Bank of New York Mellon and foreign sales from WorldScope. Then, we include ADR dummy and percentage of foreign sales in the regressions. First, we find positive correlations with size quintile – larger firms are more likely to have ADRs and higher fraction of foreign sales. After controlling for size quintile, firms with ADRs and firms with higher percentage of foreign sales are indeed more volatile.

We also use privatization of state-owned enterprises as an alternative proxy of increases in competitive pressure. An extensive literature finds that state-owned enterprises experience increases in profitability, productivity, and investment after the privatization. (See, for example, Gupta (2005).) We thus expect that privatization of state-owned enterprises affect risk of other incumbent firms. The data on privatization are from the World Bank's Privatization Database. We include privatization dummy in the regressions. The dummy takes the value of one if the firm is in an industry where privatization of state-owned enterprises took place during 1989-1998 and zero otherwise. We find that firms in industry with privatization experience higher volatilities in the subsequent period.

## 6. What Drives Firm-Level Volatilities?

***Inclusion of Interaction between Developed Country Dummy and Firm Size***

In Table 8 Panels A-C, we also estimate the specification where the interaction between Developed Country Dummy and Size Quintile is included. The coefficient on this interaction term is negative and significant. Besides Size Quintile constructed from global distribution of firms, we also use two alternative proxies: (1) Size Quintile from the distribution within one country and (2) Firm Age. The coefficients on the interaction terms are all negative. These findings are consistent with the notion that small and young firms in developed countries are particularly risky because they have to compete with both new entrants and larger incumbents. The interaction between Developed Country Dummy and High-Tech Dummy remain significant across all specifications, implying that the size and the industry effects are distinct and non-nested.

***Inclusion of Interactions between Industry Indicators and Size***

In Table 8 Panels A-C, we also estimate the specification with the interactions between High-Tech Dummy and Size Quintile, between External Finance and Size Quintile, and between Small Firm Dominated and Size Quintile. We find that the size effects are more pronounced in high-tech, external finance dependent, and large-firm dominated industries. The interactions between Developed Country Dummy and High-Tech Dummy, between Developed Country Dummy and External Finance, and between Developed Country Dummy and Small Firm Dominated remain significant, implying that the size and the country effects are distinct and non-nested.

***Alternative Specifications***

In Table 8 Panels A-C, we replace developed country dummies with a full set of country fixed-effects, replace industry characteristics with a full set of 2-digit SIC industry fixed-effects, and estimate the coefficients on the interaction between 1980 Per Capita GDP and industry characteristics (High-Tech Dummy, External Finance Dependency, and Small Firm Industry Indicators). The results are qualitatively similar. Most coefficients on the interaction terms and size quintile remain statistically significant at 1%.

## 7. Reaction to Shocks

***Alternative Specifications***

We estimate several variations of the reaction-to-shock regressions in Table 9. We use growth in output and labor productivity (output per worker) as alternative proxies for productivity shock. We use per capita GDP in 1980 instead of the developed country dummy for the interaction terms. To address the concern that financial statement data are not reliable in some countries, we replace WorldScope financial statement data with establishments, employment, fixed capital, and sales data from UNIDO. We also divide the sample based on the country dummy and firm size quintile. We find the firms in developed countries are more sensitive to shocks in all these robustness tests.

As an alternative to McLean, Zhang, and Zhao (2012)'s measures, we also use the elasticity of industry investment to industry value added from Wurgler (2000) as a proxy for allocative efficiency. The results are qualitatively similar.

***Matching Shock Size***

In Table 9, the firm fixed-effects already control for the difference in average growth rates and average productivity shock. However, shock size (absolute value of the shock) can still differ across countries. So, we examine the size distribution of shocks. We indeed find that the average shock size is larger in developing countries: we classify observations into shock size quartiles and the majority of observations from developing countries fall in the largest quartile. As a consequence, one might be concerned that firm reactions in developed and developing countries are not comparable because the productivity shocks are of different sizes. To address this concern, (1) given that most observations with small productivity shocks are from developed countries, we re-run the response-to-shock regressions using only the subsample with shocks from the largest quartile. (In this quartile, we have roughly equal number of firms in developed and developing countries.) (2) Alternatively, we directly assign each observation in developing countries a developed country match based on productivity quartile, sector, year, and firm size. We still find that firms in developed countries are more responsive to shocks. Across all types of assets and liabilities, cash is the most responsive component.

## 8. Additional Tests

### 8.2 Alternative Measures for Country Characteristics

In Table 11 Panel A, we also control for other firm characteristics from the cash holding literature: lagged Leverage, Dividend Dummy, Capital Expenditure/Total Assets, Acquisitions/Total Assets, R&D/Total Assets, and Tobin's Q. All institutional variables remain significant at the 1% level.

### 8.3 Effects of Volatilities on Cash Holding

***Alternative Specifications***

It is possible that the results in Table 12 Panel B are driven by omitted variables. Sector average of firm-level volatilities may pick up industry effects not captured by manufacturing and high-tech dummies or pick up country effects not captured by developed country dummy. To address these concerns, we replace developed country dummy with 1980 per capita GDP and replace manufacturing/ high-tech dummies with a full set of 2-digit SIC fixed effects. The coefficient on firm-level volatility is still large and statistically significant at 1% level.

***Dittmar and Duchin (2012)'s Specification***

Following Dittmar and Duchin (2012), we also estimate an alternative specification where we do not scale cash with total assets and use either (1) cash in dollar amount or (2) a dummy variable indicating whether firm cash holding is in the top decile as our dependent variable. We still find that firms in developed countries and firms in high-tech industries hold more cash. The coefficients on developed countries and high-tech dummies are large and highly

significant. As expected, larger firms hold more cash in dollar amount and are more likely to be in the top cash decile.

***Controls for Alternatives to Cash Holdings***

A concern is that cash holding may differ across countries because firms in certain countries have better access to alternative sources of liquidity. For example, closely-held firms such as family businesses might be able to raise capital from their block holders. Conglomerates may be able to transfer funds across their industrial segments. Firms with bank relationship may be able to use lines of credit in lieu of cash. As a robustness check, we control for factors that determine firm's alternatives to cash: ownership, organizational structure, and bank relationship. All data are from WorldScope.

First, we control for the fraction of shares that are closely-held. We find that shares are more closely-held in developing countries and in small firms. The correlation between the fraction of closely-held shares and developed country dummy is -18% and the correlation between the fraction of closely-held shares and size quintile is -14%. We find that closely-held firms hold less cash but the coefficients become less significant after controlling for the developed country dummy. Closely-held firms are also less volatile.

Second, we construct a dummy variable indicating whether a firm reports more than one product segment. We find that 37% of firms in developed countries and 19% of firms in developing countries are multi-segment. Multi-segment firms are also larger than single-segment firms. Firms in high-tech industries are less likely to have more than one segment while firms in manufacturing industries are more likely to have more than one segment. Multi-segment firms tend to hold less cash and have lower volatilities than average firms.

Third, we control for bank relationship. Since WorldScope does not provide any direct data on bank loans, we use a dummy variable indicating whether a firm has any loans as a proxy for bank relationship. We find that firms with positive total loans tend to hold less cash.

Overall, our evidence supports the notion that firms with better access to alternative sources of liquidity hold less cash. However, our main results are confounded with these factors - the coefficients on volatilities, developed country dummies, and other variables remain highly significant after controlling for ownership, organizational structure, and bank relationship.

***Standard Errors***

We estimate the robust standard errors and the standard errors with clusters on country and industry where each industry is defined as a two-digit SIC group. We also perform generalized least square and compute bootstrapping standard errors. All the main results are still statistically significant.

**Appendix B: Policy Function Calculation**

First Order Condition: $e_{A,t} - e_{B,t} - c\,(K_{A,t}-K_{A,t-1}) + E[V'(K_{A,t})] = 0$

Envelope Condition: $V'(K_{A,t}) = c\,(K_{A,t+1} - K_{A,t})$

Backward Induction:

At t = T,

$V(K_{A,T}) = 0$ so $E[V'(K_{A,T})] = 0$

$e_{A,T} - e_{B,T} - c\,(K_{A,T}-K_{A,T-1}) = 0$

$K_{A,T} = K_{A,T-1} + (e_{A,T} - e_{B,T})/c$

At t = T-1,

$V'(K_{A,T-1}) = c\,(K_{A,T} - K_{A,T-1}) = e_{A,T} - e_{B,T}$ so $E[V'(K_{A,T-1})] = 0$

$e_{A,T-1} - e_{B,T-1} - c\,(K_{A,T-1}-K_{A,T-2}) = 0$

$K_{A,T-1} = K_{A,T-2} + (e_{A,T-1} - e_{B,T-1})/c$

…

At t = T-i,

$V'(K_{A,T-i}) = c\,(K_{A,T-i+1} - K_{A,T-i}) = e_{A,T-i+1} - e_{B,T-i+1}$ so $E[V'(K_{A,T-i})] = 0$

$e_{A,T-i} - e_{B,T-i} - c\,(K_{A,T-i}-K_{A,T-i-1}) = 0$

$K_{A,T-i} = K_{A,T-i-1} + (e_{A,T-i} - e_{B,T-i})/c$

**Appendix C: The Country Coverage of WorldScope**

Full-Coverage

Developed countries include Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Italy, Japan, the Netherlands, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

Emerging markets include Brazil, China, Indonesia, Korea, Malaysia, Mexico, Philippines, South Africa, and Thailand.

