Shelters from the Storm:
Multinational and Local Firm Responses to Currency Crises

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ABSTRACT

This paper investigates if large depreciations differentially impact multinational affiliates and local firms in emerging markets and what determines these differential responses. U.S. multinational affiliates increase sales, assets and investment significantly more than local firms during, and subsequent to, currency crises. The enhanced relative performance of multinationals is traced to their ability to use internal capital markets to capitalize on the competitiveness benefits of large depreciations. Investment specifications indicate that increases in leverage induced by sharp depreciations constrain local firms but not multinational affiliates. Multinational parents also infuse new capital in their affiliates subsequent to currency crises. These results indicate another effect of foreign direct investment in emerging markets – affiliates expand economic activity during currency crises when local firms are most constrained.

JEL Classifications: F10, F23, F31, G15, G32 L16.

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1. Introduction

Analyses of the consequences of foreign direct investment (FDI) for host economies typically center on the presence of technology spillovers, the labor and environmental practices of multinational firms, or the effects of tax competition on the fiscal base of areas hoping to attract foreign direct investment.[1] These effects are likely magnified in emerging markets where multinational firms often constitute a large fraction of domestic output, trade balances. Given that these emerging economies are also characterized by aggregate volatility and currency crises, the question of how multinational firms respond to the macroeconomic conditions associated with currency crises is critical to assessing the impact of FDI in emerging economies.

This paper provides evidence that affiliates of multinational firms react differently than local firms to currency crises in emerging economies by significantly increasing sales, assets and investment. This differential reaction illustrates a consequence of FDI not emphasized heretofore – the mitigation of output contractions during currency crises. While large currency depreciations can benefit firms by enhancing their competitiveness, many local firms are unable to benefit from this competitiveness effect due to greater difficulties obtaining capital during and after depreciations. This paper finds that multinational affiliates circumvent the financing constraints faced by local firms and, consequently, are able to capitalize on the competitiveness effects of large depreciations. In doing so, multinational affiliates expand activity precisely when local firms are most constrained.

In addition to providing evidence on the determinants of firm performance during currency crises, this paper employs the setting of currency crises to illuminate the more general question of how leverage can constrain investment. Myers (1977) demonstrates that corporate debt can weaken a firm's incentive to pursue promising investment opportunities and Whited (1992), Lang, Ofek, and Stulz (1995), and Hennessy (2003) all provide empirical evidence of a relationship between investment and leverage. Such empirical evidence is open to the alternative explanation that firms facing poor

[1] See, for example, Aitken and Harrison (1999), Harrison and McMillan (2003), Eskeland and Harrison (2003), and Figlio and Blonigen (2000).

investment opportunities choose higher levels of leverage. The sharp depreciations studied in this paper are hypothesized (and shown) to improve investment opportunities for firms in the tradable sector while also increasing leverage, given the reliance on foreign currency denominated liabilities. As a consequence, tracing the effects of these depreciations on leverage and through to investment enables us to circumvent this alternative explanation of the links between investment and leverage. The results illustrate that currency crises create comparable investment opportunities in the tradable sector for both local and multinational firms but that local firms are constrained by changes in leverage while multinational affiliates are not. Using depreciations as instruments for changes in competitiveness and leverage, we demonstrate that increases in leverage created by currency crises limit investment by local firms, despite improved investment opportunities, while multinational affiliates circumvent these financing constraints.

The paper jointly analyzes the behavior of local firms and U.S. multinational affiliates before, during, and after a series of major depreciations between 1991 and 1999 in emerging markets. In order to perform this analysis, we pool data on local firms and multinational affiliates. This new data set permits us to control for a variety of industry effects and to identify the relative performance of the two types of firms. Although other macroeconomic conditions often accompany currency crises, by focusing on sharp depreciations we isolate periods in which firms in the tradeable sector have an incentive to expand but may face constraints. In the empirical analysis, we first investigate if multinational firms respond differently than local firms to currency crises by examining changes in sales, assets, and investment. The results indicate that after depreciations, multinational affiliates have a greater increase in sales and assets than local firms in emerging economies. In the years after large depreciations, multinational firms increase sales and assets 5.4% and 7.5%, respectively, more than local firms. The relative performance of multinational affiliates is even more striking in investment. Capital expenditures are 34.5% higher for multinational firms than local firms in the aftermath of large depreciations. These differences in performance between local firms and multinational affiliates do not appear to reflect differential changes in investment opportunities stemming from differential access to global product markets.

