ESSAYS ON MULTINATIONAL FINANCIAL MANAGEMENT

by

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ABSTRACT OF THE DISSERTATION

Essays on Multinational Financial Management

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Rose Liao

My dissertation comprises of two essays: 1) Difference in responses to currency crisis between multinational firms and local firms: the use of foreign currency debt and 2) the impact of internal capital markets on the cash holdings of subsidiaries of multinational corporations. The first essay looks at the differential responses to currency crisis between multinational affiliates and local firms when both have exposure to foreign currency debt. Previous papers (Desai, Foley and Forbes, 2008) have found that U.S. multinational affiliates use their internal capital markets to capitalize on the benefits of large currency depreciation and increase sales and investment significantly more than local firms. We trace this differential response to the use of foreign currency debt. We find that local firms without foreign currency debt are less affected by currency depreciation. In addition, multinational affiliates whose parent firms are also affected by currency crisis in their home country decreases sales and assets more. The second essay examines the impact of internal capital markets on the cash holdings of emerging market subsidiaries of multinational corporations. We examine a panel of 489 multinational firms (with 2208 subsidiaries) and 749 local firms across seven countries from 2004 to 2013 and find that emerging market subsidiaries of multinational firms tend to hold significantly less cash than their emerging

market competitors (local firms). This finding is suggestive of the existence of a favorable internal capital market for these subsidiaries. In addition, we examine the impact of the 2009-2010 sovereign debt crisis on cash holdings and find that, after the crisis, firms hold less cash in general and the difference in cash holdings between subsidiaries and their local counterparts decreases. Lastly, we find that the domicile of the parent company matters. When the parent is located in developed countries, there seems to be an effective internal capital market, and the multinational affiliates tend to hold less cash than the local competitors. In contrast, when the parent firms are located in developing countries, the multinational affiliates seem to derive little benefit from the internal capital market, and there is no significant difference in cash holdings.

DEDICATION

To my parents

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1: Difference in Responses to Currency Crisis between Multinational Firms and Local Firms: The Use of Foreign Currency Debt

1.1 Introduction

The recent global crisis had a significant impact on firm financial and investment policy (e.g., Bliss, Cheng, and Denis, 2013; Dewally and Shao, 2014, Kahle and Stulz, 2013; and Pinkowitz, Stulz, and Williamson 2013; Duchin, Ozbas, and Sensoy, 2010; Almeida, Campello, Laranjeira, and Weisbenner, 2012). The depth, spread, and severity of the crisis have led many economists to examine macro patterns and international linkages (Rose and Spiegel, 2010). However, these economic shocks affect both investment opportunities and financial policies at the same time. To isolate shocks to different sides of the balance sheets, researchers often resort to study different groups of firms such as bank dependent firms and non-bank dependent firms (Kale and Stulz, 2013).

In this paper, we study currency crisis that simultaneously *improves* investment opportunities and increases leverage and financial constraints. Currency depreciation can improve the competitiveness of firms, but at the same time, increase the financial leverage of firms that prevent them from taking advantage of more investment opportunities. Financial leverage for firms with foreign debt exposure will increase immediately following currency depreciation, unless these firms are part of a multinational conglomerate that allows the subsidiaries to borrow from the headquarter firm. Therefore, to isolate the effects of financial constraints on firm growth, we focus on the impact of

currency crisis for local firms with foreign debt exposure. [1]

We examine a sample of 1,047 multinational firms (with 20,584 subsidiaries) and 4,022 local firms in 28 countries. We separate the countries into two groups, those that suffered currency crisis[2] (referred to as "crisis" from now on) and those that did not. The companies may suffer currency crisis in certain years while not in other years. Our sample includes *1,010* multinational companies with *17,053* subsidiaries (*2,931* local firms) in the years of crisis, and *1,046* multinational companies with *20,556* subsidiaries (*4,013* local firms) in the years of non-crisis.

The median firm in our sample has $23 ($13) million in net sales (total assets). The median subsidiary has $17 ($9) million in net sales (total assets), whereas the median local firm has $70 ($81) million in net sales (total assets). In our sample, 44% (50%) of the firms have experienced a currency crisis in at least one year; this percentage is higher (50.2%) within the subsample of subsidiary firms. In our sample of local firms, 7.4% of them have foreign debt in at least one year.

Firms vary considerably between periods of crisis and non-crisis. For example, the median firm in crisis years has 9.8% assets growth and 15% sales growth, whereas in non-crisis years those numbers are 1.7% and 2%, respectively. The median capital expenditure as a proportion of total assets (fixed assets) is 1.8% (16.2%) in crisis periods, but much lower in non-crisis periods (0.5% and 7.3%, respectively).

We first investigate if multinational firms respond differently from local firms to currency crisis. We examine assets and sales as well as investment expenditures (following

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[1] Bruno and Shin (2015) show that many firms outside of the US borrow in US dollars.

[2] Currency crisis is defined as those periods when the quarterly real exchange rate of the country increased by over 25% to the value of quarterly exchange rate one year earlier, excluding the periods when last year is already in crisis (Desai et al., 2008).

Desai et al., 2008). We find that, following a depreciation crisis, multinational firms have considerably higher sales growth (4.3%) and assets growth (5.3%) than that of local. In contrast to local firms, multinational firms do not reduce their investments overall during currency crisis; their capital expenditures over net property plant and equipment (or over total assets) are significantly higher than those of local firms following a currency crisis.

To identify the real source of the differential responses, we further investigate whether local firms themselves respond differently to crisis depending on their foreign debt exposure. We define foreign debt using two proxies. First, we use a dummy variable – Foreign debt year dummy – that equals one if, in a given year, the firm has foreign debt (that has been issued previously and has not yet matured). We find that post depreciation crisis, local firms with foreign debt experienced a decrease in sales (12.4%) and assets (7%) compared to those without foreign debt. Alternatively, we identify firms with foreign debt in a given year as those that have issued foreign debt in that year or in the previous three years. The results are qualitatively the same using both proxies.

Since firms that issue foreign debt may have different characteristics from those that do not, we use a one-to-one matching technique, where each firm with foreign debt is matched to a firm with no foreign debt from the same country and year that is the closest in size (total assets). We find comparable results using either the full sample or the matched sample.

Our central hypothesis is that local firms with foreign debt are more affected by currency crisis due to the increased debt burden. We test this hypothesis directly by also providing evidence on whether financial policies respond differently among local firms with and without foreign debt. We find that during currency depreciation crisis, investment

sensitivity to cash flows are higher among local firms with foreign debt. The effect of a one-standard deviation shock to the cash flows affects the investment expenditures eight times more for firms with foreign debt, when investment is measured by capital expenditures scaled by total assets. The difference is robust and even larger when we examine capital expenditures scaled by lagged capital stock. Since local firms with foreign debt become more constrained during crisis, foreign debt is the source of differential responses between local firms and multinational firms.

Finally, our sample is based on a broad range of countries, which allows us to test how the multinational parent firm's financial condition affects their subsidiaries. If a multinational parent firm is in crisis countries and has foreign debt exposure, then we expect the subsidiaries of that firm to be affected as well. We find that the subsidiaries of multinational firms with foreign debt and multinational firms in crisis have much lower sales (10.1%) and assets (17.1%) compared to those without a depreciation crisis.

Our paper contributes to the growing literature on the impact of financial crisis on firm policy. Stulz and Kale (2013) show that firms' cash holdings exhibit a U-shape during the crisis. Bliss, Cheng, and Denis (2013) find significant reductions in corporate payouts – both dividends and (to a larger extent) share repurchases - during the crisis. Dewally and Shao (2014) show that during the crisis the change in leverage of bank-dependent firms is less than that of firms with access to public debt markets. Bank-dependent firms rely more on cash than net equity issuance to finance operations. Our paper focus on currency crisis and find that financial and investment policies differ across firms.

This paper also relates to the series of papers that investigate the performance of multinational firms and their roles in financial crisis (see Alfaro and Chen, 2010). Most of

these papers focus on the transmission of economic shocks from the multinational parent firm to their foreign subsidiaries and often compare multinational firms to local firms in crisis countries. Alfaro and Chen (2010) research on the role of foreign direct investment and show that multinational owned establishments performed better than their local competitors around the world when they faced the global financial crisis. Desai, Foley and Forbes (2008) find that sales, assets, and investments increase significantly more for U.S. multinational affiliates than for local firms when they investigate their response to sharp currency depreciations. Alvarez and Görg (2007) evaluate the response of multinational and domestic firms to an economic downturn in Chile, and find no difference between multinationals and domestic firms in their reaction to the economic crisis. We further contribute to this line of research by examining local firms with foreign debt separately.

The remainder of the paper proceeds as follows. Section I discusses previous literature and our empirical methodology. Section II describes the data, while Section III presents the results. Section IV concludes.

1.2 Hypotheses and Methodology

We analyze the relative performance of multinational and local firms during currency crises and focus on their exposure to foreign debt. Our analysis integrates the literature on firm performance during currency crises with that on the role of internal capital markets of global firms. In this section, we review these literatures and outline our empirical methodology.

1.2.1 Literature Review

A growing number of papers study the real effects of the crisis on the corporate sector. Most of them focus on the impact of financial crisis on corporate investment and find that

corporate investment decreases after the crisis (e.g., Duchin, Ozbas, and Sensoy, 2010; Kahle and Stulz, 2013; Almeida, Campello, Laranjeira, and Weisbenner, 2011; Lins, Volpin and Wagner, 2012). Tong and Wei (2008) focus on stock price changes following the crisis. Other papers examine the impact of financial crisis on the financing policies/financial constraints and there is often conflicting evidence (e.g., Bliss, Cheng, and Denis, 2013; Dewally and Shao, 2014, Kahle and Stulz, 2013; and Pinkowitz, Stulz, and Williamson 2013). Most of the papers that examine the impact of financial crisis on firm policy focus on domestic companies (e.g., Kahle and Stulz, 2013; Dewally and Shao, 2014, Bliss, Cheng, and Denis (2013)). Pinkowitz, Stulz, and Williamson (2013) extend this line of research to multinational companies, but they focus on the US multinational companies Campello, Graham, and Harvey (2010) survey corporate managers and conclude that companies experienced credit rationing, higher costs of borrowing, and difficulties in initiating or renewing credit lines during the crisis.

A related but smaller literature examines the effect of currency crisis on firm policy. Forbes (2002) shows that following currency crisis, smaller firms with lower leverage, and foreign sales exposure tend to outperform others. Desai et al. (2008) examine differential response between multinational firms and local firms in the presence of currency crisis. They find that both the investment opportunities improve and the financial constraints increase for local firms and therefore local firms do not increase sales and investment as much as subsidiaries of multinational firms who benefit from internal capital market. They assume that local firms face increased financial constraints because of exposure to foreign debt but can't test this assumption directly because they do not observe in their sample the amount of foreign debt on the balance sheet of local firms.

In our paper, we hypothesize that the differential response to currency crisis between multinational firms and local firms are driven by foreign debt exposure. We collect foreign debt issue activities for both local firms and multinational firms and test how the presence of foreign debt in a currency crisis affects firm performance and financial constraints.

1.2.2 Methodology

We begin our analysis by first replicating Desai et al (2008). They find that multinationals are able to access internal capital markets and these firms increase their output and the scale of their activity more than local firms in the wake of depreciations.

$$Y_{i,j,k,t} = \emptyset_1 Dep_{k,t} + \emptyset_2 Dep_{k,t} * Multinational_i + \emptyset_3 X_{i,j,k,t} + t + \alpha_i + \eta_j + \varepsilon_{i,t}$$

(1)

where i is a subscript for each firm, j is a subscript for each industry, k is a subscript for each country, t is a subscript for each year; $Y_{i,j,k,t}$ is a measure of operating activity (such as sales growth or capital expenditures); the depreciation dummy variables are set equal to 1 for observations from the year of (t), one year after (t+1), and two years after (t+2) after depreciation in country k; $Multinational_i$ is a dummy variable equal to 1 if company i is a multinational subsidiary; $X_{i,j,k,t}$ is a set of firm specific, time-varying controls including variables that account for producer-price inflation; t is a time trend variable; α_i is firm fixed effects; η_j is a set of industry fixed effects; and $\varepsilon_{i,t}$ is an error term. Industries are defined at the two-digit SIC level. All standard errors are clustered at the firm level to correct for serial correlation.

We then turn our attention to the local firms and test whether their responses to currency crisis are driven by foreign debt exposure. We first examine assets and sales:

$$Y_{i,k,t} = \emptyset_1 Dep_{k,t} + \emptyset_2 Dep_{k,t} * ForeignDebt_{i,t} + \emptyset_3 X_{i,k,t} + t + \alpha_i + \varepsilon_{i,t} \qquad (2)$$

where i is a subscript for each firm, , k is a subscript for each country, t is a subscript for each year; $Y_{i,j,k,t}$ is a measure of operating activity (such as assets or sales); the depreciation dummy variables are set equal to 1 for observations from the year of (t), one year after (t+1), and two years after (t+2) after depreciation in country k; $ForeignDebt_{i,t}$ is a dummy variable equal to 1 if company i has foreign debt in year t; $X_{i,k,t}$ is a set of firm specific, time-varying controls including variables that account for producer-price inflation; t is a time trend variable; α_i is firm fixed effects; and $\varepsilon_{i,t}$ is an error term. All standard errors are clustered at the firm level to correct for serial correlation.

We then test whether local firms with foreign debt exposure are also more constrained after the crisis: $Y_{i,k,t} = \emptyset_1 CashFlow_{i,,k,t} + \emptyset_2 CashFlow_{i,,k,t} * ForeignDebt_{i,t} + \emptyset_3 X_{i,,k,t} + \varepsilon_{i,t}$ (3)

where i is a subscript for each firm, k is a subscript for each country, t is a subscript for each year; $Y_{i,,k,t}$ is a measure of operating activity (such as capital expenditures); $CashFlow_{i,k,t}$ is the ratio of earnings before interest, taxes, depreciation and amortization to lag total assets. $ForeignDebt_{i,t}$ is a dummy variable equal to 1 if company i has foreign debt; $X_{i,,k,t}$ is a set of firm specific, time-varying controls including variables that account for producer-price inflation; and $\varepsilon_{i,t}$ is an error term. All standard errors are clustered at the firm level to correct for serial correlation.