Targeted Coverage

Countries include Argentina, Chile, Colombia, Czech Republic, Egypt, Hungary, India, Israel, Lithuania, New Zealand, Peru, Poland, Russia, Turkey, and Venezuela.

Table 1 Panel A: Asset and Liability Structures by Country

| Country | Number of Firm-Year Observations | 1980 Per Capita GDP | Size | Cash/Total Assets | Intangible /Total Assets | Total Liabilities /Total Assets | Current/Total Liabilities | Current Liabilities /Current Assets |
|---|---|---|---|---|---|---|---|---|
| Developing Countries | | | | | | | | |
| Argentina | 844 | 7551 | 5.04 | 7.91 | 3.08 | 23.34 | 56.84 | 43.66 |
| Brazil | 3,347 | 3557 | 5.52 | 10.49 | 1.83 | 29.82 | 55.04 | 58.74 |
| Chile | 1,692 | 2520 | 4.84 | 7.3 | 2.84 | 20.33 | 47.94 | 36.65 |
| China | 15,171 | 186 | 5.08 | 17.73 | 3.95 | 27.58 | 80.13 | 57.32 |
| Colombia | 345 | 1621 | 5.47 | 6.88 | 2.81 | 13.03 | 50.86 | 20.59 |
| Egypt | 290 | 882 | 5.8 | 15.03 | 4.77 | 24 | 47.13 | 33.97 |
| Hungary | 359 | 3769 | 4.49 | 11.36 | 5.25 | 15.55 | 62.17 | 23.73 |
| Indonesia | 3,305 | 397 | 4.33 | 11.89 | 1.57 | 38.59 | 59.31 | 68.88 |
| India | 10,648 | 229 | 4.15 | 6.8 | 1.87 | 33.24 | 42.63 | 29.87 |
| Korea | 10,797 | 3358 | 5.25 | 13.36 | 2.3 | 31.21 | 61.04 | 44.33 |
| Lithuania | 22 | n.a. | 4.61 | 7.57 | 2.45 | 30.33 | 39.1 | 42.1 |
| Mexico | 1,771 | 5114 | 6.41 | 7.78 | 6.84 | 24.23 | 41.31 | 34.86 |
| Malaysia | 9,281 | 1848 | 4.35 | 12.13 | 4.17 | 26.61 | 65.13 | 48.82 |
| Peru | 802 | 2256 | 4.37 | 6.17 | 4.65 | 24.32 | 60.18 | 43.3 |
| Philippines | 1,764 | 989 | 4.04 | 11.54 | 4.12 | 24.62 | 61.43 | 65.69 |
| Poland | 1,994 | n.a. | 3.92 | 10.97 | 4.87 | 19.33 | 61.58 | 23.89 |
| Russia | 790 | n.a. | 6.81 | 8.84 | 4.6 | 24.44 | 50.29 | 39.17 |
| Thailand | 5,195 | 796 | 4.24 | 9.01 | 2.34 | 36.47 | 64.58 | 72.45 |
| Turkey | 2,066 | 2525 | 4.75 | 9.59 | 2.4 | 23.95 | 68.22 | 31.17 |
| Venezuela | 244 | 5820 | 5.1 | 9.42 | 1.34 | 14.22 | 55.53 | 20.95 |
| South Africa | 4,617 | 3463 | 4.42 | 13.11 | 7.05 | 16.81 | 49.69 | 22.27 |
| Developed Countries | | | | | | | | |
| Australia | 13,353 | 14291 | 3.22 | 25.07 | 12.2 | 17.51 | 43.07 | 25.74 |
| Austria | 1,411 | 15946 | 5.21 | 13.04 | 5.84 | 24.84 | 52.41 | 29.51 |
| Belgium | 1,953 | 15609 | 5.19 | 14.09 | 10.24 | 25.9 | 46.96 | 27.68 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Canada | 16,376 | 16751 | 4.03 | 18.84 | 9.72 | 22.94 | 38.34 | 37.18 |
| Switzerland | 3,277 | 28206 | 5.79 | 16.42 | 7.31 | 24.82 | 37.23 | 17.92 |
| Czech Republic | 292 | n.a. | 5.13 | 6.72 | 1.72 | 21.57 | 62.55 | 41.86 |
| Germany | 11,572 | 15656 | 4.82 | 14.26 | 9.58 | 21.09 | 50.73 | 22.69 |
| Denmark | 2,349 | 19716 | 4.82 | 16.29 | 5.72 | 27.04 | 43.35 | 25.76 |
| Spain | 2,194 | 8826 | 6.02 | 9.41 | 6.33 | 23.51 | 51.89 | 30.48 |
| Finland | 2,229 | 15576 | 5.27 | 13.45 | 10.09 | 28.73 | 34.18 | 20.3 |
| France | 11,986 | 15982 | 4.98 | 14.15 | 12.81 | 22.66 | 49.29 | 19.66 |
| United Kingdom | 27,141 | 15575 | 4.22 | 16.18 | 11.42 | 20.11 | 49.87 | 24.52 |
| Greece | 3,595 | 11079 | 4.46 | 9.31 | 3.13 | 26.49 | 66.94 | 34.89 |
| Hong Kong | 8,554 | 11880 | 4.7 | 20.92 | 4.07 | 21.54 | 63.47 | 32.65 |
| Ireland | 1,146 | 9957 | 4.52 | 17.1 | 14.19 | 22.82 | 42.7 | 25.28 |
| Israel | 1,545 | 12603 | 4.98 | 25.51 | 8.37 | 23.35 | 49.35 | 26.82 |
| Italy | 3,602 | 13094 | 6.01 | 12.5 | 10.96 | 26.35 | 54.37 | 29.07 |
| Japan | 55,624 | 23982 | 5.78 | 18.28 | 1.47 | 25.85 | 57.89 | 31.02 |
| Netherlands | 3,250 | 15936 | 5.5 | 11.86 | 8.39 | 23.57 | 43.67 | 20.13 |
| Norway | 2,747 | 22301 | 4.91 | 18.87 | 9.19 | 31.31 | 27.99 | 24.24 |
| New Zealand | 1,231 | 10265 | 4.36 | 9.07 | 10.33 | 25.3 | 35.9 | 28.88 |
| Portugal | 1,084 | 6301 | 5.24 | 5.84 | 9.68 | 29.69 | 48.26 | 44.39 |
| Singapore | 5,714 | 9043 | 4.41 | 17.58 | 2.51 | 21.18 | 62.64 | 31.15 |
| Sweden | 5,002 | 19330 | 4.36 | 18.01 | 15.79 | 20.04 | 35.3 | 15.87 |
| United States | 108,575 | 22568 | 4.55 | 21.18 | 15.24 | 31.11 | 37.51 | 41.09 |

This table reports average asset and liability structures of firms in each country. Cash, Total Assets, Intangible Assets, Total Liabilities, Current Liabilities, and Current Assets are from the WorldScope Database. Size is defined as log of total assets (book value). 1980 Per Capita GDP is from the World Development Indicators Database. Countries are classified by the World Bank's Atlas method. Developed Country is defined as a high-income economy and Developing Country is defined as a middle-income economy or lower.

Table 1 Panel B: Asset and Liability Structures in Developed and Developing Countries

| Financial Structure | Global Average | Developed Country Average | Developing Country Average | Developed Minus Developing | t-Stat | Observations in Developed Countries | Observations in Developing Countries |
|---|---|---|---|---|---|---|---|
| Size | 4.76 | 4.77 | 4.75 | 0.02** | (2.3935) | 288325 | 74734 |
| Cash/Total Assets | 17.32 | 18.71 | 11.94 | 6.77*** | (82.79) | 286831 | 74469 |
| Intangible /Total Assets | 8.35 | 9.73 | 3.38 | 6.35*** | (98.7415) | 252878 | 70206 |
| Total Liabilities /Total Assets | 26.57 | 26.08 | 28.44 | -2.36*** | (18.0385) | 278730 | 72813 |
| Current/Total Liabilities | 49.66 | 46.42 | 61.27 | -14.85*** | (100.8583) | 242336 | 67607 |
| Current Liabilities /Current Assets | 35.7 | 32.79 | 46.79 | -14*** | (38.3312) | 275409 | 72103 |

This table compares asset and liability structures of firms in developed and developing countries. Cash, Total Assets, Intangible Assets, Total Liabilities, Current Liabilities, and Current Assets are from the WorldScope database. Size is defined as log of total assets (book value). Countries are classified by the World Bank's Atlas method. Developed Country is defined as a high-income economy and Developing Country is defined as a middle-income economy or lower. Numbers in the parentheses are the t statistics from univariate comparisons between developed and developing countries. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 2 Panel A: Firm-Level Risk by Country