To identify the source of these differential investment responses, we next investigate relative changes in operating profitability and leverage, proxies for how depreciations give rise to both competitiveness benefits and increased financing constraints. Although operating profitability responds similarly for the two types of firms before and after currency crises, local firms experience significantly larger increases in leverage than multinational firms. We refine this analysis by using depreciation episodes as instruments for leverage and operating profitability in investment specifications. Results indicate that the investment response to the beneficial competitiveness effects of depreciations is not significantly different for the two types of firms. The investment response by local firms, however, is significantly constrained by increases in leverage induced by depreciations. In contrast, the investment response by multinational firms is not constrained by changes in leverage. These results suggest that the internal capital markets of multinational firms provide them with the financing to increase investment after depreciations.

To further isolate how multinational affiliates circumvent local financing constraints, we examine more detailed multinational data that allow us to identify how financing patterns change in response to depreciations. The evidence indicates that multinational parents provide additional financing through intrafirm borrowing and equity infusions in response to sharp depreciations. These results provide further evidence that multinational firms overcome the negative consequences of large depreciations by ameliorating the financial constraints that handicap local firms.

The remainder of the paper is organized as follows. Section 2 motivates the subsequent analysis and empirical specifications through a review of the existing literature. Section 3 identifies the depreciation episodes and describes the data set for local firms and multinational affiliates. Section 4 presents results on the comparative performance of local and multinational firms around the depreciation episodes and the sources of the distinct performance. Section 5 discusses the more detailed analysis of how multinational firms change financing patterns in response to currency crises. Section 6 concludes.

2. Related Literature and Empirical Methodology

Our analysis of the relative performance of multinational and local firms during currency crises integrates the literature on firm performance during currency crises with the literature on how access to global markets affects firm performance. We review these two literatures and then outline our empirical methodology.

2.1 Firm Performance During Currency Crises

Sharp depreciations can benefit local firms by raising the price of imports (causing consumers to substitute toward domestically-produced goods) and by lowering production costs relative to foreign competitors (providing a cost advantage in export markets).[2] Krueger and Tornell (1999) provide empirical evidence of this competitiveness effect at the sectoral level, and Aguiar (2002) and Forbes (2002a, 2002b) provide empirical evidence at the firm-level.[3] In particular, Forbes (2002b) shows that firms with greater foreign sales exposure are more likely to have higher growth in sales, net income, market capitalization, and assets after depreciations. Evidence on the aggregate effect of sharp devaluations on output, however, is mixed. For example, both Agénor and Montiel (1996) and Gupta, Mishra and Sahay (2000) find that currency crises can have contractionary or expansionary effects, on aggregate, in different countries. Calvo and Reinhart (2000) distinguish between emerging and developed markets and conclude that currency crises in emerging markets are more likely to have large contractionary effects.

These mixed results, and especially the differential effect of devaluations in emerging and developed markets, has motivated several papers investigating effects that might offset the positive competitiveness effects described above. Most of this work considers how sharp depreciations can give rise to increased financial constraints.[4] Bernanke and Gertler (1989) show how negative shocks can be amplified in the presence of capital market imperfections and cause more widespread economic crises. When a large share of liabilities is denominated in foreign currency, as is common in emerging

[2] An important determinant of the magnitude of these effects is the extent to which exchange rate movements are "passed through" into local prices. Numerous studies, many of which are summarized in Goldberg and Knetter (1997), find that exchange rate pass through is incomplete.

[3] Johnson et al. (2000) and Mitton (2002) emphasize the importance of corporate governance in determining how devaluations affect firm stock prices during the Asian crises.

[4] Several papers, such as Edwards (1989) and Reif (2001), instead focus on how depreciations can raise the cost of imported inputs, thereby diminishing any positive competitiveness effect on firm performance.

markets, depreciations can aggravate credit constraints and worsen balance sheets, thereby hindering investment.[5] This link between investment and leverage during currency crises is the one emphasized, more generally, in Myers (1977) and examined empirically in Whited (1992), Lang, Ofek and Stulz (1995) and Hennessy (2003).

The relative importance of competitiveness effects and credit constraints for firms during currency crises remains an open question. Both Aguiar (2002) and Bleakley and Cowan (2002) attempt to determine which effect dominates and the two papers reach opposing conclusions.[6] Analysis of how multinationals and local firms respond differently to currency crises holds the promise of providing further insights on this question by comparing the behavior of two types of firms with differential access to capital while controlling for changes in investment opportunities.

2.2 Firm Performance and Access to International Markets

A large body of work indicates that having access to international sources of capital can allow firms to overcome constraints associated with local capital markets, especially in emerging markets. Some of this evidence comes from changes in financial openness. Stulz (1999) shows that financial market liberalizations reduce the cost of capital. Henry (2000a) and Bekaert and Harvey (2000) show that liberalizations increase stock market valuations, and Henry (2000b) shows that they also are associated with investment booms.