Lastly, we analyze how multinational parent's financial condition may trickle down to the subsidiary firms. For this experiment, we focus on multinational firm sample only and test how currency crisis in the country of multinational parent combined with

multinational firms' foreign debt exposure affect their subsidiary performance.

$$Y_{i,k,t} = \emptyset_1 Dep_{k,t} + \emptyset_2 Dep_{k,t} * ForeignDebt_{i,t} + \emptyset_3 X_{i,k,t} + t + \alpha_i + \varepsilon_{i,t} \qquad (4)$$

where i is a subscript for each firm, k is a subscript for each country, t is a subscript

for each year; $Y_{i,k,t}$ is a measure of operating activity (such as assets and sales); the

depreciation dummy variables are set equal to 1 for subsidiaries whose parent firms are in

currency crisis from the year of (t), one year after (t+1), and two years after (t+2) after

depreciation in country k; $ForeignDebt_{i,t}$ is a dummy variable equal to 1 if the multinational

parent has foreign debt and face a currency depreciation in current year; $X_{i,k,t}$ is a set of firm

specific, time-varying controls including variables that account for producer-price inflation;

t is a time trend variable; α_i is firm fixed effects; and $\varepsilon_{i,t}$ is an error term. All standard errors

are clustered at the firm level to correct for serial correlation

1.3 Data

1.3.1 Currency Crisis

In order to identify the currency crisis episodes, we compute real exchange rates by

first obtaining daily U.S. dollar exchange rates reported by Datastream for all available

European markets from January 2004 through August 2014. Then we adjust the nominal

exchange rate for inflation differentials using annual consumer price index from

Datastream. A country is classified as having a currency crisis in a given year if the real

exchange rate of the country in any given quarter increased by over 25% relative to the

value of exchange rate in the same quarter one year earlier. Once a country is classified as

having currency crisis in a given year, the next year is excluded for this country.

We have chosen this method to classify currency crisis in a similar spirit to that of

Desai, Foley, and Forbes (2008). Their sample focuses on emerging market whereas ours include all European countries. We also refine the measure by focusing on quarterly currency movement instead of annual currency depreciation episodes that they are primarily interested in. Therefore, we can capture extreme events when a country's real exchange rate depreciates abruptly by at least 25% within a short window of time.

Table I summarizes the years in which a given country encounters currency crisis. There are 25 countries in the entire sample and 15 are from the Eurozone. There is a strong clustering in deprecation episode in 2007 (due to the depreciation of the Euro) and 2009 (due to the global financial crisis).

1.3.2 Sample of firms

We collect firm-level data from several major sources. The sample of multinational firms and local firms are obtained from the *Bureau van Dijk Osiris* database that provides financials and ownership data from all globally listed and major unlisted and delisted firms. *Osiris* also provides the names and countries on the subsidiaries of these firms, which we utilize to identify multinational firms. A firm is classified as a multinational firm when its subsidiary has other recorded shareholders located in the foreign country and the sum of foreign total assets are larger than 10% of the firm. In addition, the firm must be the global ultimate owner of the foreign subsidiary (the percentage for the path from a subject company to its ultimate owner is larger than 50%; and it has no identified shareholder or its shareholder's percentages are not know). The firms are not classified as either multinational firm group or local firm group if a firm's all foreign subsidiaries' total assets are missing or parent firms' total assets are missing. Our sample spans from 2005 to 2014 calendar year.

We obtain financial and operating data on the subsidiaries of the multinational firms from *Amadeus*, which is a pan-European financial database containing information on over 5 million companies from 34 countries, including all the EU and Eastern Europe. The disclosure policies in Europe require both public and private firms to file detailed information on balance sheet and profits and loss accounts.

To identify whether a local firm has foreign debt or not, we utilize the new issues database provided by Thomson Reuters SDC Platinum. It provides over 760, 000 bond deals, including investment-grade, high-yield, and emerging market corporate bonds. We classified all European companies that issued bonds (non-convertible bonds, mortgage/asset backed, bonds pipeline and registrations, MTN programs and private debt) and all syndicated loans with foreign issue flag from 1990 to 2014 in the group of local firms with foreign debt. We exclude from this group companies that issued debt in a foreign country which currency is the same as that of the domestic country. For instance, we do not consider foreign debt issues of firms from the Euro-zone that issue in another Euro-zone country; similarly, we exclude foreign debt issues of firms from Swaziland and Liechtenstein using Swiss franc. We have two proxies for the foreign debt (FD) year. First, we define the foreign debt year dummy as 1 if, in a given year, the company has debt outstanding that has been issued previously and has not yet matured. Second, we use another dummy variable – foreign debt issuance within 3 years- that equals 1 if the firm has issued foreign debt in a given year or within three years prior to that year.

Table II reports for each country, the number of firms that had issued foreign debt during the sample period and the total number of firms. Panel A includes the sample of local firms and Panel B includes the sample of subsidiary firms for multinational

corporations. We consider that a subsidiary firm has foreign debt if its multinational parent has foreign debt issues. Our sample has a total of 4,022 local firms, 231 of them have foreign debt in at least one year. The total number of subsidiary firms is 20,587of which 10,005 have foreign debt. In the sample of local firms, Great Britain, France, Germany, Italy and Spain have the largest number of firms with foreign debt: 142 firms in Great Britain, 20 in France, 15 in Germany, 11 in Italy and Spain. In 14 countries (e.g. Austria, Bulgaria and Latvia) there are no local firms with foreign debt. In the sample of subsidiary firms, Great Britain, Germany, France, Spain, and Sweden have the largest number of firms with parents having foreign debt: 3,062 firms in Great Britain, 1,471 in Germany, 1,227 in France, 674 in Spain, and 598 in Sweden. Subsidiary firms in Belarus, Cyprus, Turkey, and Moldova have their parent companies with foreign debt no more than ten.

1.3.3 Summary Statistics

Table III provides descriptive statistics for all the variables used in the empirical analysis, respectively for full sample (Panel A), local firm sample (Panel B), and subsidiary firm sample (Panel C). All the variables (except dummy variables) are winsorised at 1% and 99% level. *Crisis* is an indicator variable equal to one if in the year of currency crisis, one year or two years after the currency crisis. *Foreign debt dummy* is equal to one if the firm has foreign debt in any year. *Foreign debt year dummy* is equal to one only if the firm has foreign debt in that year. *Foreign debt issuance within 3 years dummy* is equal to one if the firm issue foreign debt in the current year, one year before, two years before or three years before current year. *Parent in foreign debt year and in crisis* is equal to one if the firm's parent has foreign debt in the given year and the firm's parent is in crisis in the given year. We include the following firm characteristics: the net sales, the logarithm of one plus

1-year sales growth, the logarithm of one plus 1-year assets growth, capital expenditure over property plant and equipment, capital expenditure over total assets, the ratio of earnings before interest, taxes, depreciation and amortization to lag total assets (cash flow), industry price index, inflation rate, and capital expenditure over lagged fixed assets.

The average (median) firm in our sample has \$255 (\$23) million in net sales, \$212 (\$13) million in total assets, 6.2% (3.7%) sales growth, and 6.8% (2.3%) assets growth. The average (median) capital expenditure as a proportion of total assets is 2.4% (.6%), as a proportion of property, plant, and equipment is 1.29 (0.17), and as a proportion of fixed assets in the previous year is 47.1% (8.7%). Note that we calculated capital expenditures using the sum of first differences of fixed assets and depreciation, therefore many of the firms have negative capital expenditures as their fixed assets may decrease overtime and depreciation are small. 35% of the sample firms were in crisis and the average firm experience 2.8% inflation per year. 44% of the sample firms had foreign debt in any year during the sample period, 31% had foreign debt in the year under consideration and 19.3% of the sample firms issue foreign debt in current year or in years up to three years before.

We then split the sample and consider local firms and subsidiaries of multinational firms separately. In Panel B we show the descriptive statistics for local firms. The average (median) firm in our sample for local firm has \$700 (\$70) million in net sales, \$546 (\$81) million in total assets, 6.1% (5.2%) sales growth, and 7.2% (3.4%) assets growth. The average (median) capital expenditure as a proportion of total assets is -1.8% (-0.8%), as a proportion of property, plant, and equipment is 64.4% (-5%), and as a proportion of fixed assets in previous year is 21.6% (-2.8%). 36.2% of the local firms were in crisis and the average firm experience 3.2% inflation per year. 7.4% of the local firms had foreign debt

in any year during the sample period, 4.4% had foreign debt in the year under consideration and 2.9% of the local firms issue foreign debt in current year or in years up to three years before.

Finally, in Panel C of Table III we show the descriptive statistics for the sample of subsidiary firms. The average (median) firm for subsidiaries of multinational firms has $138 ($17) million in net sales, $154 ($9) million in total assets, which are smaller than those of local firms. The average (median) firm for subsidiaries of multinational firms has 6.2% (3.4%) sales growth, and 6.8% (2.1%) assets growth. The average (median) capital expenditure as a proportion of total assets is 3.2% (-0.8%), as a proportion of property, plant, and equipment is 143% (21.2%), and as a proportion of fixed assets in previous year is 52.2% (11.1%). All the ratios based on capital expenditures are almost twice of those for local firms. 34.4% of the subsidiary firms were in crisis, and the average firm experience 2.8% inflation per year. 50% of the subsidiary firms had foreign debt in any year during the sample period, 35% had foreign debt in the year under consideration, and 21.9% of the subsidiary firms issue foreign debt in current year or in years up to three years before. These numbers are much larger than those of local firms where only 7.4% had foreign debt in any year, 4.4% in the year under consideration, and 2.9% in current year or in years up to three years before. 4.2% of the subsidiary firms has parent with foreign debt and parent in crisis in the year under consideration.

1.4 Main Results

We first investigate if multinational firms respond differently from local firms to currency crisis. We examine assets and sales as well as investment expenditures (following

Desai et al, 2008). We then identify the real source of the differential responses by investigating whether local firms themselves respond differently to crisis depending on their foreign debt exposure. Lastly we employ alternative definition of foreign debt and use one-to-one matching method to ensure that our results are robust.

1.4.1 Responses of Multinational and Local firms to Currency Crisis

We begin our analysis by first replicating Desai et al (2008). They find that multinationals are able to access internal capital markets and these firms increase their output and the scale of their activity more than local firms in the wake of currency depreciations. We examine measures of operating activity (such as sales growth or capital expenditures) and how the currency depreciation episode affects these operating activities differently depending on whether the firm is part of a multinational corporation or a local firm. We include variables that account for producer-price inflation, firm and industry fixed effects, and a time trend variable. All standard errors are clustered at the firm level to correct for serial correlation.

Models (1) and (2) in Table IV analyze the growth of sales and assets around the time of depreciations using the specification in Equation (1). The dependent variable in Model (1) is the log of sales growth (measured as the first difference of the logarithm of net sales in nominal local currency units). The crisis dummy is set to one for the year of the currency depreciation and the two subsequent years. The coefficients on the depreciation dummies are thus interpreted as average sales growth post-deprecation crisis relative to that prior to the crisis. Note that we control for firm and industry fixed effects. The -0.061 coefficient estimate in Model (1) indicates a significant decline in the sale growth of local firms after the currency depreciation crisis. This is comparable to -0.041 reported by Desai et al.

(2008). More importantly, we find that multinational firms, however, enjoy much higher sales growth (4.3%) than that of local firms. It is again comparable to the 5.4% higher sales growth post depreciation crisis among multinational firms in Desai et al. (2008).

Model (2) presents similar estimation using the log of asset growth (measured as the first difference of the logarithm of book value of total assets in nominal US thousand dollar units). We examine firm size to measure firm scale in addition to firm output. The coefficients on the depreciation dummies are thus interpreted as average firm size growth post-deprecation crisis relative to that prior to the crisis, controlling for both firm and industry fixed effects and time trend. The -0.080 coefficient estimate in Model (2) indicates a significant decline in the asset growth of local firms after the currency depreciation crisis. This is larger than -0.026 reported by Desai et al. (2008). In addition, we find that multinational firms, however, enjoy much higher asset growth (5.3%) than that of local firms. It is comparable to the 7.5% higher asset growth post depreciation crisis among multinational firms in Desai et al. (2008).

The last two models in Table IV analyze the investment behavior of local and multinational firms during depreciations. It's possible that different levels of investment between multinational affiliates and local firms may simply reflect differences in the scope of activity following depreciations, instead of differences in the investment responses of entities of a similar size. To address this possibility, we employ two measures of investment: capital expenditures scaled by net property plant and equipment (PPE) and capital expenditures scaled by total assets, as our dependent variables. Model (3) shows that the level of capital expenditures relative to the net PPE significantly falls from their mean levels for both multinational and local firms in the years after the depreciation crisis.

Further, similar to asset and sales growth, investment expenditures for multinational firms are higher than those for local firms following depreciation crisis. In fact, the coefficient estimate for the interaction term between crisis and multinational subsidiaries is 2.458, which completely cancels out the drop in investment expenditure during crisis (-2.103). It suggests that multinational firms did not reduce their investment overall during crisis. Model (4) shows that the level of capital expenditures relative to firm size also falls significantly from their mean levels for both multinational and local firms in the years after the depreciation crisis. Further, similar to capital expenditures scaled by PPE, investment expenditures scaled by total assets are much higher for multinational firms than those for local firms following depreciation crisis.