| Country | Number of Firms | 1980 Per Capita GDP | Volatility of Sales Growth | Volatility of Assets Growth | Volatility of Cash Holding Growth | Volatility of Profit Growth | Volatility of Intangible Assets Growth | Volatility of Total Debts Growth | Volatility of Short-Term Liabilities | Volatility of Employment Growth |
|---|---|---|---|---|---|---|---|---|---|---|
| Developing Countries | | | | | | | | | | |
| Argentina | 80 | 7551 | 0.47 | 0.32 | 0.98 | 0.65 | 1.06 | 0.93 | 1.33 | 0.15 |
| Brazil | 373 | 3557 | 0.39 | 0.35 | 1.18 | 0.7 | 1.06 | 0.74 | 0.92 | 0.25 |
| Chile | 147 | 2520 | 0.36 | 0.21 | 1.14 | 0.54 | 1.06 | 0.63 | 0.91 | 0.26 |
| China | 1,843 | 186 | 0.34 | 0.28 | 0.84 | 0.45 | 0.89 | 0.6 | 0.67 | 0.28 |
| Colombia | 31 | 1621 | 0.23 | 0.23 | 0.76 | 0.5 | 1.22 | 1.04 | 1.4 | 0.2 |
| Egypt | 46 | 882 | 0.21 | 0.21 | 0.83 | 0.35 | 0.8 | 0.49 | 0.62 | 0.05 |
| Hungary | 38 | 3769 | 0.39 | 0.27 | 0.92 | 0.65 | 0.79 | 0.74 | 0.96 | 0.27 |
| Indonesia | 310 | 397 | 0.38 | 0.28 | 1 | 0.75 | 0.76 | 0.69 | 1.01 | 0.26 |
| India | 1,995 | 229 | 0.26 | 0.23 | 0.97 | 0.42 | 0.9 | 0.53 | 0.9 | 0.14 |
| Korea | 1,152 | 3358 | 0.38 | 0.32 | 0.93 | 0.73 | 1.15 | 0.69 | 0.94 | 0.22 |
| Lithuania | 5 | n.a. | 0.17 | 0.16 | 0.84 | 0.52 | 0.65 | 0.43 | 0.89 | 0.18 |
| Mexico | 154 | 5114 | 0.26 | 0.22 | 0.86 | 0.58 | 0.84 | 0.63 | 1.08 | 0.17 |
| Malaysia | 969 | 1848 | 0.41 | 0.29 | 0.93 | 0.66 | 0.71 | 0.71 | 0.89 | 0.27 |
| Peru | 83 | 2256 | 0.31 | 0.25 | 1.16 | 0.61 | 0.95 | 0.87 | 1.12 | 0.33 |
| Philippines | 157 | 989 | 0.54 | 0.37 | 1.09 | 0.9 | 0.66 | 0.69 | 0.99 | 0.41 |
| Poland | 317 | n.a. | 0.38 | 0.43 | 1.33 | 0.67 | 1.28 | 0.94 | 1.14 | 0.31 |
| Russia | 132 | n.a. | 0.37 | 0.34 | 1.1 | 0.53 | 1.05 | 0.64 | 1.01 | 0.14 |
| Thailand | 487 | 796 | 0.34 | 0.27 | 1.1 | 0.63 | 0.73 | 0.81 | 1.06 | 0.24 |
| Turkey | 207 | 2525 | 0.43 | 0.34 | 1.26 | 0.72 | 1.27 | 0.95 | 1.1 | 0.3 |
| Venezuela | 23 | 5820 | 0.48 | 0.39 | 0.94 | 0.64 | 0.55 | 0.66 | 0.85 | 0.13 |
| South Africa | 591 | 3463 | 0.45 | 0.47 | 1.35 | 0.59 | 0.97 | 1.02 | 1.29 | 0.27 |
| Developed Countries | | | | | | | | | | |
| Australia | 1,950 | 14291 | 0.76 | 0.62 | 1.36 | 0.69 | 0.85 | 1.05 | 1.5 | 0.44 |
| Austria | 133 | 15946 | 0.41 | 0.33 | 1.03 | 0.58 | 1.12 | 0.73 | 0.97 | 0.28 |
| Belgium | 175 | 15609 | 0.39 | 0.33 | 0.91 | 0.62 | 0.91 | 0.76 | 1.04 | 0.39 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Canada | 2,024 | 16751 | 0.6 | 0.57 | 1.57 | 0.75 | 0.8 | 0.9 | 1.3 | 0.3 |
| Switzerland | 260 | 28206 | 0.36 | 0.28 | 0.7 | 0.5 | 0.95 | 0.7 | 1.2 | 0.22 |
| Czech Republic | 52 | n.a. | 0.23 | 0.22 | 0.88 | 0.66 | 0.62 | 0.46 | 0.72 | 0.11 |
| Germany | 1,001 | 15656 | 0.4 | 0.42 | 1.22 | 0.68 | 1.06 | 1 | 1.29 | 0.32 |
| Denmark | 187 | 19716 | 0.37 | 0.35 | 1.12 | 0.58 | 0.91 | 0.75 | 1.05 | 0.3 |
| Spain | 174 | 8826 | 0.32 | 0.25 | 0.94 | 0.56 | 0.94 | 0.81 | 0.99 | 0.24 |
| Finland | 166 | 15576 | 0.26 | 0.27 | 0.72 | 0.55 | 0.85 | 0.62 | 0.91 | 0.21 |
| France | 1,169 | 15982 | 0.31 | 0.31 | 0.88 | 0.58 | 0.84 | 0.77 | 1.02 | 0.3 |
| United Kingdom | 2,907 | 15575 | 0.46 | 0.48 | 1.39 | 0.62 | 0.83 | 0.99 | 1.28 | 0.32 |
| Greece | 342 | 11079 | 0.34 | 0.32 | 1.07 | 0.58 | 1.15 | 0.86 | 1.11 | 0.36 |
| Hong Kong | 894 | 11880 | 0.47 | 0.43 | 0.93 | 0.68 | 0.91 | 1.03 | 1.24 | 0.42 |
| Ireland | 105 | 9957 | 0.44 | 0.52 | 1.39 | 0.59 | 0.67 | 1.09 | 1.24 | 0.36 |
| Israel | 192 | 12603 | 0.34 | 0.34 | 0.81 | 0.82 | 0.85 | 0.75 | 1.06 | 0.23 |
| Italy | 327 | 13094 | 0.36 | 0.3 | 0.93 | 0.54 | 0.76 | 0.7 | 0.9 | 0.3 |
| Japan | 4,203 | 23982 | 0.19 | 0.19 | 0.44 | 0.57 | 0.64 | 0.46 | 0.63 | 0.16 |
| Netherlands | 270 | 15936 | 0.29 | 0.32 | 1.07 | 0.52 | 0.85 | 0.76 | 1.1 | 0.28 |
| Norway | 324 | 22301 | 0.55 | 0.46 | 1 | 0.73 | 0.8 | 0.77 | 1.2 | 0.41 |
| New Zealand | 151 | 10265 | 0.4 | 0.44 | 1.4 | 0.52 | 0.84 | 0.74 | 1.5 | 0.4 |
| Portugal | 103 | 6301 | 0.34 | 0.26 | 1 | 0.58 | 1.13 | 0.65 | 1.05 | 0.23 |
| Singapore | 635 | 9043 | 0.37 | 0.3 | 0.78 | 0.63 | 0.89 | 0.85 | 1.09 | 0.26 |
| Sweden | 533 | 19330 | 0.48 | 0.41 | 1.04 | 0.72 | 0.8 | 0.85 | 1.25 | 0.37 |
| United States | 11,392 | 22568 | 0.53 | 0.55 | 1.37 | 0.7 | 0.77 | 0.93 | 1.35 | 0.37 |

This table reports average firm-level volatilities of total assets, cash, intangible assets, total liabilities, short-term liabilities, sales, profit, and employment. Volatility is defined as the time-series standard deviation of the annual growth rate. All firm characteristics are from the WorldScope database. 1980 Per Capita GDP is from the World Development Indicators Database. Countries are classified by the World Bank's Atlas method. Developed Country is defined as a high-income economy and Developing Country is defined as a middle-income economy or lower.

Table 2 Panel B: Firm-Level Risk in Developed and Developing countries

| Firm-Level Risk | Global Average | Developed Country Average | Developing Country Average | Developed Minus Developing | t-Stat | Observations in Developed Countries | Observations in Developing Countries |
|---|---|---|---|---|---|---|---|
| Volatility of Sales Growth | 0.419 | 0.432 | 0.388 | 0.044*** | (6.65) | 24272 | 9935 |
| Volatility of Assets Growth | 0.41 | 0.436 | 0.347 | 0.089*** | (16.58) | 25847 | 10428 |
| Volatility of Cash Holding Growth | 1.107 | 1.113 | 1.092 | 0.021* | (1.9) | 25564 | 10187 |
| Volatility of Profit Growth | 0.624 | 0.639 | 0.593 | 0.046*** | (6.4) | 18813 | 8768 |
| Volatility of Intangible Assets Growth | 0.83 | 0.795 | 0.93 | -0.136*** | (12.1) | 19574 | 6770 |
| Volatility of Total Debts Growth | 0.802 | 0.837 | 0.718 | 0.119*** | (12.14) | 22477 | 9232 |
| Volatility of Short-Term Liabilities | 1.107 | 1.162 | 0.97 | 0.192*** | (16.34) | 21685 | 8860 |
| Volatility of Employment Growth | 0.304 | 0.317 | 0.257 | 0.06*** | (11.55) | 23440 | 6870 |

This table compares firm-level volatilities in developed and developing countries. Volatility is defined as the time-series standard deviation of the annual growth rate. Total assets, cash, intangible assets, total liabilities, short-term liabilities, sales, profit, and employment are from the WorldScope database. Countries are classified by the World Bank's Atlas method. Developed Country is defined as high-income economy and developing country is defined as middle-income economy or lower. Numbers in the parentheses are the t statistics from univariate comparisons between developed and developing countries. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 2 Panel C: Firm-Level Growth in Developed and Developing countries

| Firm-Level Growth | Global Average | Developed Country Average | Developing Country Average | Developed Minus Developing | t-Stat | Observations in Developed Countries | Observations in Developing Countries |
|---|---|---|---|---|---|---|---|
| Average Sales Growth | 0.182 | 0.183 | 0.179 | 0.004 | (0.73) | 25564 | 10523 |
| Average Assets Growth | 0.176 | 0.168 | 0.196 | -0.028*** | (6.6) | 27083 | 10976 |
| Average Cash Holding Growth | 0.143 | 0.124 | 0.189 | -0.065*** | (8.18) | 26914 | 10785 |
| Average Profit Growth | 0.14 | 0.13 | 0.16 | -0.029*** | (4.78) | 20570 | 9657 |
| Average Intangible Assets Growth | 0.192 | 0.184 | 0.213 | -0.029*** | (3.26) | 21470 | 7668 |
| Average Total Debts Growth | 0.113 | 0.105 | 0.132 | -0.027*** | (3.51) | 24336 | 10031 |
| Average Short-Term Liabilities | 0.117 | 0.105 | 0.145 | -0.039*** | (4.4) | 23672 | 9736 |
| Average Employment Growth | 0.078 | 0.087 | 0.049 | 0.038*** | (9.61) | 25122 | 7756 |

This table compares average firm-level growth rates in developed and developing countries. Total assets, cash, intangible assets, total liabilities, short-term liabilities, sales, profit, and employment are from the WorldScope database. Countries are classified by the World Bank's Atlas method. Developed Country is defined as a high-income economy and Developing Country is defined as a middle-income economy or lower. Numbers in the parentheses are the t statistics from univariate comparisons between developed and developing countries. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 3: Assets and Liabilities Structure

| | Size | Cash/Total Assets | Intangible /Total Assets | Total Liabilities /Total Assets | Short-Term/Total Liabilities | Short-Term Liabilities /Short-Term Assets |
|---|---|---|---|---|---|---|
| Developed Country Dummy | 0.047 | 6.609 | 6.582 | -1.874 | -12.384 | -12.183 |
| | (4.92)*** | (83.11)*** | (102.33)*** | (13.93)*** | (84.33)*** | (32.69)*** |
| Manufacturing Dummy | 0.484 | -2.124 | -2.316 | 0.308 | 3.875 | -5.799 |
| | (64.16)*** | (33.33)*** | (44.01)*** | (2.85)*** | (32.49)*** | (19.37)*** |
| High-Tech Dummy | -0.734 | 10.202 | 4.93 | -4.24 | 0.116 | -9.324 |
| | (79.07)*** | (129.49)*** | (75.17)*** | (31.70)*** | (0.76) | (25.22)*** |
| Size Quintile | | -2.75 | 0.518 | -0.162 | -6.02 | -7.01 |
| | | (121.18)*** | (27.63)*** | (4.20)*** | (139.24)*** | (65.63)*** |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.06 | 0.13 | 0.08 | 0.01 | 0.1 | 0.02 |
| *N* | 363059 | 361300 | 323084 | 351543 | 309943 | 347512 |

This table reports the coefficient estimates from the assets and liabilities structures regressions. The dependent variables are the following firm characteristics - firm size (natural log of total assets), cash/total assets, intangible assets/total assets, total liabilities/total assets, short-term liabilities/total liabilities, and short-term liabilities/current assets. The explanatory variables are Developed Country Dummy, Manufacturing Dummy, High-Tech Dummy, and Size Quintile. Developed Country Dummy takes the value of one if the country is classified as a high-income economy and zero if the country is classified as a middle-income economy or lower. Manufacturing Dummy is equal to one if the firm is in the manufacturing industries (SIC codes 2000-3999). High-Tech is equal to one if the firm is in the high-tech industry according to the American Electronic Association. Size Quintile is constructed from the cross-country distribution of total assets. Also estimated but not reported are a constant term and the year fixed-effects. Numbers in the parentheses are the t statistics. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 4: Firm-Level Volatilities

| Y= Firm-Level Volatility | Volatility of Sales Growth | Volatility of Asset Growth | Volatility of Cash Holding Growth | Volatility of Profit Growth | Volatility of Intangible Assets Growth | Volatility of Total Debt Growth | Volatility of Short-term Liabilities Growth | Volatility of Employment Growth |
|---|---|---|---|---|---|---|---|---|
| Developed Country Dummy | 0.038 | 0.073 | 0.024 | 0.064 | -0.149 | 0.096 | 0.161 | 0.043 |
| | (5.89)*** | (14.50)*** | (2.21)** | (8.90)*** | (13.29)*** | (10.04)*** | (13.67)*** | (8.41)*** |
| Manufacturing Dummy | -0.098 | -0.12 | -0.136 | -0.034 | -0.084 | -0.155 | -0.179 | -0.072 |
| | (16.97)*** | (26.22)*** | (13.93)*** | (5.05)*** | (8.50)*** | (17.80)*** | (16.80)*** | (16.82)*** |
| High-Tech Dummy | 0.064 | 0.1 | -0.01 | 0.05 | 0.113 | 0.211 | 0.169 | 0.02 |
| | (9.17)*** | (18.23)*** | (0.82) | (5.83)*** | (9.69)*** | (19.71)*** | (12.83)*** | (3.98)*** |
| Size Quintile | -0.118 | -0.115 | -0.241 | -0.076 | -0.06 | -0.134 | -0.072 | -0.055 |
| | (52.41)*** | (65.43)*** | (64.42)*** | (27.84)*** | (15.61)*** | (39.87)*** | (17.46)*** | (33.12)*** |
| R-squared | 0.09 | 0.15 | 0.12 | 0.03 | 0.02 | 0.08 | 0.04 | 0.05 |
| *N* | 34207 | 36275 | 35751 | 27581 | 26344 | 31709 | 30545 | 30310 |

This table reports the coefficient estimates from the firm-level volatility regressions. The dependent variables are the volatilities of total assets, cash, intangible assets, total liabilities, short-term liabilities, sales, profit, and employment. Volatility is defined as the time-series standard deviation of the firm's annual growth rate. The explanatory variables are Developed Country Dummy, Manufacturing Dummy, High-Tech Dummy, and Size Quintile. Developed Country Dummy takes the value of one if the country is classified as a high-income economy and zero if the country is classified as a middle-income economy or lower. Manufacturing Dummy is equal to one if the firm is in the manufacturing industries (SIC codes 2000-3999). High-Tech is equal to one if the firm is in the high-tech industry according to the American Electronic Association. Size Quintile is constructed from the cross-country distribution of total assets. Also estimated but not reported is a constant term. Numbers in the parentheses are the t statistics. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 5: Cross-Sectional Dispersions

| Y= Within Country Dispersions across Firms | Dispersion of Sales Growth | Dispersion of Asset Growth | Dispersion of Cash Holding Growth | Dispersion of Profit Growth | Dispersion of Intangible Assets Growth | Dispersion of Total Debt Growth | Dispersion of Short-term Liabilities Growth | Dispersion of Employment Growth |
|---|---|---|---|---|---|---|---|---|
| Developed Country Dummy | 0.317 | 0.256 | 0.244 | 0.233 | 0.04 | 0.368 | 0.46 | 0.04 |
| | (4.65)*** | (4.09)*** | (3.32)*** | (3.31)*** | (0.50) | (4.75)*** | (5.34)*** | (0.47) |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.24 | 0.27 | 0.11 | 0.23 | 0.1 | 0.2 | 0.18 | 0.11 |
| *N* | 684 | 679 | 602 | 591 | 620 | 605 | 582 | 578 |

This table reports the coefficient estimates from the cross-sectional dispersion regressions. The dependent variables are the cross-sectional dispersion of total assets, cash, intangible assets, total liabilities, short-term liabilities, sales, profit, and employment. Cross-sectional dispersion is defined as the cross-sectional standard deviation of the firm growth rate calculated across all firms within a country. The explanatory variable is Developed Country Dummy. Developed Country Dummy takes the value of one if the country is classified as a high-income economy and zero if the country is classified as a middle-income economy or lower. Also estimated but not reported are a constant term and the year fixed-effects. Numbers in the parentheses are the t statistics. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 6 Panel A: Sector-Level Volatilities

| Y= Sector-Level Volatility | Volatility of Sales Growth | Volatility of Asset Growth | Volatility of Cash Holding Growth | Volatility of Profit Growth | Volatility of Intangible Assets Growth | Volatility of Total Debt Growth | Volatility of Short-term Liabilities Growth | Volatility of Employment Growth |
|---|---|---|---|---|---|---|---|---|
| Developed Country Dummy | -0.056 | -0.051 | -0.146 | -0.086 | -0.162 | -0.091 | -0.07 | -0.01 |
| | (4.49)*** | (5.51)*** | (5.29)*** | (4.24)*** | (4.29)*** | (2.36)** | (1.59) | (0.70) |
| Manufacturing Fraction | -0.057 | -0.053 | -0.008 | -0.007 | -0.032 | -0.036 | 0.033 | -0.026 |
| | (3.57)*** | (4.45)*** | (0.22) | (0.25) | (0.67) | (0.72) | (0.58) | (1.49) |
| High-Tech Fraction | 0.027 | 0.064 | -0.036 | -0.126 | -0.175 | -0.003 | -0.082 | -0.013 |
| | (0.84) | (2.70)*** | (0.51) | (2.40)** | (1.84)* | (0.04) | (0.73) | (0.38) |
| R-squared | 0.05 | 0.07 | 0.04 | 0.04 | 0.04 | 0.01 | 0.01 | 0 |
| *N* | 629 | 631 | 631 | 627 | 612 | 629 | 629 | 612 |