1.4.2 Foreign Debt Exposure and Differential Responses of Local firms to Currency Crisis

In this section, we investigate whether local firms react to the currency crisis differently depending on their financial conditions. The advantage of studying currency crisis is that it simultaneously *improves* investment opportunities and increases leverage and financial constraints. Currency depreciation can improve the competitiveness of firms, but at the same time, increase the financial leverage of firms that prevent them from taking advantage of more investment opportunities. Financial leverage for firms with foreign debt exposure will increase immediately following currency depreciation, unless these firms are part of a multinational conglomerate that allows the subsidiaries to borrow from the headquarter firm. Therefore, to isolate the effects of financial constraints on firm growth,

we focus on the impact of currency crisis for local firms with foreign debt exposure. [3]

Table V presents the results where we examine how local firms respond to the currency crisis depending on their indebtedness. We focus on one important aspect of financial burdens: debt denominated in foreign currency. At the time of currency depreciation, firms with outstanding foreign debt are especially constrained since their debt burdens increase in the form of their local currency.

We examine the levels of assets and sales and how the currency depreciation episode affects these operating activities differently depending on whether the local firm has outstanding foreign debt. We again include variables that account for producer-price inflation, firm and industry fixed effects, and a time trend variable. All standard errors are clustered at the firm level to correct for serial correlation.

Models (1) and (2) in Table V analyze the level of sales and assets around the time of depreciations using the specification in Equation (2). The dependent variable in Model (1) is the log of sales (measured as the logarithm of net sales in nominal US thousand dollar units). The crisis dummy is set to one for the year of the currency depreciation and the two subsequent years. The coefficients on the crisis dummies are thus interpreted as average level of sales post-deprecation crisis relative to that prior to the crisis. Note that we control for firm fixed effects. Interestingly, we find that local firms without foreign debt burden actually increased their sales. The 0.144 coefficient estimate in Model (1) indicates that sales actually increased for local firms by 14% after the currency depreciation crisis.

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[3] Of course, the differential investment response of local firms and multinational firms could be also due to product market exposures. However, as shown by Desai et al. (2008), the product market exposure alone cannot explain the magnitude of differential responses between local firms and multinational firms following a currency crisis.

Moreover, firms with foreign debt prior to currency have higher net sales than those without, suggesting that they have bigger outputs in general. However more importantly, firms with foreign debt have much lower sales (12.4%) compared to those without post depreciation crisis.

Model (2) presents similar estimation using the log of total assets. The coefficients on the crisis dummies are thus interpreted as the average firm size post-depreciation crisis relative to that prior to the crisis, controlling for firm fixed effects and time trend. We again find that local firms without foreign debt burden actually increased their firm size. The 0.135 coefficient estimate in Model (1) indicates that firm size actually increased for local firms by 13.5% after the currency depreciation crisis. Moreover, firms with foreign debt prior to currency crisis have higher firm size than those without, suggesting that they are bigger firms in general. However, more importantly, firms with foreign debt have lowered their assets (7.0%) compared to those without post depreciation crisis.

Models (3) to (4) in Table V present a similar analysis using one-to-one matching method. It's possible that the results uncovered above about firms with foreign debt and those without may simply reflect differences in their sizes, instead of differences in the responses of entities of a similar size, even though we have firm-fixed effects in our estimations. To address this possibility, we employ a one-to-one matching method. We first separate the firms into two groups— a first group of firms with foreign debt in any year and a second group of firms with no foreign debt in any year. Then we matched each firm of the first group with one firm of the second group from the same country in the same year that was closest in size (total assets). Models (3) and (4) present same control variable and dependent variable as in Models (1) and (2) except for firm fixed effects and time trend.

Model (3) presents one-to-one matching estimation using the log of net sales. The crisis dummy is set to one for the year of the currency depreciation and the two subsequent years. The coefficients on the crisis dummies are thus interpreted as average level of sales post-depreciation crisis relative to that prior to the crisis. We find that local firms without foreign debt burden increased their firm sales with no certain. The 0.209 coefficient estimate with T-statistics indicates that local firms without foreign debt increased their sales by 21% after the currency depreciation crisis but not with certain. Moreover, firms with foreign debt, prior to currency crisis, have higher net sales than those without but the result is not statistically significant. It suggests that they may have bigger outputs in general. More importantly, firms with foreign debt have much lower sales (32.3%) compared to those without post depreciation crisis.

Model (6) presents a similar estimation using the log of total assets. Since our one-to-one matching procedure requires firms to be matched by size (total assets), the logarithm of total assets has no significant difference between firms with and without foreign debt, either before or after the depreciation crisis.

The last two models (5) and (6) in Table V present a similar analysis using alternative definition of foreign debt. The dummy variable *foreign debt issuance within 3 years* is equal to one if the companies issue foreign debt in the given year, or within three years prior to the given year. This alternate proxy is used since the use of foreign debt year may enlarge the foreign debt companies' sample. We set the foreign debt year as one if the firm's foreign debt is not yet in final maturity and the final maturity is regarded as infinity (like perpetuities) in our sample if it is missing value in the data. When we use the dummy variable *foreign debt issuance within 3 years*, the sample of firms with foreign debt

decrease from 252 when using *foreign debt year* to 201.

Model (5) analyzes the level of sales around the time of depreciation using the specification in Equation (2). The crisis dummy is set to one for the year of the currency depreciation and the two subsequent years. The coefficients on the crisis dummies are thus interpreted as the average level of sales post-deprecation crisis relative to the period prior to the crisis. In this regression we control for firm fixed effects and time trend and find that local firms without foreign debt burden actually increase their firm sales after the currency crisis. The coefficient 0.142, similar to that (0.144) in Model (1) indicates that sales actually increase for local firms by 14.2% after the currency depreciation. Moreover, similar to that in Model (1), firms with foreign debt prior to currency crisis have higher net sales than those without foreign debt, suggesting that they have higher outputs. However more importantly, firms with foreign debt have much lower sales post depreciation crisis (15.4%), even lower than that (12.4%) in Model (1), compared to those without foreign debt.

Model (6) presents similar results using the log of total assets. We again find that local firms without foreign debt increased their firm size. The 0.133 coefficient estimate in Model (6) is similar to that (0.135) in Model (1), indication that firm size increases for local firms by 13.3% after the currency depreciation crisis. Similar to the previous analyses, firms with foreign debt prior to currency crisis seem to be larger than those without foreign debt, but, more importantly, post depreciation crisis, firms with foreign debt reduced their assets by 6.8%, on average, compared to those without foreign debt..

1.5 Financing Responses

In this section, we examine if local firms with foreign debt become more constrained during crisis compared to those without foreign debt. If foreign debt were indeed the source of differential responses between local firms and multinational firms, then we'd expect that local firms with foreign debt also become more constrained during crisis.

To study financial constraints, we follow a large literature that investigates the impact of financial imperfections on investment by using investment-to-cash flow sensitivities (Fazzari et al., 1988, Lamont, 1997, Shin and Stulz, 1998, Blanchard et al., 1994, Hadlock, 1998, Hoshi et al., 1991, Bertrand and Shoar, 2001, and Malmendier and Tate, 2001, and Almeida and Campello, 2007).

Table VI estimates Equation 4 and presents the main results on how foreign debt affects differential financing constraints during crisis. In all models the standard errors are clustered at the firm level. In Panel A we use the foreign debt year dummy that equals one if the firm has foreign debt in that year, whereas in Panel B we use the alternative dummy for foreign debt that equals one if a firm issues foreign debt in the current year, or within 3 years prior to the current year. Four models are presented in each panel: in Models (1) and (2) the dependent variable is the capital expenditures scaled by total assets in crisis and non-crisis periods, respectively; Models (3) and (4) examine capital expenditures scaled by the lagged fixed assets in crisis and non-crisis periods, respectively.

We find that, during currency depreciation crisis, the investment sensitivity to cash flows is higher among local firms with foreign debt. This result is robust to different

definitions of capital expenditures and alternate proxies for foreign debt.

To illustrate the effect of foreign debt on local firms' financial constraints during crisis period, we consider the difference in the sensitivity of investment to cash flows between firms with foreign debt and those without in Model (1). The coefficient of *Cash Flow* for firms without foreign debt is 0.077, whereas for firms with foreign debt it is .575 (.077+ .498), which suggests that the effect of a one-standard deviation shock to the cash flows affects the investment expenditures eight times more for firms with foreign debt. The difference is even larger when we examine capital expenditures scaled by lag period capital stock in Model (3).

These results identify the exact channel through which currency depreciation crisis affects local firms harder than multinational firms. Desai et al. (2007) found that local firms are not able to overcome financial constraints during crisis as easily as multinational firms are. We find that those firms that are hit hardest among local firms are the ones that have foreign debt issuances and are facing sudden increase in their debt burden.

1.6 Extensions

One advantage of our global sample is that multinational firms are based on a broad range of countries, which allows us to test how multinational parent firm's financial condition affects their subsidiaries. If a multinational parent firm is in crisis countries and has foreign debt exposure, then we expect the subsidiaries of these firms to be affected as well.

In Table VII, we estimate Equation 4 and investigate whether multinational firms react to the currency crisis differently depending on their own financial conditions. Again,

we focus on one important aspect of financial burdens: debt denominated in foreign currency. At the time of currency depreciation, firms with outstanding foreign debt are especially constrained since their debt burdens increase in the form of their local currency.

Similar to Table V, we examine the levels of assets and sales and how the currency depreciation episode affects these operating activities differently depending on whether the multinational firm has outstanding foreign debt. We again include variables that account for producer-price inflation, firm fixed effects, and a time trend variable. All standard errors are clustered at the subsidiary firm level to correct for serial correlation.

The dependent variable in Model (1) is the log of sales. The *subsidiary in crisis (0,+2y)* dummy is set to one if the subsidiary firms are in the year of the currency depreciation and within the two subsequent years. We find that subsidiaries of multinational firms increased their sales during crisis period. The 0.127 coefficient estimate in Model (1) indicates that sales increased by 12.7% after the currency depreciation crisis. More interestingly, subsidiaries of multinational firms with foreign debt that face a currency depreciation have much lower sales (10.1%) compared to those without foreign debt after the currency crisis.

Model (2) presents a similar estimation using the log of total assets. The coefficients of the *subsidiary in crisis(0,+2y)* dummies are thus interpreted as the average firm size post-deprecation crisis relative to that prior to the crisis. In these regressions we control for both firm fixed effects and time trend. We again find that multinational firms without foreign debt burden increase their firm size after the depreciation crisis, on average by 8.3% (Model (2)). However, when the multinational parent company has exposure to foreign debt and faces a currency depreciation crisis, the subsidiaries of that multinational suffer a

significant reduction, post depreciation crisis, in their assets (17.1%) compared to subsidiaries of multinational firms that have no foreign debt.

To further examine if subsidiaries become more financially constrained following a currency crisis when their parent company has exposure to foreign debt and is itself in a country facing a currency depreciation, we examine the differences in investment-to-cash flow sensitivities of subsidiary firms depending on whether their multinational parents have foreign debt or not after being affected by a currency depreciation. We repeat our analysis in Table VI but focus on multinational firms only and show the results in Table VIII. As before, Panels A and B use our alternate proxies for foreign debt. In Models (1) and (2) the dependent variable is the capital expenditures scaled by total assets in crisis and non-crisis periods, respectively; in Models (3) and (4) we examine capital expenditures scaled by the lagged fixed assets in crisis and non-crisis periods, respectively.

Similar to our previous finding, during currency depreciation crisis, investment sensitivity to cash flows are higher among subsidiaries of multinational parent firms with foreign debt. This result is robust to different definitions of capital expenditures and foreign debt issuance. Though the economic magnitude is not as stark as we found earlier for local firms, there is a strong statistically significant difference between subsidiaries of multinational firms with foreign debt and those without.

To summarize, the results in this section extend our findings further on how foreign debt and currency depreciation affect subsidiaries of multinational firms. In the previous section, we identify the exact channel through which currency depreciation crisis affects local firms harder than multinational firms. Our findings in this section suggest that even among multinational firms, the financial condition of the parent firm affects investments

and financing of the subsidiary firms.

1.7 Conclusions

In this paper we study whether and how local firms and subsidiaries of multinational firms respond differently to a currency depreciation crisis when the local firms or, in the case of the subsidiaries, the parent companies are exposed to foreign debt. A currency depreciation crisis can affect differently both sides of the firms' balance sheets. On one side, it can create new investment opportunities as firms become more price competitive but, on the other side, it can also increase firms' financial constraints as it aggravates the firms' debt burden. This can be critical especially for firms exposed to foreign debt as they immediately observe a leverage increase following a currency depreciation shock.

We perform our analyses using a broad sample of *1,047* multinational firms with *20,584* subsidiaries and *4,022* local firms from *28* different countries, over the time period 2005 to 2014 calendar year. Consistent with previous literature (Desai et al. 2008), we find that subsidiaries of multinational firms have higher asset and sales growth than local firms and they do not reduce their investment rates following a currency crisis. This suggests that the internal capital markets of multinational companies help their subsidiaries capitalize on the investment opportunities and mitigate the potential debt burden increase that a currency depreciation might create.

Our main goal, however, is to test a mechanism – the use of foreign debt – that can potentially explain the different responses of firms to a currency crisis. We therefore examine the sample of local firms and separate those with foreign debt exposure from those with no foreign debt. Our results show that local firms with foreign debt have a higher drop in assets and sales post currency depreciation than their peers with no foreign debt. These

results are robust to the use of alternate definitions of foreign debt, firm fixed effects, clustered standard errors at the firm level, and also the use of a matched sample by size, country, and year. We also test whether and how financial policies respond differently to a currency crisis when the local firms are exposed to foreign debt. Specifically, we analyze changes in financial constraints (measured as the sensitivity of investment to cash flow) post currency crisis for local firms with and without foreign debt. Our results indicate that local firms with foreign debt become more financially constrained following a currency depreciation.

Finally, we extend our analysis to subsidiaries of multinational firms and examine the changes in assets, sales, and financial constraints following a currency crisis. We find that following a currency crisis the levels of assets and sales of subsidiary firms decrease and their financial constraint increase. This is so, when the multinational parent company is exposed to foreign debt and also facing a currency depreciation crisis.

Overall, our results show that a key mechanism that explains, at least in part, how firms differently respond to currency crises, in terms of their investment or financing policies, is their exposure to foreign debt.

Table 1.1 Currency Crisis by Country and Year

This table summarizes the years in which a given country encounters currency crisis. There are 25 countries in the entire sample and 15 are from the Eurozone. In order to identify the currency crisis episodes, we compute real exchange rates by first obtaining daily U.S. dollar exchange rates reported by Datastream for all available European markets from January 2004 through December 2013. Then we adjust the nominal exchange rate for inflation differentials using annual consumer price index from Datastream, daily or monthly consumer price index is not used since annual values are most populated. A country is classified as having a currency crisis in a given year if the real exchange rate of the country in any given quarter increased by over 25% relative to the value of exchange rate in the same quarter one year earlier. Once a country is classified as having currency crisis in a given year, the next year is excluded for this country.

Country	Year								
	2005	2006	2007	2008	2009	2010	2011	2012	2013
ALBANIA					1				
AUSTRIA			1						
BELARUS					1		1		
BELGIUM			1						
CROATIA					1				
CYPRUS			1						
CZECH REPUBLIC					1				
ESTONIA			1						
FINLAND			1						
FRANCE			1						
GERMANY (Deutschland)			1						
GREAT BRITAIN (United Kingdom)				1					
GREECE			1						
HUNGARY					1				
IRELAND			1						
ITALY			1						
LATVIA			1						
LITHUANIA			1		1				
MALTA			1						
SLOVAKIA			1						
SLOVENIA			1						
SPAIN			1						
SWEDEN			1		1			1	
TURKEY		1			1		1		1
UKRAINE				1					

Table 1.2 Sample of Local and Multinational Subsidiaries with Foreign Debt by Country

This table reports for each country, the number of firms that had issued foreign debt during the sample period and the total number of firms. Panel A includes the sample of local firms and Panel B includes the sample of subsidiary firms for multinational corporations. For the subsidiaries, we define a firm to have foreign debt if its multinational parents have foreign debt issues.

Country	Panel A: Local Firms		Panel B: Subsidiary Firms	
	Number of Firms with Foreign debt	Total Number of Firms	Number of Firms with Parents Having Foreign Debt	Total number of Firms
ALBANIA	0	0	11	25
AUSTRIA	0	32	350	954
BELARUS	0	0	3	6
BELGIUM	1	59	467	1,078
BULGARIA	0	13	48	109
CROATIA	0	22	67	141
CYPRUS	1	59	3	6
CZECH REPUBLIC	0	13	230	538
DENMARK	1	64	206	483
ESTONIA	0	11	56	138
FINLAND	2	49	216	560
FRANCE	20	575	1,227	2,928
GERMANY	15	481	1,471	2,789
GREAT BRITAIN	142	1,548	3,062	5,102
GREECE	3	209	87	164
HUNGARY	0	19	211	423
IRELAND	4	45	154	278
ITALY	11	145	497	1,233
LATVIA	0	32	54	107
LITHUANIA	0	31	49	115
MALTA	0	5	20	55
MOLDOVA	0	4	5	8
SLOVAKIA	0	10	119	251
SLOVENIA	0	4	49	130
SPAIN	11	74	674	1,438
SWEDEN	9	279	598	1,403
TURKEY	10	237	3	5
UKRAINE	1	2	68	120
TOTAL	231	4022	10005	20587

Table 1.3 Descriptive Statistics of Main Variables

This table provides descriptive statistics for all the variables used in the empirical analysis, respectively for full sample (Panel A), local firm sample (Panel B), and subsidiary firm sample (Panel C). All the variables (except dividend dummy) are winsorised at 1% and 99% level. *Crisis* is an indicator variable equal to one if in the year of currency crisis, one year or two years after the currency crisis. *Foreign debt dummy* is equal to one if the firm has foreign debt in any year. *Foreign debt year dummy* is equal to one only if the firm has foreign debt in that year. See Appendix B for other variable definitions.

			Panel A:All Firms			
Variable	N	P25	Mean	Median	p75	Std. Dev.
Net sales	142,287	4,425	255,111	22,681	92,722	1,177,868
Log(1+sales growth)	112,435	-0.098	0.062	0.037	0.198	0.591
Total assets	206,964	2,384	211,695	12,728	69,365	782,977
Log(1+assets growth)	170,053	-0.105	0.068	0.023	0.177	0.647
Capex/PPE	139,050	-0.077	1.291	0.173	0.573	22.717
Capex/total assets	171,712	-0.004	0.024	0.006	0.054	0.155
Cash flow	123,187	0.022	0.102	0.096	0.192	0.235
Crisis	224,497	0	0.347	0	1	0.476
PPI	189,071	92.2	98.008	98.5	104.7	8.245
Inflation	162,164	0.015	0.028	0.027	0.048	0.035
Foreign debt dummy	224,497	0	0.444	0	1	0.497
Foreign debt year dummy	224,497	0	0.309	0	1	0.462
Capex/lag fixed assets	150,038	-0.051	0.471	0.087	0.327	1.892
Foreign debt issuance within 3 years	224,497	0	0.193	0	0	0.395

Panel B:Local Firms						
Variable	N	P25	Mean	Median	p75	Std. Dev.
Net sales	29,629	14,098	699,766	69,854	301,289	2,352,514
Log(1+sales growth)	23,940	-0.096	0.061	0.052	0.212	0.608
Total assets	30,416	20,130	545,845	80,579	319,876	1,275,899
Log(1+assets growth)	25,336	-0.089	0.072	0.034	0.181	0.455
Capex/PPE	25,054	-0.405	0.644	-0.05	0.321	37.2
Capex/total assets	25,928	-0.069	-0.018	-0.008	0.056	0.236
Cash flow	24,598	0.004	0.049	0.08	0.151	0.241
Crisis	30,448	0	0.362	0	1	0.48
PPI	25,804	88.9	95.985	97	102.4	8.679
Inflation	21,628	0.019	0.032	0.029	0.053	0.035
Foreign debt dummy	30,448	0	0.074	0	0	0.261
Foreign debt year dummy	30,448	0	0.044	0	0	0.205
Capex/lag fixed assets	25,086	-0.165	0.216	-0.028	0.149	1.293
Foreign debt issuance within 3 years	30,448	0	0.029	0	0	0.169

Panel C: Subsidiary Firms						
Variable	N	P25	Mean	Median	p75	Std. Dev.
Net sales	112,658	3,558	138,166	17,426	65,747	480,717
Log(1+sales growth)	88,495	-0.099	0.062	0.034	0.193	0.586
Total assets	176,548	1,787	154,128	9,348	46,003	644,724
Log(1+assets growth)	144,717	-0.108	0.068	0.021	0.176	0.675
Capex/PPE	113,996	-0.015	1.434	0.212	0.605	18.035
Capex/total assets	145,784	0	0.032	0.008	0.053	0.134
Cash flow	98,589	0.025	0.116	0.102	0.205	0.232
Crisis	194,049	0	0.344	0	1	0.475
PPI	163,267	93.1	98.328	99.6	104.8	8.128
Inflation	140,536	0.015	0.028	0.027	0.048	0.035
Foreign debt dummy	194,049	0	0.502	1	1	0.5
Foreign debt year dummy	194,049	0	0.351	0	1	0.477
Capex/lag fixed assets	124,952	-0.025	0.522	0.111	0.357	2
Foreign debt issuance within 3 years	194,049	0	0.219	0	0	0.413
Parent in foreign debt year and in crisis	194,049	0	0.042	0	0	0.202

Table 1.4 Responses of Multinationals and Local Firms to Currency Crisis

This table presents the estimates from panel regressions explaining growth of sales and assets growth and level of capital expenditure for multinational firms and local firms between fiscal year 2004 to 2013. *Crisis (0, +2y)* is an indicator variable equal to one if in the year of currency crisis, one year or two years after the currency crisis. *Crisis(0,+2y)*Multinational* is an interaction between crisis dummy and subsidiary dummy. *PPI* is the annual industry price index obtained from Datastream. Inflation is the first difference of industry price index scaled by lag industry price index. *Log (1+sales growth)* is the first difference of logarithm of net sales. *Log(1+assets growth)* is the first difference of logarithm of the book value total assets. *Capital expenditure* is measured as the sum of the first difference of fixed assets and depreciation costs. *PPE* is the net property plant and equipment. All the variables (except dummy variables) are winsorised at 1% and 99% level. All regressions include industry and firm fixed effects. Standard errors are clustered at the firm level. T-statistics are in parentheses. ***, ** or * indicates that the coefficient estimate is significant at 1%, 5% or 10% level, respectively.

	Log(1+sales growth)	*Log(1+assets growth)*	*Capital expenditure/ PPE*	*Capital expenditure/ total assets*
	(1)	(2)	(3)	(4)
Crisis(0,+2y)	-0.061***	-0.080***	-2.103***	-0.030***
	(-5.82)	(-10.14)	(-3.24)	(-7.26)
Crisis(0,+2y)*Multinational	0.043***	0.053***	2.458***	0.033***
	(3.76)	(5.96)	(3.72)	(7.66)
Time Trend	-0.030***	-0.030***	-0.079	-0.004***
	(-31.96)	(-36.50)	(-1.43)	(-10.83)
Inflation	0.507***	-0.260***		
	(7.96)	(-4.27)		
PPI			-0.025	-0.000***
			(-1.49)	(-2.61)
Industry fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Observations	93,534	133,683	115,177	135,025
R-squared	0.236	0.207	0.275	0.255

Table 1.5 Foreign Debt Exposure and Differential Responses of Local Firms to

Currency Crisis

This table presents the estimates from panel regressions and one-to-one matching explaining changes of firm-level annual sales and total assets of local firms between fiscal year 2004 to 2013. Model (1) and (3) use panel regressions for estimation. *Foreign debt year dummy* is used as proxy for foreign debt in model (1) and foreign debt issuance within 3 years is used as proxy in model (3). Model (2) use one-to-one matching estimation. The firms are matched by size within same country year. Log(sales) is the logarithm of net sales. Log(assets) is the logarithm of total assets. *Crisis(0,+2y)* is an indicator variable equal to one if in the year of currency crisis, one year or two years after the currency crisis. *Foreign debt year dummy* is a dummy variable which is one if the firm has foreign debt (after the foreign debt issue and before maturity) in the given year. *Crisis(0,+2y)* Foreign debt year dummy* is an interaction term of crisis and Foreign debt year dummy. *Foreign debt issuance within years* is a dummy variable which is one if the firm issues foreign debt in the given year, or issues foreign debt one year, two years or three years before the given year. *Crisis(0,+2y)* Foreign debt issuance within* is an interaction term of crisis(0,+2y) and foreign debt issuance within 3 years. *PPI* is industry price index and annual industry price index is obtained from Datastream All the variables (except dummy variables) are winsorised at 1% and 99% level. Year trend is included in all regressions. Standard errors are clustered at the firm level. T-statistics are in parentheses.***, ** or * indicates that the coefficient estimate is significant at 1%, 5% or 10% level, respectively.

	Log(sales)	Log(assets)	Log(sales)	Log(assets)	Log(sales)	Log(assets)
	(1)	(2)	(3)	(4)	(5)	(6)
Crisis(0,+2y)	0.144***	0.135***	0.209	-0.065	0.142***	0.133***
	(10.57)	(12.84)	(1.37)	(-0.48)	(10.56)	(12.75)
Foreign debt year dummy	0.300***	0.349***	0.154	0.105		
	(3.73)	(5.48)	(0.82)	(0.58)		
Crisis(0,+2y)* Foreign debt year dummy	-0.124***	-0.070**	-0.323*	0.017		
	(-3.51)	(-1.99)	(-1.81)	(0.10)		
Foreign debt issuance within 3 years					0.293***	0.296***
					(4.22)	(5.44)
Crisis(0,+2y)*Foreign debt issuance within 3 years					-0.154***	-0.068*
					(-3.69)	(-1.84)
PPI	-0.005**	-0.002	0.048***	0.042***	-0.005**	-0.002
	(-2.49)	(-1.61)	(3.39)	(3.12)	(-2.49)	(-1.61)
Time Trend	0.056***	0.055***	-0.117***	-0.070*	0.056***	0.055***
	(8.19)	(9.97)	(-2.89)	(-1.82)	(8.18)	(10.00)
Firm fixed effects	Yes	Yes	No	No	Yes	Yes
Methodology	Panel regressions	Panel regressions	One-to-one matching	One-to-one matching	Panel regressions	Panel regressions
Observations	24,297	25,693	2,151	2,194	24,297	25,693
R-squared	0.937	0.948	0.013	0.016	0.937	0.948

Table 1.6 Foreign Debt Exposure and Financing Responses of Local Firms to Currency Crisis

This table presents the estimates from panel regressions explaining cash flow sensitivities of local firms from fiscal year 2004 to 2013. *FD* is a dummy variable for foreign debt year dummy or foreign debt issuances within 3years dummy. *Cash flow* is ebitda over lag total assets. *FD *cash flow* is an interaction term of FD dummy and cash flow. *PPI* is industry price index and annual industry price index is obtained from Datastream Panel A presents the results when FD dummy is foreign debt year dummy, which is one if the firm issued the foreign debt and before maturity in the given year. Columns (1) and (3) present the results when the firms are in crisis in the given year. Columns (2) and (4) presents the results when the firms are in non-crisis in the given year. Panel B presents the results when FD is foreign debt issuances within 3years dummy, which is one if the firm issues foreign debt in the given year, or issues foreign debt one year, two years or three years before the given year. All the variables (except dummy variables) are winsorised at 1% and 99% level. Standard errors are clustered at the firm level. T-statistics are in parentheses.***, ** or * indicates that the coefficient estimate is significant at 1%, 5% or 10% level, respectively.