This table reports the coefficient estimates from the sector-level volatility regressions. The dependent variables are the volatilities of total assets, cash, intangible assets, total liabilities, short-term liabilities, sales, profit, and employment. Volatility is defined as the time-series standard deviation of the sector-level annual growth rate. Sector classification is based on 17 Fama-French industries. The explanatory variables are Developed Country Dummy, Manufacturing Fraction, and High-Tech Fraction. Developed Country Dummy takes the value of one if the country is classified as a high-income economy and zero if the country is classified as a middle-income economy or lower. Manufacturing Dummy is the fraction of manufacturing firms in that sector. High-Tech is the fraction of high-tech firms in that sector according to the American Electronic Association. Also estimated but not reported is a constant term. Numbers in the parentheses are the t statistics. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 6 Panel B: Country-Level Volatilities

| Y= Country-Level Volatility | Volatility of Sales Growth | Volatility of Asset Growth | Volatility of Cash Holding Growth | Volatility of Profit Growth | Volatility of Intangible Assets Growth | Volatility of Total Debt Growth | Volatility of Short-term Liabilities Growth | Volatility of Employment Growth |
|---|---|---|---|---|---|---|---|---|
| Developed Country Dummy | -0.085 | -0.083 | -0.1 | -0.107 | -0.294 | -0.15 | -0.158 | -0.008 |
| | (3.75)*** | (3.29)*** | (4.26)*** | (4.12)*** | (2.49)** | (2.93)*** | (2.66)** | (0.96) |
| R-squared | 0.24 | 0.2 | 0.29 | 0.28 | 0.12 | 0.16 | 0.14 | 0.02 |
| *N* | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 |

This table reports the coefficient estimates from the country-level volatility regressions. The dependent variables are the volatilities of total assets, cash, intangible assets, total liabilities, short-term liabilities, sales, profit, and employment. Volatility is defined as the time-series standard deviation of the country-level annual growth rate. Developed Country Dummy takes the value of one if the country is classified as a high-income economy and zero if the country is classified as a middle-income economy or lower. Also estimated but not reported is a constant term. Numbers in the parentheses are the t statistics. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 7 Panel A: Foreign Entry and Volatilities

| Y= Firm-Level Volatility | Volatility of Sales Growth | Volatility of Asset Growth | Volatility of Cash Holding Growth | Volatility of Profit Growth | Volatility of Intangible Assets Growth | Volatility of Total Debt Growth | Volatility of Short-term Liabilities Growth | Volatility of Employment Growth |
|---|---|---|---|---|---|---|---|---|
| Developed Country Dummy | 0.07 | 0.095 | 0.015 | 0.078 | -0.117 | 0.069 | 0.061 | 0.014 |
| | (9.95)*** | (17.53)*** | (1.32) | (8.48)*** | (8.26)*** | (5.83)*** | (4.12)*** | (2.39)** |
| Manufacturing Dummy | -0.08 | -0.089 | -0.067 | -0.018 | -0.098 | -0.14 | -0.146 | -0.061 |
| | (11.91)*** | (17.03)*** | (5.99)*** | (2.00)** | (7.57)*** | (12.16)*** | (10.35)*** | (11.37)*** |
| High-Tech Dummy | 0.015 | 0.036 | 0.005 | 0.02 | 0.074 | 0.195 | 0.158 | 0.013 |
| | (1.82)* | (5.53)*** | (0.33) | (1.74)* | (4.73)*** | (13.30)*** | (8.79)*** | (1.90)* |
| Size Quintile | -0.078 | -0.078 | -0.141 | -0.058 | -0.058 | -0.109 | -0.057 | -0.031 |
| | (29.64)*** | (39.05)*** | (32.42)*** | (16.24)*** | (11.26)*** | (24.01)*** | (10.04)*** | (14.62)*** |
| Incoming Mergers/ All Mergers | 0.086 | 0.078 | 0.161 | -0.063 | 0.124 | 0.129 | 0.171 | 0.046 |
| | (7.93)*** | (9.28)*** | (8.93)*** | (4.46)*** | (5.78)*** | (6.96)*** | (7.54)*** | (5.02)*** |
| Initial Volatility | 0.556 | 0.54 | 0.565 | 0.349 | 0.191 | 0.387 | 0.423 | 0.266 |
| | (24.53)*** | (20.32)*** | (38.74)*** | (15.30)*** | (10.72)*** | (18.04)*** | (22.10)*** | (12.61)*** |
| R-squared | 0.1 | 0.14 | 0.16 | 0.03 | 0.04 | 0.09 | 0.06 | 0.04 |
| *N* | 20149 | 21242 | 20975 | 17293 | 15943 | 18464 | 17874 | 16355 |

This table reports the coefficient estimates from the firm-level volatility regressions. The dependent variables are the volatilities of total assets, cash, intangible assets, total liabilities, short-term liabilities, sales, profit, and employment. Volatility is defined as the time-series standard deviation of the firm annual growth rate. The explanatory variables are Developed Country Dummy, Manufacturing Dummy, High-Tech Dummy, Size Quintile and Incoming Mergers/All Mergers. Developed Country Dummy takes the value of one if the country is classified as a high-income economy and zero if the country is classified as a middle-income economy or lower. Manufacturing Dummy is equal to one if the firm is in the manufacturing industries (SIC codes 2000-3999). High-Tech is equal to one if the firm is in the high-tech industry according to the American Electronic Association. Size Quintile is constructed from the cross-country distribution of total assets. Incoming Mergers/All Mergers is the sector-level aggregate inward cross-border M&As scaled by all (domestic and inward foreign) M&As from SDC. Sector classification is based on 17 Fama-French industries. To avoid reverse causality, the measure of foreign entry is computed from 1989-1998 data while the firm-level volatilities are computed from the non-overlapping period of 1999-2008 (as opposed to the full 1989-2008 sample in other specifications). Initial volatilities are the sector average of firm-level volatilities computed from 1989-1998 data. Also estimated but not reported is a constant term. Numbers in the parentheses are the t statistics. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 7 Panel B: Foreign Outflow and Volatilities

| Y= Firm-Level Volatility | Volatility of Sales Growth | Volatility of Asset Growth | Volatility of Cash Holding Growth | Volatility of Profit Growth | Volatility of Intangible Assets Growth | Volatility of Total Debt Growth | Volatility of Short-term Liabilities Growth | Volatility of Employment Growth |
|---|---|---|---|---|---|---|---|---|
| Developed Country Dummy | 0.057 | 0.088 | -0.03 | 0.079 | -0.139 | 0.042 | 0.033 | 0 |
| | (7.52)*** | (15.09)*** | (2.43)** | (7.94)*** | (9.22)*** | (3.30)*** | (2.06)** | (0.08) |
| Manufacturing Dummy | -0.071 | -0.079 | -0.059 | -0.028 | -0.086 | -0.133 | -0.132 | -0.06 |
| | (10.38)*** | (14.67)*** | (5.21)*** | (3.08)*** | (6.56)*** | (11.26)*** | (9.17)*** | (10.82)*** |
| High-Tech Dummy | 0.016 | 0.039 | 0.006 | 0.015 | 0.08 | 0.201 | 0.167 | 0.014 |
| | (1.88)* | (6.00)*** | (0.46) | (1.32) | (5.12)*** | (13.65)*** | (9.27)*** | (2.08)** |
| Size Quintile | -0.08 | -0.079 | -0.144 | -0.059 | -0.06 | -0.112 | -0.058 | -0.032 |
| | (29.87)*** | (38.94)*** | (32.74)*** | (16.31)*** | (11.74)*** | (24.31)*** | (10.19)*** | (14.83)*** |
| Outgoing Mergers/ All Mergers | 0.002 | -0.02 | 0.096 | 0.042 | 0.037 | 0.043 | 0.026 | 0.028 |
| | (0.16) | (1.91)* | (4.35)*** | (2.44)** | (1.44) | (1.91)* | (0.93) | (2.69)*** |
| Initial Volatility | 0.567 | 0.544 | 0.592 | 0.348 | 0.206 | 0.389 | 0.442 | 0.294 |
| | (24.80)*** | (20.27)*** | (39.74)*** | (15.07)*** | (11.68)*** | (18.07)*** | (23.03)*** | (14.30)*** |
| R-squared | 0.1 | 0.14 | 0.16 | 0.03 | 0.03 | 0.09 | 0.06 | 0.04 |
| *N* | 19971 | 21063 | 20796 | 17138 | 15854 | 18297 | 17711 | 16247 |