	Panel A: Foreign Debt Year Dummy				Panel B: Foreign Debt Issuances within 3 Years			
	Capex/total assets	Capex/total assets	Capex/lag fixed assets	Capex/lag fixed assets	Capex/total assets	Capex/total assets	Capex/lag fixed assets	Capex/lag fixed assets
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	Crisis	Non-Crisis	Crisis	Non-Crisis	Crisis	Non-Crisis	Crisis	Non-Crisis
FD	-0.039*	-0.023*	-0.281***	-0.202**	-0.050**	-0.032*	-0.272**	-0.193
	(-1.84)	(-1.72)	(-3.12)	(-2.24)	(-2.06)	(-1.66)	(-2.38)	(-1.52)
Cash Flow	0.077***	0.019**	-0.334**	-0.453***	0.076***	0.019**	-0.337**	-0.455***
	(4.95)	(1.99)	(-2.31)	(-4.19)	(4.90)	(2.00)	(-2.33)	(-4.23)
FD * Cash Flow	0.498***	0.244***	2.360***	0.807	0.684***	0.407***	2.752***	1.268
	(2.99)	(2.88)	(2.90)	(1.36)	(4.59)	(3.03)	(2.87)	(1.53)
PPI	-0.001**	-0.003***	-0.002	-0.019***	-0.001**	-0.003***	-0.002	-0.019
	(-2.06)	(-10.87)	(-1.28)	(-14.13)	(-2.07)	(-10.92)	(-1.29)	(-14.21)
Observations	8,918	12,153	8,846	12,020	8,918	12,153	8,846	12,020
R-squared	0.010	0.013	0.006	0.022	0.011	0.013	0.006	0.022

Table 1.7 Foreign Debt Exposure and Responses of Multinational Firms to

Currency Crisis

This table presents the estimates from panel regressions explaining changes of firm-level annual sales and net income of subsidiary firms between fiscal year 2004 to 2013. Subsidiary in crisis(0,+2y) is an indicator variable equal to one if in the year of currency crisis, one year or two years after the currency crisis. Parent in foreign debt year and in crisis is a dummy variable which is one if the subsidiary' parent firm has foreign debt and is in crisis in the given year. Subsidiary in crisis(0,+2y)*Parent in foreign debt year and in crisis is an interaction term of Subsidiary in crisis(0,+2y) and Parent in foreign debt year and in crisis. PPI is industry price index and annual industry price index is obtained from Datastream All the variables (except dummy) are winsorised at 1% and 99% level. All regressions include firm fixed effects. Standard errors are clustered at the subsidiary firm level. T-statstics are in parentheses.***, ** or * indicates that the coefficient estimate is significant at 1%, 5% or 10% level, respectively.

	Log(sales)	*Log(assets)*
	(1)	(2)
Subsidiary in crisis(0,+2y)	0.127***	0.083***
	(20.65)	(15.31)
PPI	0.006***	0.002*
	(5.56)	(1.67)
Time Trend	0.027***	0.036***
	(8.10)	(10.39)
Parent in foreign debt year and in crisis	0.156***	0.189***
	(5.57)	(9.97)
*Subsidiary in crisis(0,+2y) *Parent in foreign debt year and in crisis*	-0.101***	-0.171***
	(-3.40)	(-7.76)
Firm fixed effects	Yes	Yes
Observations	88,329	143,450
R-squared	0.924	0.926

Table 1.8 Foreign Debt Exposure and Financing Responses of Multinational Firms to Currency Crisis

This table presents the estimates from panel regressions explaining cash flow sensitivities of subsidiary firms from fiscal year 2004 to 2013. *FD* is a dummy variable for subsidiary firm's foreign debt year dummy or foreign debt issuances within 3years dummy. *Cash flow* is ebitda over lag total assets. *FD *cash flow* is an interaction term of FD dummy and cash flow. *PPI* is industry price index and annual industry price index is obtained from Datastream Panel A presents the results when FD dummy is foreign debt year dummy, which is one if the subsidiary of multinational firm has foreign debt(issued the foreign debt and before maturity) in the given year. Columns (1) and (3) present the results when the subsidiary of multinational firms are in crisis in the given year. Columns (2) and (4) presents the results when the subsidiary of multinational firm is in non-crisis in the given year. Panel B presents the results when the FD is foreign debt issuances within 3years dummy, which is one if the subsidiary of multinational firm issues foreign debt in the given year, or issues foreign debt one year, two years or three years before the given year. Columns (1) and (3) present the results when the subsidiary of multinational firm is in crisis in the given year. Columns (2) and (4) presents the results when the subsidiaries of multinational firms are in non-crisis in the given year. All the variables (except dummy variables) are winsorised at 1% and 99% level. Standard errors are clustered at the firm level. T-statistics are in parentheses. ***, ** or * indicates that the coefficient estimate is significant at 1%, 5% or 10% level, respectively.

	Panel A: Foreign Debt Year Dummy				Panel B: Foreign Debt Issuances within 3 Years			
	Capex/total assets (1)	Capex/total assets (2)	Capex/lag fixed assets (3)	Capex/lag fixed assets (4)	Capex/total assets (1)	Capex/total assets (2)	Capex/lag fixed assets (3)	Capex/lag fixed assets (4)
	Crisis	Non-Crisis	Crisis	Non-Crisis	Crisis	Non-Crisis	Crisis	Non-Crisis
FD	-0.006***	-0.004***	-0.106***	-0.111***	-0.005***	0.001	-0.098***	-0.082***
	(-3.51)	(-3.30)	(-4.19)	(-5.43)	(-2.74)	-0.42	(-3.46)	(-3.33)
Cash Flow	0.033***	0.050***	0.098*	0.121***	0.037***	0.052***	0.145***	0.163***
	(9.29)	(17.49)	(1.7)	(2.6)	(10.9)	(19.8)	(2.66)	(3.81)
FD* Cash Flow	0.023***	0.012**	0.337***	0.144*	0.016**	0.007	0.260**	-0.008
	-3.57	-2.33	-3.24	-1.67	-2.25	-1.09	-2.24	(-0.08)
PPI	-0.002***	-0.000***	-0.010***	-0.006***	-0.002***	-0.000***	-0.010***	-0.006***
	(-10.17)	(-7.41)	(-3.14)	(-6.25)	(-10.16)	(-7.76)	(-3.14)	(-6.24)
Observations	34,125	51,099	33,809	50,551	34,125	51,099	33,809	50,551
R-squared	0.009	0.011	0.001	0.002	0.009	0.011	0.001	0.002

CHAPTER 2: The Impact of Internal Capital Markets on the Cash Holdings of Subsidiaries of Multinational Corporations

2.1 Introduction

The 2009-2010 sovereign debt crisis (Hui and Chung, 2011) caused substantial disruptions in the global market for capital. For many firms, external capital dried up almost completely. As a consequence, some firms ran out of cash and went bankrupt, while others, such as Apple and Microsoft, started hording cash. Consequently, the crisis and the ensuing behavior of corporations as a result of the capital market disruptions has generated renewed interest in corporate cash holdings and liquidity (see Kahle and Stulz, 2013; Dewally and Shao, 2014; Pinkowitz, Stulz and Williamson, 2013; and Yu, Lee, and Sopranzetti, 2014). The challenges of raising external capital is often felt more keenly in emerging markets where the channels for capital acquisition are often limited relative to developed markets. Desai, Foley and Forbes (2008) examines the performance of emerging markets firms and documents the differential, superior performance of multinational affiliates relative to local emerging market firms after the crisis. This result begs the question of why, and draws attention to the potential role and importance of internal capital markets (Alvarez and Gorg, 2007; Alfaro and Chen, 2010; Desai, Foley and Forbes, 2008) in helping the affiliates of multinational companies compete advantageously in an emerging market.

To this end, we study the role of internal capital markets on the cash holdings of subsidiaries of multinational corporations in emerging markets in Europe. The existence of internal capital markets may benefit emerging market subsidiaries of multinational

companies since they can, not only access external capital directly, but also borrow money from their parents when their access to external capital is constrained. Local emerging market firms, in contrast, do not have access to an internal capital market, and are therefore reliant exclusively on external capital markets when they need additional funding. Such firms might be more included to hold a larger amount of cash than their multinational subsidiary counterparts for precautionary reasons; that is, as a buffer in the event that access to external capital is constrained.

We examine a sample of 489 multinational firms (with 2208 subsidiaries) and 749 local firms across seven emerging countries (Bulgaria, Hungary, Poland, Romania, Russian Federation, Turkey, and Ukraine) in Europe from 2004 to 2013. We first investigate differences in cash holdings between multinational affiliates and local firms when they are both located in the same emerging country. Using the natural logarithm of cash holdings to total assets, we find that subsidiaries of multinational firms have considerably lower cash holdings ratio (36.6% lower) than that of local firms. This difference suggests that multinational affiliates have less need to hold precautionary cash due to their access to internal capital markets. Furthermore, the relative difference in cash holdings also exists but decrease during the 2009-2010 sovereign debt crisis. For example, multinational affiliates have, on average, 66.8% (36.9%) lower ratios of cash holdings before (during) the sovereign debt crisis that their local counterparts. This result shows that the difference in cash holdings is not due to the sovereign debt crisis.

To further analyze the role of internal capital markets on cash holdings, we investigate whether the location of the parent company has an effect on subsidiaries' cash holdings. Is the effectiveness of the internal capital market dependent upon the parent

company's access to external capital? Ceteris paribus, parent companies located in developed countries should have easier access to external capital relative to those not in developed countries. This means that they are in a better position than their emerging market counterparts to fund their subsidiaries when the subsidiaries require capital. In other words, the internal capital market for the emerging market subsidiaries of emerging market based multinationals may not be effective, since the subsidiaries cannot rely on the parent company to accommodate their financial needs. Consistent with this argument, we find that when parent companies are located in developed countries, the subsidiaries hold less cash (32.4%) than their local competitors. In contrast, when the parents are located in developing countries, there are no significant differences in cash holdings between the subsidiaries and their local competitors. This evidence shows that internal capital markets are perhaps not efficient in providing liquidity to subsidiary firms when the parents are domiciled in developing countries.

Our paper contributes to the growing literature on the firms' cash holdings behavior and the impact of internal capital markets, especially in the context of multinational companies. Pinkowitz, Stulz and Williamson (2012) find that U.S. multinational firms experience an increase in abnormal cash holdings during the 2000s. Using a large sample of European multinational corporations and their subsidiaries in the period 1998-2004, Beuselinck, Deloof and Vabstraelen (2012) find that foreign subsidiaries hold more cash than domestic subsidiaries for the multinational firms. Our paper goes beyond Beuselinck, Deloof and Vabstraelen (2012) to examine the role of internal capital markets of multinational firms by comparing the cash holdings behavior of emerging market multinational subsidiaries and their local competitors. We focus on emerging market firms

because access to external capital is limited in these markets, and thus the impact of internal capital markets may be of particular importance.

Our paper also contributes the literature on corporate behavior of multinational affiliates versus local competitors. Previous literature has studied differences in sales, assets and investment performance (Desai, Foley and Forbs 2007), aggregate output, demand, and credit conditions (Alfaro and Chen, 2010), and the employment growth (Alvarez and Gorg, 2007) of multinational firms and local firms after the financial crisis, but no paper has examined the cash holdings behavior of multinational affiliates versus their local competitors. Our paper contributes to this area by studying the cash holdings behavior in European emerging markets from 2004 to 2013.

The remainder of the paper proceeds as follows. Section II discusses previous literature. Section III describes the data. Section IV presents our methodology and empirical results. Section V concludes.

2.2 Literature Review

We analyze the relative cash holdings of multinational and local firms when they are located in emerging markets and face external financing difficulties. Our analysis combines the literature on firm cash holdings and the role of the internal capital market of multinational firms. A growing number of papers study the determinants of cash holdings (e.g. Dittmar et al. (2003), Bates, Kahle, and Stulz (2009), Pinkowitz, Stulz and Williamson (2012)). However, a related and smaller literature examines the determinants of cash holdings for multinational firms. Pinkowitz, Stulz and Williamson (2012) find that U.S. multinational firms had cash holdings similar to those of purely domestic firms in the late 1990s. Moreover, they show that, since the late 1990s, U.S. multinationals increased their

cash holdings relative to foreign multinationals by roughly the same percentage as relative to U.S. domestic firms. Beuselinck, Deloof and Vabstraelen (2012) study cash policies of multinational corporations, using a large sample of European multinationals and their subsidiaries in the period 1998-2004, and find that foreign subsidiaries hold more cash than domestic subsidiaries.

There are a limited number of papers that compare the corporate behavior of multinational affiliates and local competitors. Desai, Foley and Forbes (2007) find that U.S. multinational affiliates increase sales, assets and investment significantly more than local firms during, and subsequent to, currency depreciations. Alfaro and Chen (2010) show that multinational owned establishments performed better in aggregate output, demand, and credit conditions than their local competitors around the world when they were hit by the global financial crisis. Alvarez and Gorg (2007) evaluate the impact of an economic downturn in Chile on the employment growth of multinational and domestic firms and find no difference between multinational and domestic firms in their reaction to the economic crisis.

Fewer papers empirically examine the impact of financial crises on the cash holdings (Pinkowitz, Stulz and Williamson 2012). There are two different views on the impact of a financial crisis on cash holdings. According to the precautionary demand for cash hypothesis (Keynes, 1936), firms hold cash as a buffer to protect themselves against adverse cash flow shocks. Therefore, the precautionary demand for cash increases during periods of crisis to respond to potential good investment opportunities in the future. Another possibility is that firms might use the cash for investment purposes to mitigate the adverse impact of the economic shock that may also reduce the firm's cash holdings (see

Kahle and Stulz, 2013). Consistent with the precautionary demand theory, Dewally and Shao (2014) document the firms hold more cash during and after the 2008 financial crisis. Kahle and Stulz (2013) document that cash holdings follow a U-shape during the crisis. They find that cash holdings fall significantly during the first year of the crisis and the post-Lehman period, which is consistent with their investment purpose argument. However, the sharp increase after the collapse of Lehman and through 2009 support the precautionary demand theory instead.

In our paper, we hypothesize that the multinational affiliates will capitalize on the internal capital market when they have an external financial difficulty. We compare the cash holdings activities between multinational affiliates and local firms to test whether the existence of internal capital market affects the cash holdings of firms. Desai (2004b) analyze how multinationals capitalize affiliates around the world and demonstrate that multinational affiliates substitute internal borrowing for costly external finance stemming from adverse capital market conditions. Desai et al. (2006) demonstrates that affiliates of multinational firms employ internal capital markets to circumvent capital controls in a manner that is unlikely to be available to local firms.

2.3 Data

We collect firm-level data from two major sources. The sample of multinational firms and local firms are obtained from the *Bureau van Dijk Osiris* database that provides financials and ownership data from all globally listed and major unlisted and delisted firms. *Osiris* also provides the names and countries on the subsidiaries of these firms, which we utilize to identify multinational firms. A firm is classified as a multinational firm when its subsidiary has other recorded shareholders located in the foreign country and the sum of

foreign total assets are larger than 10% of the firm. In addition, the firm must be the global ultimate owner of the foreign subsidiary (the percentage for the path from a subject company to its ultimate owner is larger than 50%; and it has no identified shareholder or its shareholder's percentages are not know). The firms are not classified as either multinational firm group or local firm group if a firm's all foreign subsidiaries' total assets are missing or parent firms' total assets are missing. Our sample covers all European countries and spans from 2004 to 2013 fiscal year and only keeps the consolidated companies. Financials and utilities firms are dropped.

We obtain financial and operating data on the subsidiaries of the multinational firms from *Amadeus*, which is a pan-European financial database containing information on over 5 million companies from 40 countries, including all the EU and Eastern Europe. The disclosure policies in Europe require both public and private firms to file detailed information on balance sheet and profits and loss accounts. Only level 1 subsidiary (the subsidiary of a multinational corporations is considered, the subsidiary of a subsidiary is not taken consideration) of multinational corporations are included in our sample. Only foreign subsidiaries (the incorporation county is different from that of the headquarters' country) are kept in our sample. Financials and utilities firms are dropped.

Our sample include 7 countries as emerging market countries for multinational affiliates and subsidiaries location. For the countries of parent companies of multinational corporations are located in 20 developing countries and 6 developed countries are included. As a result, our sample include 489 multinational firms (with 2208 subsidiaries) and 749 local firms across 2004 to 2013 fiscal year.

Table I reports the number of firms in each emerging countries in Europe. Column 1 presents the number of multinational firms whose foreign subsidiaries located in these 7 countries respectively. Column 2 and 3 shows the number of subsidiaries and local firms located in these countries. Our sample has a total of 2208 multinational affiliates and 749 local firms across 2004 to 2013 fiscal year. The number of multinational corporations whose foreign subsidiaries located in these countries (1077) is more than twice the number of multinational corporations (489) in our sample since some MNE may have foreign subsidiaries more than one of these countries and be double counted. Poland has the largest number of multinational corporations who have foreign subsidiaries located in this country (333). Hungary, Romania and Russia have 211, 192 and 190 MNE with foreign subsidiaries in those countries respectively. Bulgaria, Ukraine and Turkey have smallest number of firms in these countries, 78, 72 and 1 respectively. In the sample of foreign subsidiaries located in emerging market, Poland has the largest number of subsidiaries firms of multinational corporations (736), which is more than twice of the number of MNE. It means on average one MNE has more than two foreign subsidiaries in Poland. Russian, Hungary and Romania also have a large number of subsidiaries in their countries: 527 subsidiaries in Russian, 393 subsidiaries in Hungary and 333 subsidiaries in Romania. The subsidiaries number are always larger than one but smaller than three times of the number of MNE and it shows on average one MNE have more than one but fewer than three foreign subsidiaries in these countries. In that case, these foreign subsidiaries can cover the whole countries' operations and activities just as the local firms do, so they are comparable to the local firms as to the cash holdings behavior. Ukraine, Bulgaria and Turkey have smallest number of subsidiaries in their countries: 118 subsidiaries in Ukraine, 100 subsidiaries in

Bulgaria and 1 subsidiary in Turkey. As to the local firms, Russia has the largest number (301) local firms. Turkey and Poland have 206 and 179 local firms respectively. Romania, Hungary, Bulgaria and Ukraine all have fewer than 50 local firms.

Table II provides descriptive statistics for all the variables used in the empirical analysis, respectively for full sample (Panel A), subsidiaries of multinational firms (Panel B), and local firms (Panel C). All the variables (except dummy variables) are winsorized at 1% and 99% level. Crisis is an indicator variable equal to one if in the year begin with 2009. MNE is a dummy variable equal to one if the firm is a foreign subsidiary of a multinational corporation, zero if the firm is a local one, We include the following firm characteristics: total assets, logarithm of cash and cash equivalent over total assets, capital expenditure over total assets, earnings before interest, depreciation and amortization over total assets, property plant and equipment over total assets, working capital over total assets and book leverage.

The average (median) firm in our sample has $200($17) million in total assets, 8.7% (0) book leverage. The average (median) logarithm of cash and cash equivalent as a proportion of total assets is -3.286 (-2.949). The average (median) capital expenditure as a proportion of total assets is 3.6% (1.5%), and the average (median) earnings before interest, taxes, depreciation and amortization of total assets is 10.2% (9.8%). The average (median) PPE and working capital over total assets are 27.1% (20.8%) and 19.7% (17.9%) respectively. 53% of the sample firms were in crisis.

We then split the sample and consider subsidiaries of multinational corporations and local firms separately. In Panel B we show the descriptive statistics for the subsidiaries of multinational corporations. The average (median) firm in our sample for subsidiaries has

$87 ($9) million in total assets and 8.2% (0) in book leverage. The average (median) logarithm of cash to total assets is -3.123 (-2.745). 52% of the subsidiary firms were experiencing 2009 sovereign debt crisis. The average (median) capital expenditures, earnings before interest, taxes, depreciation and amortization, property plant and equipment and working capital has 4.5% (1.7%), 10.7% (10.5%), 24.7% (15.6%) and 21.7% (19.4%) as a proportion of total assets.

Finally, in Panel C of Table II we show the descriptive statistics for the sample of local firms. The average (median) firm for local firms has $599 ($146) million in total assets and 10.3% (3.7%) in book leverage, which are larger than those of subsidiary firms. The average (median) logarithm of cash and cash equivalent over total assets is -3.859 (-3.554). 58% of the local firms were experiencing 2009 sovereign debt crisis. The average (median) capital expenditures, earnings before interest, taxes, depreciation and amortization, property plant and equipment and working capital has 0.3% (0.4%), 9.2% (8.7%), 35.2% (34.9%) and 14.2% (15.1%) as a proportion of total assets.

2.4 Methodology and Results

2.4.1 Cash Holdings of Multinational Affiliates versus Local Firms

We begin our analysis by first comparing the cash holdings of multinational affiliates and local firms in emerging markets. Firms domiciled in emerging markets may have difficulty in obtaining external finance, and as a result they might need to hold cash for precautionary reasons. Since multinational affiliates are able to borrow from their headquarters when they need to (and thus may not need to hold additional precautionary cash), we test whether the multinational affiliates hold less cash than their local counterparts. We estimate the following ordinary least squares regression model:

$$Y_{i,j,k,t} = \emptyset_1 MNE_i + \emptyset_2 X_{i,j,k,t} + t + \alpha_j + \eta_k + \varepsilon_{i,t} \tag{1}$$

Where

- i is a subscript for each firm,

- j is a subscript for each industry

- k is a subscript for each country

- t is a subscript for each year

- $Y_{i,j,k,t}$ is the log cash holdings scaled by total assets

- MNE_i is a dummy variable equal to 1 if company i is a multinational affiliate

- $X_{i,j,k,t}$ is a set of firm-specific time-varying controls that include

  - firm size, which is measured as logarithm of total assets

  - cash flow, which is measured as earnings before interest, taxes, depreciation and amortization scaled by total assets

  - tangibility, which is measured as property, plant, and equipment divided by total assets

  - capital expenditure scaled by total assets

  - working capital scaled by total assets

  - a one period lag of the book of leverage scaled by total assets

- t is a time trend variable;

- α_j is a set of industry fixed effects. Where industries are defined at the two-digit SIC level

- η_k is a set of country fixed effects

- $\varepsilon_{i,t}$ is an error term.

All standard errors are clustered at the firm level to correct for serial correlation. The results of the ordinary least squares regression of Equation (1) are shown in column (1) of Table III.

The coefficient on MNE is negative (-0.366) and significantly different from zero, which reject the null hypothesis of there being no difference between the cash holdings of multinational affiliates relative to local firms. Multinational affiliates hold less cash. The signs on the control variables are what one would expect. Firm size is significantly negative related to cash holdings. Larger firms are more likely to have access to external capital markets, and thus on average should hold less precautionary cash. Cash flow is significantly positive related to cash holdings ratio. Firms that make more money, tend to hold more cash. Tangibility is negative related to cash holdings. It means the more the tangible assets on the balance sheet, the less cash firms need for precautionary motives, since it should be better able to borrow money using those assets as collateral. Capital expenditures are not significantly related to cash holdings, but working capital is significantly negative related to the cash holdings. The lag period of book leverage is significantly negative to cash holdings. In summation, the evidence supports the existence of an internal capital market that allows subsidiaries of multinational corporations to hold less cash than their local competitors.

2.4.2 Impact of the Sovereign Debt Crisis

We next examine whether the 2009-2010 sovereign debt crisis has any impact on our results. Firms might want to increase their cash holdings when facing future funding uncertainty, in order to inoculate future investment opportunities from funding shocks. This

may be especially true for local firms that do not have access to internal capital markets. To test the impact of the crisis, we employ an ordinary least squares regression model where we first include a crisis dummy variable, and then, for robustness, split our sample into sub-periods before, during, and after the crisis. We begin by examining the following model

$$Y_{i,j,k,t} = \emptyset_1 MNE_i + \emptyset_2 Crisis_t + \emptyset_3 Crisis_t * MNE_i + \emptyset_4 X_{i,j,k,t} + t + \alpha_j + \eta_k + \varepsilon_{i,t}$$

(2)

Where we employ the same control variables included in Equation (1), but include a dummy variable CRISIS, that equals 1 if the year of the observation was greater than or equal to 2009. Once again all standard errors are clustered at the firm level to correct for serial correlation.

The results are reported in Column (2) in Table III. The -0.117 coefficient estimate on the sovereign debt crisis dummy variables indicates after the 2009 crisis the firms (both local firms and multinational affiliates) hold 11.7% less cash than that before the crisis since the firms may have less precautionary motive for cash holdings after the crisis, but it is statistically insignificant. On average the multinational affiliates still hold significantly less cash (-0.470) than the local firms even after 2009crisis, but the difference significantly decrease (15%).

For robustness, we further examine the impact of the crisis on cash holdings by trifurcating the sample: before the crisis (2004-2008), during the crisis (2009-2010), and

after the crisis (2011 onwards). We employ the regression specification in Equation (3), where the control variables are the same as in Equation (1).

$$Y_{i,j,k,t} = \emptyset_1 MNE_i + \emptyset_2 X_{i,j,k,t} + t + \alpha_j + \eta_k + \varepsilon_{i,t} \quad (t=2004,2005\ldots,2008)$$

$$Y_{i,j,k,t} = \emptyset_1 MNE_i + \emptyset_2 X_{i,j,k,t} + \alpha_j + \eta_k + \varepsilon_{i,t} \quad (t=2009,2010)$$

(3)

$$Y_{i,j,k,t} = \emptyset_1 MNE_i + \emptyset_2 X_{i,j,k,t} + t + \alpha_j + \eta_k + \varepsilon_{i,t} \quad (t=2011,2010,\ldots,2013)$$

The results are reported in Columns (3), (4), and (5) of Table III. Column (3) demonstrates that, on average, the multinational affiliates hold much less cash (-0.668) than local firms before crisis (2004-2007). Column (4) reports the cash holdings of multinational affiliates is still significantly smaller (-0.369) than that of local firms in year 2009-2010, but not as small as it was in 2004-2008. One possibility is the parent firms of multinational corporations are also experiencing crisis at the same time, so they cannot support their subsidiaries as much as before. In that case, the subsidiaries has larger motive to hold precautionary cash than before the crisis. Column (5) reports that after the crisis, the multinational affiliates do not have significantly different cash holdings relative to local competitors since both multinational affiliates and local firms have no precautionary motive for cash holdings after the crisis. [4]

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[4] Appendix table A shows the results are robust when we study the cash holdings of firms in all developing countries (We include Bosnia and Herzegovina, Bulgaria, Croatia, Hungary, Lithuania, Macedonia, Montenegro, Poland, Moldova, Romania, Russian Federation, Serbia, Turkey and Ukraine in the developing countries sample). The multinational affiliates still hold significantly less cash than local firms before 2009 sovereign debt crisis, but the difference of relative cash holdings decrease in 2009-2010 sovereign crisis year and there are not significantly difference after the sovereign debt crisis.

2.4.3 Does the Domicile of the Parent Company Matter

We now turn our attention to the parent firms of multinational corporations and test whether a more financially constrained environment for the parent firm affects the cash holdings of their subsidiaries located in emerging markets. To this end, we divided the sample of multinational subsidiaries into two groups, those with parents in developing countries (that have better access to external capital) and those with parents in developed countries and employ an ordinary least squares regression to examine the factors that drive cash holdings. We again estimate the regression results using the specification in Equation (1). Table IV shows that the location of parent firms matter for the cash holdings of multinational affiliates and local firms.

2.4.3.1 Results When the Parent Is in a Developed Country

Panel A reports the regression estimation results when the multinational parent is located in a developed country[5] The regression results are similar with those reported in Table III. The -0.324 coefficient estimate of MNE in Column (1) indicates that multinational affiliates of parents located in developed countries tend to hold less cash relative to local firms. We then estimate Equation (2) in subsample to determine whether the crisis had any impact on the results. The results are reported in Column (2) of Table IV. The -0.100 coefficient estimate of the crisis dummy variable indicates that after the crisis, the firms (both local firms and multinational affiliates) hold 10% less cash than that before the crisis, but this difference is not statistically significant.