This table reports the coefficient estimates from the firm-level volatility regressions. The dependent variables are the volatilities of total assets, cash, intangible assets, total liabilities, short-term liabilities, sales, profit, and employment. Volatility is defined as the time-series standard deviation of the firm annual growth rate. The explanatory variables are Developed Country Dummy, Manufacturing Dummy, High-Tech Dummy, Size Quintile, and Outgoing Mergers/All Mergers. Developed Country Dummy takes the value of one if the country is classified as a high-income economy and zero if the country is classified as a middle-income economy or lower. Manufacturing Dummy is equal to one if the firm is in the manufacturing industries (SIC codes 2000-3999). High-Tech is equal to one if the firm is in the high-tech industry according to the American Electronic Association. Size Quintile is constructed from the cross-country distribution of total assets. Outgoing Mergers/All Mergers is the sector-level aggregate outward cross-border M&As scaled by all (domestic and outward foreign) M&As from SDC. Sector classification is based on 17 Fama-French industries. To avoid reverse causality, the measure of foreign entry is computed from 1989-1998 data while the firm-level volatilities are computed from the non-overlapping period of 1999-2008 (as opposed to the full 1989-2008 sample in other specifications). Initial volatilities are the sector average of firm-level volatilities computed from 1989-1998 data. Also estimated but not reported is a constant term. Numbers in the parentheses are the t statistics. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 8 Panel A: Technology and Volatilities

| Y= Firm-Level Volatility | Volatility of Sales Growth | Volatility of Asset Growth | Volatility of Cash Holding Growth | Volatility of Profit Growth | Volatility of Intangible Assets Growth | Volatility of Total Debt Growth | Volatility of Short-term Liabilities Growth | Volatility of Employment Growth |
|---|---|---|---|---|---|---|---|---|
| Developed Country Dummy | 0.041 | 0.074 | 0.029 | 0.056 | -0.168 | 0.101 | 0.171 | 0.049 |
| | (5.88)*** | (13.36)*** | (2.45)** | (7.17)*** | (13.38)*** | (9.61)*** | (13.26)*** | (8.83)*** |
| High-Tech Dummy | 0.013 | 0.023 | -0.084 | -0.009 | -0.003 | 0.116 | 0.074 | -0.004 |
| | (0.92) | (1.94)* | (3.42)*** | (0.54) | (0.11) | (5.22)*** | (2.70)*** | (0.33) |
| Developed Country Dummy x High Tech | 0.056 | 0.085 | 0.078 | 0.077 | 0.142 | 0.106 | 0.104 | 0.021 |
| | (3.42)*** | (6.42)*** | (2.81)*** | (4.04)*** | (5.16)*** | (4.18)*** | (3.34)*** | (1.56) |
| Size Quintile | -0.121 | -0.119 | -0.246 | -0.076 | -0.062 | -0.138 | -0.077 | -0.057 |
| | (53.68)*** | (68.00)*** | (66.13)*** | (28.06)*** | (16.36)*** | (41.05)*** | (18.62)*** | (34.70)*** |
| R-squared | 0.09 | 0.14 | 0.11 | 0.03 | 0.02 | 0.07 | 0.03 | 0.04 |
| *N* | 34207 | 36275 | 35751 | 27581 | 26344 | 31709 | 30545 | 30310 |

This table reports the coefficient estimates from the firm-level volatility regressions. The dependent variables are the volatilities of total assets, cash, intangible assets, total liabilities, short-term liabilities, sales, profit, and employment. Volatility is defined as the time-series standard deviation of the firm annual growth rate. The explanatory variables are Developed Country Dummy, High-Tech Dummy, the interaction term between Developed Country Dummy and High-Tech Dummy, as well as Size Quintile. Developed Country Dummy takes the value of one if the country is classified as a high-income economy and zero if the country is classified as a middle-income economy or lower. High-Tech is equal to one if the firm is in the high-tech industry according to the American Electronic Association. Size Quintile is constructed from the cross-country distribution of total assets. Also estimated but not reported is a constant term. Numbers in the parentheses are the t statistics. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 8 Panel B: External Finance Dependency and Volatilities

| Y= Firm-Level Volatility | Volatility of Sales Growth | Volatility of Asset Growth | Volatility of Cash Holding Growth | Volatility of Profit Growth | Volatility of Intangible Assets Growth | Volatility of Total Debt Growth | Volatility of Short-term Liabilities Growth | Volatility of Employment Growth |
|---|---|---|---|---|---|---|---|---|
| Developed Country Dummy | -0.01 | 0.029 | 0.047 | 0.011 | -0.227 | 0.027 | 0.104 | 0.036 |
| | (0.73) | (2.56)** | (1.89)* | (0.65) | (8.60)*** | (1.19) | (3.74)*** | (3.14)*** |
| External Dependency | 0.066 | 0.071 | -0.134 | -0.017 | -0.031 | 0.138 | 0.082 | 0.017 |
| | (2.92)*** | (3.98)*** | (3.40)*** | (0.62) | (0.76) | (3.77)*** | (1.82)* | (0.87) |
| Developed Country Dummy x External Dependency | 0.159 | 0.155 | 0.078 | 0.188 | 0.181 | 0.254 | 0.228 | 0.037 |
| | (5.86)*** | (7.26)*** | (1.65)* | (5.60)*** | (3.70)*** | (5.76)*** | (4.23)*** | (1.67)* |
| Size Quintile | -0.101 | -0.096 | -0.248 | -0.067 | -0.048 | -0.124 | -0.083 | -0.048 |
| | (35.01)*** | (42.68)*** | (49.90)*** | (17.85)*** | (9.38)*** | (26.80)*** | (14.61)*** | (22.20)*** |
| R-squared | 0.1 | 0.14 | 0.13 | 0.03 | 0.02 | 0.08 | 0.04 | 0.04 |
| *N* | 17628 | 18133 | 17953 | 14509 | 13783 | 16412 | 15985 | 15407 |

This table reports the coefficient estimates from the firm-level volatility regressions. The dependent variables are the volatilities of total assets, cash, intangible assets, total liabilities, short-term liabilities, sales, profit, and employment. Volatility is defined as the time-series standard deviation of the firm annual growth rate. The explanatory variables are Developed Country Dummy, External Finance Dependency Indicator, the interaction term between Developed Country Dummy and External Finance Dependency Indicator, as well as Size Quintile. Developed Country Dummy takes the value of one if the country is classified as a high-income economy and zero if the country is classified as a middle-income economy or lower. External Finance Dependency Indicator is from Rajan and Zingales (1998). Size Quintile is constructed from the cross-country distribution of total assets. Also estimated but not reported is a constant term. Numbers in the parentheses are the t statistics. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 8 Panel C: Small-Firm Dominance and Volatilities

| Y= Firm-Level Volatility | Volatility of Sales Growth | Volatility of Asset Growth | Volatility of Cash Holding Growth | Volatility of Profit Growth | Volatility of Intangible Assets Growth | Volatility of Total Debt Growth | Volatility of Short-term Liabilities Growth | Volatility of Employment Growth |
|---|---|---|---|---|---|---|---|---|
| Developed Country Dummy | 0.146 | 0.185 | 0.108 | 0.119 | -0.086 | 0.263 | 0.305 | 0.073 |
| | (9.48)*** | (15.11)*** | (4.03)*** | (6.33)*** | (3.03)*** | (10.50)*** | (10.03)*** | (5.87)*** |
| Small Firm Industry | -0.001 | -0.001 | -0.001 | 0.001 | 0.001 | 0.004 | 0.005 | -0.001 |
| | (0.85) | (1.00) | (0.18) | (0.48) | (0.39) | (1.30) | (1.62) | (0.93) |
| Developed Country Dummy x Small Firm Industry | -0.01 | -0.01 | -0.006 | -0.003 | -0.008 | -0.014 | -0.012 | -0.003 |
| | (4.83)*** | (6.12)*** | (1.55) | (1.14) | (1.99)** | (4.10)*** | (2.89)*** | (1.49) |
| Size Quintile | -0.11 | -0.105 | -0.243 | -0.072 | -0.054 | -0.141 | -0.096 | -0.05 |
| | (39.23)*** | (48.00)*** | (50.52)*** | (19.44)*** | (10.84)*** | (31.05)*** | (17.31)*** | (23.97)*** |
| R-squared | 0.09 | 0.13 | 0.13 | 0.03 | 0.02 | 0.07 | 0.03 | 0.04 |
| *N* | 17628 | 18133 | 17953 | 14509 | 13783 | 16412 | 15985 | 15407 |

This table reports the coefficient estimates from the firm-level volatility regressions. The dependent variables are the volatilities of total assets, cash, intangible assets, total liabilities, short-term liabilities, sales, profit, and employment. Volatility is defined as the time-series standard deviation of the firm annual growth rate. The explanatory variables are Developed Country Dummy, Small Firm Industry Indicator, the interaction term between Developed Country Dummy and Small Firm Industry Indicator, as well as Size Quintile. Developed Country Dummy takes the value of one if the country is classified as a high-income economy and zero if the country is classified as a middle-income economy or lower. Small Firm Industry Indicator is from Beck, Demirguc-Kunt, Laeven, and Levine (2008). Size Quintile is constructed from the cross-country distribution of total assets. Also estimated but not reported is a constant term. Numbers in the parentheses are the t statistics. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 8 Panel D: Rivalry among Industry Leaders

| Y= Volatilities of Industry Leader's Market Share | Market Share among the Top 2 Firms | | | Market Share among the Top 5 Firms | | |
|---|---|---|---|---|---|---|
| | Technological Intensity | External Dependency | Small Firm Dominance | Technological Intensity | External Dependency | Small Firm Dominance |
| Developed Country Dummy | 0.506 | -0.045 | 0.477 | 0.496 | 0.002 | 0.56 |
| | (11.15)*** | (0.50) | (4.48)*** | (11.49)*** | (0.02) | (5.55)*** |
| High-Tech Dummy | 1.18 | | | 1.16 | | |
| | (8.74)*** | | | (9.03)*** | | |
| Developed Country Dummy x High Tech | 0.399 | | | 0.419 | | |
| | (2.58)*** | | | (2.85)*** | | |
| External Dependency | | 0.723 | | | 0.704 | |
| | | (3.91)*** | | | (4.02)*** | |
| Developed Country Dummy x External Dependency | | 0.687 | | | 0.584 | |
| | | (3.20)*** | | | (2.87)*** | |
| Small Firm Industry | | | 0.012 | | | 0.026 |
| | | | (0.98) | | | (2.29)** |
| Developed Country Dummy x Small Firm Industry | | | -0.032 | | | -0.043 |
| | | | (2.29)** | | | (3.33)*** |
| Year | 0.108 | 0.09 | 0.093 | 0.106 | 0.088 | 0.091 |
| | (25.71)*** | (17.18)*** | (17.79)*** | (26.48)*** | (17.71)*** | (18.28)*** |
| R-squared | 0.02 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 |
| *N* | 67615 | 38638 | 38638 | 67615 | 38638 | 38638 |