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[5] We include Austria, Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Slovakia, Slovenia, Spain, Sweden and United Kingdom in the developed countries sample for the home country of multinational firms.

To further examine the impact of the crisis on cash holdings, we estimate Equation (3) for the subsample firms. The results are reported in Columns (3), (4), and (5) of Table IV. Column (3) reports that multinational affiliates hold much less cash (60.5%) than local firms before crisis (2004-2008). In Column (4), we see that the cash holdings of multinational affiliates still significantly smaller (34.4%) than the local firms in 2009-2010, but not as small as it was in 2004-2007, which is consistent with the full sample results. Column (5) reports that there is no significant difference in the cash holdings after the crisis due to no precautionary motivation for both kinds of firms.

2.4.3.2 Results When the Parent Is in a Developing Country

Panel B of Table IV regression estimation results when the parent firms is located in a developing country. [6] We estimate the regression results using the specification in Equation (1). The coefficient of MNE dummy is 0.8% and not significantly different from zero. This implies that multinational affiliates of parents that come from developed countries do not hold less cash than do their local competitors. This results suggests that when the parent firms have difficulty accessing external capital, then the multinational affiliates have no funding advantage relative to their local competitors. There seems to be little benefit to the internal capital market for the emerging market subsidiary. In this case, these firms need to hold similar ratio of cash holdings with their local counterparts. Column (2) to Column (5) shows there is no significant difference in cash holdings between multinational affiliates and local firms before, during or after the crisis since the multinational headquarters cannot help their affiliates [7]

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[6] These include Croatia, Hungary, Lithuania, Poland, Russian Federation and Turkey.

[7] Panel A of Appendix Table B shows the results are robust when we study the cash holdings of firms in all developing countries as host countries (We include Bosnia and Herzegovina, Bulgaria, Croatia, Hungary, Lithuania, Macedonia,

To summarize, the results in Table IV and the robustness in Appendix Table B demonstrate that the location of parent firms matters when comparing the cash holdings ratio of multinational affiliates and local firms. When the parent firms are located in developed countries, there seems to be an effective internal capital market, and the multinational affiliates do not need to hold the same amount of cash as the local firms. In contrast, when the parent firms are located in developing countries, the multinational affiliates derive little benefit from the internal capital market, and there is no significant difference in cash holdings.

2.5 Conclusion

In this paper we study the role of the internal capital markets by examining the cash holdings of emerging market subsidiaries of multinational corporations relative to their local competitors. We perform our analyses using a panel of 489 multinational firms (with 2208 subsidiaries) and 749 local firms across seven emerging European markets from 2004 to 2013. Our main finding is that emerging market subsidiaries of multinational corporations tend to hold less cash than do their local competitors. Our results are robust when we extend our sample to all developing countries (which include 14 countries here) instead of emerging countries only. We suggest that the reason for the lower cash holdings for the multinational subsidiaries is the existence of an effective internal capital market.

Montenegro, Poland, Moldova, Romania, Russian Federation, Serbia, Turkey and Ukraine in the developing countries sample) and the parents of multinational firms are in developed countries. The multinational affiliates still hold significantly less cash than local firms before 2009 sovereign debt crisis, the difference in cash holdings decrease in 2009-2010 crisis period and even no significantly difference after the crisis. Panel B of Appendix Table B shows the robust results when the host countries are developing countries. The coefficient of dummy variable MNE is negative but still not significant (-0.069) and it shows the multinational affiliates and their local counterparts on average hold no significantly different cash holdings ratio when their parents are in developing countries

We also test whether the location of parent firms affect the cash holdings of their subsidiaries, by separating the subsidiaries into two groups depending on whether their parents were located in developed or developing countries. We find that the domicile of the parent matters. Subsidiaries of parents located in developed countries hold significantly less cash than their local counterparts, but subsidiaries of parents located in developing countries do not hold less cash than their local competitors.

Overall, our results show that the internal capital market of multinational firms has an effect on the cash holdings of their subsidiaries, and we suggest that the reason why is that they alleviate the pressure on the subsidiary to hold precautionary cash. Interestingly, when the internal capital market is more prone to failures, as might be the case when the parent company is from a developing country, subsidiary firms show no different behavior than their local competitors.

Table 2.1 Firm distributions in emerging market

This table provides the number of firms in each emerging countries in Europe. The number of multinational corporations whose foreign subsidiaries are located in these countries, the number of subsidiary firms located in the same country and the number of local firms in the same county are reported respectively.

Country	Headquarter No.	Subsidiary No.	Local No.
Poland	333	736	179
Hungary	211	393	18
Romania	192	333	32
Russian Federation	190	527	301
Bulgaria	78	100	11
Ukraine	72	118	2
Turkey	1	1	206
Total	1077	2208	749

Table 2.2 Descriptive Statistics of Main Variables

This table provides descriptive statistics for all the variables used in the empirical analysis, respectively for subsidiaries of multinational firms (Panel A) and local firms (Panel B). In both panels, the variables of subsidiary firms and local firms are reported respectively. All the variables (except dummy variables) are winsorised at 1% and 99% level.

Panel A: all firms						
Variable	N	P25	Mean	Median	P75	Standard deviation
Total assets	19,144	3,575	200,506	17,678	93,941	636,855
Cash/total assets	19,117	0.013	0.128	0.052	0.165	0.184
Crisis	19,144	0	0.531	1	1	0.499
MNE	19,144	1	0.779	1	1	0.415
Capex/total assets	15,880	-0.011	0.036	0.015	0.075	0.146
Ebitda/total assets	13,966	0.026	0.102	0.098	0.191	0.199
PPE/total assets	18,897	0.048	0.271	0.208	0.448	0.244
Working capital/total assets	15,706	0.034	0.197	0.179	0.367	0.285
Book leverage	15,804	0	0.087	0	0.086	0.176

Panel B: subsidiaries of multinational corporations						
Variable	N	P25	Mean	Median	P75	Standard deviation
Total assets	14,908	2,248	87,390	9,279	41,359	331,203
Cash/total assets	14,887	0.015	0.147	0.064	0.197	0.199
Crisis	14,908	0	0.517	1	1	0.500
Capex/total assets	12,404	-0.004	0.045	0.017	0.077	0.139
Ebitda/total assets	10,018	0.022	0.107	0.105	0.208	0.219
PPE/total assets	14,688	0.036	0.247	0.156	0.417	0.247
Working capital/total assets	11,470	0.039	0.217	0.194	0.397	0.282
Book leverage	12,351	0	0.082	0	0.036	0.183

Panel C: local firms						
Variable	N	P25	Mean	Median	P75	Standard deviation
Total assets	4,236	47,444	598,602	145,914	528,133	1,115,183
Cash/total assets	4,230	0.007	0.063	0.029	0.083	0.086
Crisis	4,236	0	0.580	1	1	0.494
Capex/total assets	3,476	-0.054	0.003	0.004	0.068	0.166
Ebitda/total assets	3,948	0.035	0.092	0.087	0.151	0.136
PPE/total assets	4,209	0.175	0.352	0.349	0.507	0.216
Working capital/total assets	4,236	0.020	0.142	0.151	0.293	0.286
Book leverage	3,453	0	0.103	0.037	0.153	0.144

Table 2.3 Comparison of cash holdings for subsidiary firms and local firms

This table presents the estimates from panel regressions explaining cash holdings of subsidiary firms and local firms in the emerging market between fiscal year 2004 to 2013. *Log(cash/total assets)* is the logarithm of cash and cash equivalent to total assets. *MNE* is an indicator variable equal to one if the firm is a subsidiary of a multinational corporation, zero if the firm is a local one. *Crisis* is an indicator variable equal to one from fiscal year 2009. *MNE*crisis* is an interaction term between MNE dummy and Crisis dummy. *Capital expenditure* is measured as the sum of the first difference of fixed assets and depreciation costs. *PPE* is the net property plant and equipment. *Book leverage* is the ratio of total debt and total assets. *Ebitda* is earnings before interests, taxes, depreciation and amortization. *Working capital* is the difference of total current asset and total current liabilities. All the variables (except Crisis dummy) are winsorised at 1% and 99% level. All regressions include industry and country fixed effects. Standard errors are clustered at the firm level. T-statistics are in parentheses. ***, ** or * indicates that the coefficient estimate is significant at 1%, 5% or 10% level, respectively.

	Log(cash/total assets)	Log(cash/total assets)	Log(cash/total assets) 2004-2008	Log(cash/total assets) 2009-2010	Log(cash/total assets) 2011-2013
	(1)	(2)	(3)	(4)	(5)
MNE	-0.366***	-0.470***	-0.668***	-0.369**	-0.118
	(-3.13)	(-3.65)	(-4.30)	(-2.23)	(-0.82)
Crisis		-0.117			
		(-1.58)			
MNE*crisis		0.150*			
		(1.85)			
Log(assets)	-0.098***	-0.099***	-0.124***	-0.100***	-0.058**
	(-4.46)	(-4.52)	(-4.93)	(-3.33)	(-2.16)
Ebitda/total assets	1.242***	1.236***	1.456***	0.720***	1.418***
	(8.63)	(8.61)	(7.42)	(3.26)	(6.70)
PPE/total assets	-1.474***	-1.478***	-1.676***	-1.322***	-1.362***
	(-7.68)	(-7.70)	(-6.82)	(-5.13)	(-6.21)
Capex/total assets	-0.178	-0.163	-0.034	0.028	-0.570**
	(-1.11)	(-1.02)	(-0.17)	(0.08)	(-2.14)
Working capital/total assets	-0.388**	-0.384**	-0.512***	-0.336	-0.269
	(-2.49)	(-2.46)	(-2.83)	(-1.56)	(-1.45)
L.Book leverage	-0.900***	-0.898***	-1.555***	-0.935***	-0.046
	(-4.30)	(-4.29)	(-5.52)	(-2.98)	(-0.17)
Time Trend	-0.048***	-0.046***	-0.055***	-0.008	-0.004
	(-5.61)	(-3.78)	(-2.67)	(-0.19)	(-0.11)
Observations	9,980	9,980	3,901	2,781	3,298
R-squared	0.199	0.200	0.241	0.194	0.192

Table 2.4 Location of parent firms

This table presents the estimates from panel regressions explaining the comparisons of cash holdings of subsidiary firms and local firms between fiscal year 2004 to 2013 separately when the location of parent firms are in developed countries (Panel A) and in developing countries (Panel B) . *The subsidiaries and local firms are in emerging countries in this sample. Log(cash/total assets)* is the logarithm of cash and cash equivalent to total assets. *MNE* is an indicator variable equal to one if the firm is a subsidiary of a multinational corporation, zero if the firm is a local one. *Crisis* is an indicator variable equal to one from fiscal year 2009. *MNE*crisis* is an interaction term between MNE dummy and Crisis dummy. *Capital expenditure* is measured as the sum of the first difference of fixed assets and depreciation costs. *PPE* is the net property plant and equipment. *Book leverage* is the ratio of total debt and total assets. *Ebitda* is earnings before interests, taxes, depreciation and amortization. *Working capital* is the difference of total current asset and total current liabilities. All the variables (except Crisis dummy) are winsorised at 1% and 99% level. All regressions include industry and country fixed effects. Standard errors are clustered at the firm level. T-statistics are in parentheses. ***, ** or * indicates that the coefficient estimate is significant at 1%, 5% or 10% level, respectively.

Panel A: When parent firms are in developed countries					
	Log(cash/tot al assets)	Log(cash/tot al assets)	Log(cash/tot al assets) 2004-2008	Log(cash/tot al assets) 2009-2010	Log(cash/tot al assets) 2011-2013
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
MNE	-0.324***	-0.409***	-0.605***	-0.344**	-0.067
	(-2.75)	(-3.15)	(-3.87)	(-2.06)	(-0.46)
Crisis		-0.100			
		(-1.35)			
MNE*crisis		0.123			
		(1.50)			
Log(assets)	-0.086***	-0.087***	-0.107***	-0.093***	-0.046*
	(-3.84)	(-3.90)	(-4.17)	(-3.03)	(-1.68)
Ebitda/total assets	1.216***	1.211***	1.399***	0.709***	1.417***
	(8.32)	(8.30)	(7.04)	(3.12)	(6.42)
PPE/total assets	-1.520***	-1.523***	-1.787***	-1.370***	-1.335***
	(-7.64)	(-7.65)	(-7.10)	(-5.13)	(-5.85)
Capex/total assets	-0.216	-0.203	-0.092	0.010	-0.629**
	(-1.32)	(-1.24)	(-0.44)	(0.03)	(-2.29)
Working capital/total assets	-0.390**	-0.386**	-0.533***	-0.333	-0.273
	(-2.43)	(-2.41)	(-2.86)	(-1.51)	(-1.41)
L.Book leverage	-0.939***	-0.938***	-1.577***	-1.019***	-0.068
	(-4.36)	(-4.35)	(-5.47)	(-3.17)	(-0.25)
Time Trend	-0.052***	-0.049***	-0.060***	-0.032	-0.004
	(-5.92)	(-3.93)	(-2.83)	(-0.71)	(-0.09)
Constant	101.127***	95.104***	117.915***	59.795	2.840
	(5.72)	(3.79)	(2.77)	(0.66)	(0.04)
Observations	9,621	9,621	3,748	2,682	3,191
R-squared	0.200	0.201	0.243	0.197	0.191