This table reports the coefficient estimates from the market share volatility regressions. The dependent variables are the volatilities of industry leader's market share. In each year, we identify the largest two (five) firms in each four-digit SIC industry in each country. We track the size of these two (five) firms over the next five years. Then, we compute the volatilities of market share of the largest firms. Volatility is defined as the time-series standard deviation of the market share. The first three columns report the results from the top two firms' market shares. The last three columns report the results from the top five firms' market shares. The explanatory variables are developed country dummy, industry indicators (high-tech, external finance, and small firm industries), the interactions between developed country dummy and industry indicators. and Year. High-Tech is equal to one if the firm is in the high-tech industry according to the American Electronic Association. External Finance Dependency Indicator is from Rajan and Zingales (1998). Small Firm Industry Indicator is from Beck, Demirguc-Kunt, Laeven, and Levine (2008). Also estimated but not reported is a constant term. Numbers in the parentheses are the t statistics. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 9: Reactions to Productivity Shocks

| Shock =Growth in Value Added | Sales Growth | Asset Growth | Cash Holding Growth | Profit Growth | Intangible Assets Growth | Total Debt Growth | Short-term Liabilities Growth | Employment Growth |
|---|---|---|---|---|---|---|---|---|
| Shock | 0.124 | 0.09 | 0.128 | 0.216 | 0.094 | 0.056 | 0.081 | 0.06 |
| | (8.42)*** | (6.77)*** | (3.89)*** | (8.81)*** | (2.40)** | (2.00)** | (2.10)** | (4.33)*** |
| Shock x Developed Country Dummy | 0.141 | 0.15 | 0.255 | 0.254 | 0.15 | 0.108 | 0.077 | -0.007 |
| | (7.33)*** | (8.69)*** | (5.92)*** | (7.78)*** | (3.15)*** | (2.90)*** | (1.52) | (0.42) |
| Firm Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.26 | 0.25 | 0.15 | 0.18 | 0.19 | 0.19 | 0.14 | 0.22 |
| *N* | 102402 | 105775 | 103403 | 72911 | 76752 | 88967 | 85296 | 88013 |

This table reports the coefficient estimates from the reactions-to-productivity-shocks regressions. The dependent variables are the growth rate of sales, total assets, cash, profit, intangible assets, total liabilities, short-term liabilities, and employment. The explanatory variables are Productivity Shocks and the interaction between Productivity Shocks and Developed Country dummy. Productivity Shock is the percentage change in value added from the UNIDO Database. Developed Country Dummy takes the value of one if the country is classified as a high-income economy and zero if the country is classified as a middle-income economy or lower. Also estimated but not reported are the firm-fixed effects. Numbers in the parentheses are the t statistics. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 10: Difference-in-Difference Analysis for Cash Holdings

| Y= Cash/Total Assets | Technological Intensity | External Dependency | Small Firm Dominance | Foreign Inflows | Foreign Outflows |
|---|---|---|---|---|---|
| Developed Country Dummy | 6.013 | -0.317 | 13.807 | 5.88 | 5.966 |
| | (70.43)*** | (1.82)* | (68.45)*** | (60.81)*** | (57.63)*** |
| High-Tech Dummy | 4.564 | | | 7.206 | 7.208 |
| | (23.24)*** | | | (61.60)*** | (61.54)*** |
| Developed Country Dummy x High Tech | 6.39 | | | | |
| | (29.90)*** | | | | |
| External Dependency | | 6.245 | | | |
| | | (20.10)*** | | | |
| Developed Country Dummy x External Dependency | | 16.66 | | | |
| | | (47.27)*** | | | |
| Small Firm Industry | | | -0.053 | | |
| | | | (2.21)** | | |
| Developed Country Dummy x Small Firm Industry | | | -0.733 | | |
| | | | (26.40)*** | | |
| Incoming Mergers/ All Mergers | | | | 0.179 | |
| | | | | (1.18) | |
| Outgoing Mergers/ All Mergers | | | | | -0.604 |
| | | | | | (3.33)*** |
| Manufacturing Dummy | | | | -3.945 | -3.782 |
| | | | | (42.90)*** | (40.04)*** |
| Size Quintile | -2.797 | -1.784 | -2.633 | -2.913 | -2.926 |
| | (123.70)*** | (57.31)*** | (83.58)*** | (87.13)*** | (86.62)*** |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.13 | 0.16 | 0.09 | 0.12 | 0.12 |
| *N* | 361300 | 188503 | 188503 | 151521 | 150386 |

This table reports the coefficient estimates from the cash holding regressions. The dependent variable is Cash/Total Assets. Developed Country dummy takes the value of one if the country is classified as a high-income economy and zero if the country is classified as a middle-income economy or lower. Manufacturing Dummy is equal to one if the firm is in the manufacturing industries (SIC codes 2000-3999). High-Tech is equal to one if the firm is in the high-tech industry according to the American Electronic Association. External Finance Dependency Indicator is from Rajan and Zingales (1998). Small Firm Industry Indicator is from Beck, Demirguc-Kunt, Laeven, and Levine (2008). Incoming Mergers/All Mergers is the sector-level aggregate inward cross-border M&As scaled by all (domestic and inward foreign) M&As. Outgoing Mergers/All Mergers is the sector-level aggregate outward cross-border M&As scaled by all (domestic and outward foreign) M&As. Size Quintile is constructed from the cross-country distribution of total assets. To avoid reverse causality, the measure of foreign entry is computed from 1989-1998 data while Cash/Total Assets in the last two columns are restricted to the non-overlapping period of 1999-2008 (as opposed to the full 1989-2008 sample in other specifications). Also estimated but not reported are a constant term and the year fixed-effects. Numbers in the parentheses are the t statistics. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table11 Panel A: Institution and Cash Holding

| Y=Cash/Total Assets; Institution= | Ease of Doing Business Rank | Judiciary Efficiency | Rule of Law | Corruption | Accounting Standard | Log of Per Capita GDP in 1980 | Stock Market Capitalization/ GDP in 1980 | Investment-Q Sensitivity | Share Issue-Q Sensitivity | Debt Issue -Q Sensitivity |
|---|---|---|---|---|---|---|---|---|---|---|
| Institution | -0.068 | 1.697 | 1.715 | 1.624 | 0.122 | 1.87 | 4.466 | 27.771 | 10.305 | 9.32 |
| | (72.05)*** | (84.58)*** | (91.99)*** | (72.06)*** | (38.18)*** | (76.60)*** | (35.07)*** | (40.30)*** | (50.92)*** | (56.08)*** |
| Manufacturing Dummy | -2.324 | -2.379 | -2.143 | -2.217 | -2.663 | -2.064 | -2.609 | -2.512 | -2.358 | -2.366 |
| | (36.43)*** | (36.19)*** | (32.54)*** | (33.43)*** | (40.16)*** | (31.37)*** | (38.01)*** | (37.66)*** | (35.31)*** | (35.56)*** |
| High-Tech Dummy | 10.267 | 10.433 | 10.258 | 10.679 | 10.955 | 10.445 | 11.082 | 10.95 | 10.772 | 10.727 |
| | (129.76)*** | (127.92)*** | (125.78)*** | (130.86)*** | (133.64)*** | (128.35)*** | (131.06)*** | (133.64)*** | (131.34)*** | (130.88)*** |
| Size Quintile | -2.69 | -2.81 | -2.826 | -2.777 | -2.703 | -2.828 | -2.788 | -2.6 | -2.567 | -2.6 |
| | (118.16)*** | (120.54)*** | (121.43)*** | (118.82)*** | (114.85)*** | (121.11)*** | (114.80)*** | (109.24)*** | (108.09)*** | (110.19)*** |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.12 | 0.13 | 0.14 | 0.13 | 0.12 | 0.13 | 0.12 | 0.12 | 0.12 | 0.12 |
| *N* | 360629 | 342967 | 342967 | 342967 | 342967 | 347161 | 324074 | 342967 | 342967 | 342967 |