	Log(cash/total assets)	Log(cash/total assets)	Log(cash/total assets) 2004-2008	Log(cash/total assets) 2009-2010	Log(cash/total assets) 2011-2013
Panel B: parent firms of multinational corporations are in developing countries					
	(1)	(2)	(3)	(4)	(5)
MNE	0.008	-0.230	-0.306	0.192	0.106
	(0.03)	(-0.81)	(-0.99)	(0.53)	(0.30)
Crisis		-0.110			
		(-1.33)			
MNE*crisis		0.378*			
		(1.70)			
Log(assets)	0.172***	0.169***	0.131***	0.194***	0.180***
	(5.29)	(5.22)	(2.70)	(4.63)	(4.80)
Ebitda/total assets	1.854***	1.842***	2.265***	1.651**	1.616***
	(4.67)	(4.62)	(4.39)	(2.23)	(3.76)
PPE/total assets	-0.339	-0.344	-0.240	-0.045	-0.644**
	(-1.40)	(-1.42)	(-0.68)	(-0.13)	(-2.21)
Capex/total assets	-0.525**	-0.508**	-0.141	-0.448	-0.990***
	(-2.53)	(-2.43)	(-0.52)	(-0.75)	(-3.09)
Working capital/total assets	0.994***	1.005***	0.800***	0.885***	1.326***
	(4.85)	(4.90)	(3.05)	(2.87)	(5.87)
L.Book leverage	-0.672**	-0.668**	-1.265***	-0.911*	0.058
	(-2.30)	(-2.30)	(-3.02)	(-1.94)	(0.16)
Time Trend	-0.024*	-0.011	-0.058*	-0.003	0.034
	(-1.74)	(-0.56)	(-1.66)	(-0.04)	(0.59)
Constant	41.992	15.700	108.969	0.336	-73.874
	(1.53)	(0.41)	(1.57)	(0.00)	(-0.64)
Observations	3,570	3,570	1,231	1,005	1,334
R-squared	0.279	0.280	0.309	0.289	0.316

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APPENDIX

Chapter 1 Appendix Table A SDC/Osiris matching summary

In Osiris data			
# of firms with sedol	56231		
In SDC data (globally)			
# of firms with sedol			
	UP	Ultimate parent has sedol	7531
	I	issuer has sedol	7720
# of firms that merge SDC with **global** Osiris data	UP/I	Osiris firm itself or its subsidiary has foreign debt	6776
	UP	Osiris firm's subsidiaries have foreign debt	5900
	I	Osiris firm itself has foreign debt	5827
# of firms that merge SDC with **European** Osiris data			
	UP/I	Osiris firm itself or its subsidiary has foreign debt	1642
	UP	Osiris firm's subsidiaries have foreign debt	1357
	I	Osiris firm itself has foreign debt	1490

Appendix Table B Variable Definitions

variables	definitions	
	local firms	subsidiaries
total debt	the sum of total long term interest bearing debt, other short term debt and current long term debt in US thousand dollar	the sum of long-term debt and loan
market capitalization	the difference of enterprise value and net debt	/
common equity	total shareholders equity-preferred shares-redeemable preferred shares	/
market value of assets	total assets-common equity+market capitalization	/
capex	the sum of first difference of fixed assets and depreciation	the sum of first difference of fixed assets and amortization
cash flow	the ratio of earnings before interest, taxes, depreciation and amortization to lag total assets	
capex/assets	the ratio of capital expenditure to total assets	
capex/lag assets	the ratio of capital expenditure to lag total assets	
capex/PPE	the ratio of capital expenditure to total assets to net property plant and equipment	the ratio of capital expenditure to tangible assets
capex/lag PPE	the ratio of capital expenditure to total assets to lag net property plant and equipment	the ratio of capital expenditure to lag tangible assets
capex/fixed assets	the ratio of capital expenditure to fixed assets	
capex/lag fixed assets	the ratio of capital expenditure to lag fixed assets	
ebitda/sales	the ratio of earnings before interest, taxes, depreciation and amortization to net sales	
ebitda/assets	the ratio of earnings before interest, taxes, depreciation and amortization to total assets	
market leverage	the ratio of total debt to market value of assets	/
book leverage	the ratio of total debt to total assets	
sales growth	the ratio of changes in sales to lag sales	
assets growth	the ratio of changes in assets to lag assets	

log(1+sales growth)	changes in logarithm of sales
log(1+assets growth)	changes in logarithm of assets
inflation	the ratio of changes in industry price index to lag industry price index
parent crisis dummy	/ dummy variable, 1 if the parent firm is in depreciation crisis in the given year
crisis(0,+2y)	dummy variable, 1 if in the year of and two years following a depreciation
foreign debt year dummy	dummy variable, 1 if the firm has issued the foreign debt and before maturity in the given year
foreign debt issuance within 3 years dummy	dummy variable, 1 if the firm issued the foreign debt in the given year, or in previous years up to three years before
crisis(0,+2y)*foreign debt year dummy	dummy variable, the interaction of crisis(0,+2y) and foreign debt year dummy
crisis(0,+2y)*foreign debt issuance within 3 years dummy	dummy variable, the interaction of crisis(0,+2y) and foreign debt issuance within 3 years dummy
foreign debt year dummy*cash flow	the interaction of foreign debt year dummy and cash flow
foreign debt issuance within 3 years dummy*cash flow	the interaction of foreign debt issuance within 3 years dummy and cash flow
parent in foreign debt year and in crisis	/ dummy variable, 1 if the parent firm has foreign debt and the parent firm is in crisis in the given year.
subsidiary in crisis(0,+2y)*parent in foreign debt year and in crisis	/ the interaction of crisis(0,+2y) for subsidiary firm and parent in foreign debt year and in crisis

parent with foreign debt issuance within 3 years and in crisis	/	dummy variable, 1 if parent firm issue foreign debt within 3 years and the parent firm is in crisis in the given year.
subsidiary in crisis(0,+2y)*parent with foreign debt issuance within 3 years and in crisis	/	the interaction of crisis(0,+2y) for subsidiary firm and parent with foreign debt issuance within 3 years

Chapter 2 Appendix Table A: Comparison of cash holdings for subsidiary firms and local firms for developing countries

This table presents the estimates from panel regressions comparing the cash holdings of subsidiary firms and local firms in the developing countries between fiscal year 2004 to 2013. *Log(cash/total assets)* is the logarithm of cash and cash equivalent to total assets. *MNE* is an indicator variable equal to one if the firm is a subsidiary of a multinational corporation, zero if the firm is a local one. *Crisis* is an indicator variable equal to one from fiscal year 2009. *MNE*crisis* is an interaction term between MNE dummy and Crisis dummy. *Capital expenditure* is measured as the sum of the first difference of fixed assets and depreciation costs. *PPE* is the net property plant and equipment. *Book leverage* is the ratio of total debt and total assets. *Ebitda* is earnings before interests, taxes, depreciation and amortization. *Working capital* is the difference of total current asset and total current liabilities. All the variables (except Crisis dummy) are winsorised at 1% and 99% level. All regressions include industry and country fixed effects. Standard errors are clustered at the firm level. T-statistics are in parentheses. ***, ** or * indicates that the coefficient estimate is significant at 1%, 5% or 10% level, respectively.

	Log(cash/total assets)	Log(cash/total assets)	Log(cash/total assets) 2004-2008	Log(cash/total assets) 2009-2010	Log(cash/total assets) 2011-2013
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
MNE	-0.415***	-0.502***	-0.704***	-0.461***	-0.135
	(-3.80)	(-4.15)	(-4.99)	(-3.01)	(-1.00)
Crisis		-0.125*			
		(-1.72)			
*MNE*crisis*		0.130*			
		(1.65)			
Log(assets)	-0.105***	-0.106***	-0.136***	-0.100***	-0.064***
	(-5.51)	(-5.57)	(-6.32)	(-3.78)	(-2.63)
Ebitda/total assets	1.077***	1.073***	1.278***	0.600***	1.260***
	(7.49)	(7.47)	(6.81)	(2.94)	(6.05)
PPE/total assets	-1.452***	-1.454***	-1.593***	-1.362***	-1.340***
	(-8.58)	(-8.59)	(-7.39)	(-5.96)	(-6.73)
Capex/total assets	-0.097	-0.087	-0.017	0.247	-0.518**
	(-0.67)	(-0.60)	(-0.10)	(0.80)	(-2.04)
Working capital/total assets	-0.361***	-0.360***	-0.477***	-0.308	-0.312*
	(-2.66)	(-2.65)	(-3.03)	(-1.63)	(-1.83)
L.Book leverage	-0.891***	-0.889***	-1.378***	-0.873***	-0.181
	(-5.46)	(-5.45)	(-6.23)	(-3.67)	(-0.79)
Time Trend	-0.041***	-0.035***	-0.036*	-0.009	0.003
	(-5.09)	(-3.14)	(-1.91)	(-0.22)	(0.09)
Constant	79.811***	68.066***	69.741*	14.681	-9.956
	(4.91)	(3.01)	(1.85)	(0.18)	(-0.15)
Observations	12,034	12,034	4,795	3,341	3,898
R-squared	0.198	0.198	0.240	0.193	0.192

Appendix Table B Location of parent firms when subsidiaries are in developing

countries

This table presents the estimates from panel regressions explaining the comparisons of cash holdings of subsidiary firms and local firms between fiscal year 2004 to 2013 separately when the location of parent firms are in developed countries (Panel A) and in developing countries (Panel B). The subsidiaries and local firms are in developing countries in this sample. *Log(cash/total assets)* is the logarithm of cash and cash equivalent to total assets. *MNE* is an indicator variable equal to one if the firm is a subsidiary of a multinational corporation, zero if the firm is a local one. *Crisis* is an indicator variable equal to one from fiscal year 2009. *MNE*crisis* is an interaction term between MNE dummy and Crisis dummy. *Capital expenditure* is measured as the sum of the first difference of fixed assets and depreciation costs. *PPE* is the net property plant and equipment. *Book leverage* is the ratio of total debt and total assets. *Ebitda* is earnings before interests, taxes, depreciation and amortization. *Working capital* is the difference of total current asset and total current liabilities. All the variables (except Crisis dummy) are winsorised at 1% and 99% level. All regressions include industry and country fixed effects. Standard errors are clustered at the firm level. T-statistics are in parentheses. ***, ** or * indicates that the coefficient estimate is significant at 1%, 5% or 10% level, respectively.

Panel A: parent firms of multinational corporations in developed countries				
	Log(cash/t otal assets)	*Log(cash/tot al assets)*	*Log(cash/tot al assets)* *2004-2008*	*Log(cash/tot al assets)* *2009-2010*	*Log(cash/tot al assets)* *2011-2013*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
MNE	-0.364***	-0.443***	-0.662***	-0.410***	-0.068
	(-3.29)	(-3.62)	(-4.69)	(-2.65)	(-0.50)
Crisis		-0.107			
		(-1.47)			
MNE*crisis		0.117			
		(1.48)			
Log(assets)	-0.092***	-0.094***	-0.120***	-0.089***	-0.051**
	(-4.66)	(-4.71)	(-5.39)	(-3.24)	(-2.00)
Ebitda/total assets	1.037***	1.034***	1.243***	0.575***	1.219***
	(7.04)	(7.02)	(6.50)	(2.73)	(5.62)
PPE/total assets	-1.490***	-1.491***	-1.729***	-1.372***	-1.296***
	(-8.43)	(-8.43)	(-7.75)	(-5.75)	(-6.18)
Capex/total assets	-0.162	-0.153	-0.084	0.168	-0.611**
	(-1.10)	(-1.04)	(-0.45)	(0.54)	(-2.38)
Working capital/total assets	-0.347**	-0.345**	-0.501***	-0.288	-0.289
	(-2.47)	(-2.46)	(-3.06)	(-1.48)	(-1.63)
L.Book leverage	-0.929***	-0.927***	-1.342***	-1.012***	-0.204
	(-5.50)	(-5.48)	(-5.94)	(-4.12)	(-0.85)
Time Trend	-0.043***	-0.039***	-0.039**	-0.018	0.001
	(-5.18)	(-3.32)	(-2.01)	(-0.45)	(0.04)
Constant	83.416***	74.363***	76.091*	33.199	-6.578
	(4.99)	(3.19)	(1.95)	(0.41)	(-0.10)
Observations	11,469	11,469	4,550	3,186	3,733
R-squared	0.197	0.197	0.240	0.194	0.191

	Log(cash/total assets)	Log(cash/total assets)	Log(cash/total assets) 2004-2008	Log(cash/total assets) 2009-2010	Log(cash/total assets) 2011-2013
Panel B: parent firms of multinational corporations in developing countries					
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
MNE	-0.069	-0.096	-0.286	-0.05	0.053
	(-0.30)	(-0.39)	(-1.01)	(-0.17)	(0.18)
Crisis		-0.087			
		(-1.11)			
MNE*crisis		0.045			
		(0.24)			
Log(assets)	0.127***	0.127***	0.084**	0.151***	0.141***
	(4.20)	(4.17)	(2.00)	(3.85)	(3.97)
Ebitda/total assets	2.091***	2.083***	2.325***	1.871***	1.839***
	(5.53)	(5.50)	(4.78)	(2.69)	(4.29)
PPE/total assets	-0.364	-0.363	-0.206	-0.212	-0.601**
	(-1.63)	(-1.62)	(-0.65)	(-0.66)	(-2.22)
Capex/total assets	-0.427**	-0.423**	-0.134	-0.373	-0.898***
	(-2.16)	(-2.13)	(-0.55)	(-0.70)	(-2.80)
Working capital/total assets	0.934***	0.937***	0.775***	0.804***	1.264***
	(4.77)	(4.78)	(3.05)	(2.76)	(5.84)
L.Book leverage	-0.593**	-0.590**	-1.105***	-0.821*	0.108
	(-2.18)	(-2.16)	(-2.85)	(-1.89)	(0.32)
Time Trend	-0.022	-0.007	-0.080**	-0.032	0.061
	(-1.64)	(-0.39)	(-2.53)	(-0.46)	(1.17)
Constant	38.158	8.795	155.390**	59.424	-127.021
	(1.44)	(0.25)	(2.45)	(0.42)	(-1.22)
Observations	4,121	4,121	1,476	1,151	1494
R-squared	0.267	0.268	0.299	0.279	0.315