This table reports the coefficient estimates from the cash holding regressions. The dependent variable is Cash/Total Assets. The explanatory variables are Institutional Indicator, Manufacturing Dummy, High-Tech Dummy, and Size Quintile. Institutional Indicators are Ease of Doing Business Rank from the World Bank's doing business indicator, Judiciary Efficiency, Rule of Law, Corruption, Accounting Standard from La Porta et. al (1998), 1980 Log of Per Capita GDP from World Development Indicator Database, 1980 Stock Market Capitalization per GDP from Rajan and Zingales (1998), investment sensitivity, share issue sensitivity, and debt issue sensitivity to Tobin's Q from McLean, Zhang, and Zhao (2012). Manufacturing Dummy is equal to one if the firm is in the manufacturing industries (SIC codes 2000-3999). High-Tech is equal to one if the firm is in the high-tech industry according to the American Electronic Association. Size Quintile is constructed from the cross-country distribution of total assets. Also estimated but not reported are a constant term and the year fixed-effects. Numbers in the parentheses are the t statistics. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 11 Panel B: Institution and Firm- Level Risk

| Y=Volatility of Sales Growth; Institution= | Ease of Doing Business Rank | Judiciary Efficiency | Rule of Law | Corruption | Accounting Standard | Log of Per Capita GDP in 1980 | Stock Market Capitalization/ GDP in 1980 | Investment-Q Sensitivity | Share Issue-Q Sensitivity | Debt Issue -Q Sensitivity |
|---|---|---|---|---|---|---|---|---|---|---|
| Institution | -0.001 | 0.014 | 0.03 | 0.025 | 0.004 | 0.027 | 0.115 | 1.982 | 0.571 | 0.427 |
| | (15.53)*** | (7.71)*** | (19.06)*** | (12.96)*** | (12.35)*** | (13.37)*** | (10.42)*** | (32.17)*** | (31.35)*** | (28.84)*** |
| Manufacturing Dummy | -0.09 | -0.099 | -0.086 | -0.091 | -0.096 | -0.089 | -0.097 | -0.076 | -0.073 | -0.078 |
| | (15.41)*** | (16.22)*** | (14.16)*** | (14.79)*** | (15.88)*** | (14.74)*** | (15.40)*** | (12.53)*** | (12.11)*** | (12.90)*** |
| High-Tech Dummy | 0.056 | 0.063 | 0.052 | 0.061 | 0.063 | 0.058 | 0.064 | 0.052 | 0.047 | 0.048 |
| | (8.08)*** | (8.68)*** | (7.12)*** | (8.36)*** | (8.67)*** | (8.03)*** | (8.51)*** | (7.23)*** | (6.58)*** | (6.68)*** |
| Size Quintile | -0.118 | -0.119 | -0.122 | -0.12 | -0.117 | -0.123 | -0.12 | -0.111 | -0.112 | -0.115 |
| | (52.55)*** | (50.94)*** | (52.27)*** | (51.42)*** | (50.22)*** | (52.65)*** | (49.74)*** | (48.20)*** | (48.31)*** | (49.62)*** |
| R-squared | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.12 | 0.12 | 0.12 |
| *N* | 34120 | 31984 | 31984 | 31984 | 31984 | 32594 | 30221 | 31984 | 31984 | 31984 |

This table reports the coefficient estimates from the volatility regressions. The dependent variable is the volatilities of sales growth. The explanatory variables are Institutional Indicator, Manufacturing Dummy, High-Tech Dummy, and Size Quintile. Institutional Indicators are Ease of Doing Business Rank from the World Bank's doing business indicator, Judiciary Efficiency, Rule of Law, Corruption, Accounting Standard from La Porta et. al (1998), 1980 Log of Per Capita GDP from World Development Indicator Database, 1980 Stock Market Capitalization per GDP from Rajan and Zingales (1998), investment sensitivity, share issue sensitivity, and debt issue sensitivity to Tobin's Q from McLean, Zhang, and Zhao (2012). Manufacturing Dummy is equal to one if the firm is in the manufacturing industries (SIC codes 2000-3999). High-Tech is equal to one if the firm is in the high-tech industry according to the American Electronic Association. Size Quintile is constructed from the cross-country distribution of total assets. Also estimated but not reported is a constant term. Numbers in the parentheses are the t statistics. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 12 Panel A: Cash Holding and Volatilities

| Y=Cash/Total Assets | Sample = U.S. Firms Only | | Sample = All Countries | | | Non-Overlapping Sample |
|---|---|---|---|---|---|---|
| Country-Level Aggregate Sales Volatility | | | -3.989 | | | |
| | | | (4.81)*** | | | |
| Sector-Level Aggregate Sales Volatility | 5.633 | | | -2.182 | | |
| | (2.07)** | | | (5.69)*** | | |
| Firm-Level Sales Volatility | | 29.169 | | | 10.101 | 9.83 |
| | | (45.28)*** | | | (56.04)*** | (30.88)*** |
| Developed Country Dummy | | | 6.236 | 6.399 | 5.97 | 7.45 |
| | | | (56.19)*** | (73.03)*** | (74.64)*** | (76.27)*** |
| Manufacturing Dummy | -0.744 | 1.164 | -2.124 | -2.147 | -1.322 | -2.198 |
| | (5.02)*** | (7.69)*** | (33.34)*** | (33.63)*** | (20.32)*** | (26.15)*** |
| High-Tech Dummy | 13.271 | 10.742 | 10.168 | 10.159 | 9.587 | 10.076 |
| | (83.61)*** | (64.51)*** | (128.55)*** | (128.37)*** | (121.03)*** | (102.05)*** |
| Size Quintile | -3.924 | -3.644 | -2.744 | -2.755 | -2.468 | -3.13 |
| | (81.90)*** | (76.17)*** | (120.81)*** | (121.31)*** | (106.65)*** | (107.25)*** |
| Year Fixed-Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.16 | 0.18 | 0.13 | 0.13 | 0.14 | 0.14 |
| *N* | 103351 | 103351 | 361300 | 361268 | 361268 | 244090 |

This table reports the coefficient estimates from the cash holding regressions. The dependent variable is Cash/Total Assets. Country-level volatility is defined as the standard deviation of average sales growth in one country. Sector-level volatility is defined as the standard deviation of average sales growth in one sector. Firm-level volatility is defined as the standard deviation of firm-level sales growth. To alleviate the endogeneity problem, firm-level volatilities were averaged across all firms in their sector before they are included in the regressions. Developed Country dummy takes the value of one if the country is classified as a high-income economy and zero if the country is classified as a middle-income economy or lower. Manufacturing Dummy is equal to one if the firm is in the manufacturing industries (SIC codes 2000-3999). High-Tech is equal to one if the firm is in the high-tech industry according to the American Electronic Association. Size Quintile is constructed from the cross-country distribution of total assets. In the last column, the measure of firm-level volatility is computed from 1989-1998 data while Cash/Total Assets are restricted to the non-overlapping period of 1999-2008 (as opposed to the full 1989-2008 sample in other specifications). Also estimated but not reported are a constant term and the year fixed-effects. Numbers in the parentheses are the t statistics. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 12 Panel B: Cash Holding, Volatilities, and Firm Characteristics

| Y=Cash/Total Assets | | | | | | | |
|---|---|---|---|---|---|---|---|
| Firm-Level Sales Volatility | 10.101 | 8.618 | 8.567 | 12.292 | 13.945 | 15.188 | 12.625 |
| | (56.04)*** | (46.50)*** | (45.28)*** | (61.05)*** | (55.63)*** | (37.81)*** | (32.62)*** |
| Developed Country Dummy | 5.97 | 5.16 | 5.588 | 4.876 | 4.94 | 3.747 | 2.751 |
| | (74.64)*** | (62.86)*** | (64.06)*** | (54.75)*** | (46.18)*** | (19.65)*** | (14.91)*** |
| Manufacturing Dummy | -1.322 | -1.26 | -1.174 | -1.264 | -0.952 | -2.443 | -1.73 |
| | (20.32)*** | (18.98)*** | (17.24)*** | (17.80)*** | (11.39)*** | (18.89)*** | (13.79)*** |
| High-Tech Dummy | 9.587 | 9.421 | 9.648 | 9.601 | 10.227 | 7.367 | 6.921 |
| | (121.03)*** | (115.37)*** | (115.14)*** | (111.59)*** | (103.32)*** | (53.31)*** | (51.38)*** |
| Size Quintile | -2.468 | -2.294 | -2.268 | -2.304 | -2.314 | -1.709 | -0.958 |
| | (106.65)*** | (96.02)*** | (91.50)*** | (90.57)*** | (79.02)*** | (37.54)*** | (21.26)*** |
| Lagged Leverage | | -0.1 | -0.099 | -0.096 | -0.089 | -0.115 | -0.146 |
| | | (94.33)*** | (91.20)*** | (86.60)*** | (72.95)*** | (65.41)*** | (79.47)*** |
| Lagged Dividend Dummy | | | -0.002 | -0.002 | -0.002 | -0.002 | -0.002 |
| | | | (15.78)*** | (14.47)*** | (13.94)*** | (13.25)*** | (13.64)*** |
| Lagged Capital Expenditure/Total Assets | | | | -0.234 | -0.253 | -0.343 | -0.396 |
| | | | | (51.37)*** | (47.85)*** | (38.77)*** | (43.80)*** |
| Lagged Acquisitions/Total Assets | | | | | -0.352 | -0.392 | -0.348 |
| | | | | | (45.93)*** | (33.15)*** | (30.56)*** |
| Lagged R&D/Total Assets | | | | | | 0.387 | 0.318 |
| | | | | | | (86.39)*** | (66.56)*** |
| Lagged Tobin's Q/Total Assets | | | | | | | 0.893 |
| | | | | | | | (57.85)*** |
| Year Fixed-Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.14 | 0.16 | 0.16 | 0.18 | 0.19 | 0.28 | 0.31 |
| *N* | 361268 | 312189 | 298090 | 279656 | 216918 | 104175 | 94624 |

This table reports the coefficient estimates from the cash holding regressions. The dependent variable is Cash/Total Assets. Firm-level volatility is defined as the standard deviation of firm-level sales growth. To alleviate the endogeneity problem, firm-level volatilities were averaged across all firms in their sector before they are included in the regressions. Developed Country dummy takes the value of one if the country is classified as a high-income economy and zero if the country is classified as a middle-income economy or lower. Manufacturing Dummy is equal to one if the firm is in the manufacturing industries (SIC codes 2000-3999). High-Tech is equal to one if the firm is in the high-tech industry according to the American Electronic Association. Size Quintile is constructed from the cross-country distribution of total assets. Leverage, Dividend Dummy, Capital Expenditure/Total Assets, Acquisitions/Total Assets, R&D/Total Assets, and Tobin's Q are from the WorldScope. Also estimated but not reported are a constant term and the year fixed-effects. Numbers in the parentheses are the t statistics. The *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.