Access to global capital markets may also affect the relative performance of the subset of firms in an economy that can access those markets. Desai, Foley and Hines (2003a) 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. In a related vein, Desai, Foley

[5] See Aghion, Bachetta and Banerjee (2000) and Caballero and Krishnamurthy (2003) for formal models of how depreciations can interact with credit constraints to cause large output contractions. In particular, Caballero and Krishnamurthy (2003) highlights the role of dollar-denominated debt in underdeveloped financial markets. For a review of the extensive evidence on capital market imperfections and investment, see Hubbard (1998).

[6] Aguiar (2002) shows that balance-sheet effects significantly constrained investment in Mexican firms after the 1994 peso crisis. On the other hand, Bleakley and Cowan (2002) find that any balance-sheet effects are outweighed by the positive competitiveness effects of depreciations for firms from 5 Latin American countries between 1990 and 1999.

and Hines (2003b) demonstrate that affiliates of multinationals firms employ internal product and capital markets to circumvent capital controls in a manner that is likely not available to local firms.

Differential access to global markets may help explain aggregate patterns of FDI, more generally. Froot and Stein (1991) explain the correlation between FDI inflows and currency devaluations with a model in which capital market imperfections limit the ability of local firms to access external markets, thus putting foreign firms at an advantage in bidding for assets as a result of the associated wealth effects. Aguiar and Gopinath (2003) study the frequency and terms of cross border merger and acquisition activity subsequent to currency crises in Asia and present evidence that foreign firms buy assets at times that local firms may be liquidity constrained. Blonigen (1997) provides evidence that firm-specific assets (such as intangibles) become more highly valued by foreign acquirers during depreciations as these acquirers are better able to mobilize those assets abroad in the more highly valued currency as a result of product market imperfections. Taken together, this evidence that access to global markets is a source of distinctive performance suggests that multinational firms might respond to currency crises differentially given the value of such access during crises.

2.3 Empirical Methodology

If multinationals are able to access internal capital markets in order to capitalize on competitiveness effects, then these firms should increase their output and the scale of their activity more than local firms in the wake of depreciations. Therefore, we begin by analyzing sales, assets, and investment using the following specification:

$$
\begin{aligned}
Y_{i,j,k,t} &= \theta_1 Depreciation(t\text{-}1)_{k,t} + \theta_2 Depreciation(t)_{k,t} + \theta_3 Depreciation(t+1)_{k,t} + \theta_4 Depreciation(t+2)_{k,t} \\
&+ \theta_5 Multinational_i * Depreciation(t\text{-}1)_{k,t} + \theta_6 Multinational_i * Depreciation(t)_{k,t} \\
&+ \theta_7 Multinational_i * Depreciation(t+1)_{k,t} + \theta_8 Multinational_i * Depreciation(t+2)_{k,t} \\
&+ \theta_9 X_{i,j,k,t} + \eta_{j,t} + \alpha_i + \varepsilon_{i,t}
\end{aligned} \tag{1}
$$

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 a measure of operating activity (such as sales growth or capital expenditures); the depreciation dummy variables are respectively set equal to 1 for observations from one year before, the year of, one year

after, and two years after a depreciation in country k; $Multinational_i$ 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 including variables that account for producer-price inflation; $\eta_{j,t}$ is a set of industry-year dummy fixed effects; α_i is a firm-specific effect; and $\varepsilon_{i,t}$ is an error term. Industries are defined at the three-digit SIC level. All standard errors are clustered at the firm level to correct for serial correlation.[7]

The key variables of interest are the coefficients on the depreciation dummy variables and on these dummies interacted with the dummy variable for multinational affiliates. The depreciation dummies measure the response of local firms to depreciations, and the interaction terms capture the incremental performance of multinational affiliates relative to local firms. To facilitate calculations of the persistent effects of depreciations, we also estimate some specifications with only two depreciation dummies; the first is equal to one for observations in the year before a depreciation, and the second is equal to one for observations in the year of and each of two years following a depreciation. Following Evans (1987a) and other empirical work on the growth of firms, we include the initial value of the relevant measure of operating activity when the independent variable is measured as a growth rate. [8] All specifications include a fixed effect for each industry/year pair in order to control for time varying patterns in industry performance and investment opportunities.

Evidence on the distinct responses of multinational and local firms do not, of course, by themselves indicate the extent to which competitiveness benefits or changes in financial constraints explain differences in performance. As a first step in untangling these effects, we use measures of operating profits and leverage as dependent variables in specifications that are similar to equation (1). These specifications allow us to test if either competitiveness effects or financial constraints change in a distinct way for local and multinational firms surrounding a currency crisis.

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[7] See Bertrand, Duflo, and Mullainathan (2004). Results are qualitatively similar if standard errors are clustered by country. As a robustness test, we also estimate specifications which include country/industry/year fixed effects, with industry groups similar to two-digit SIC codes. In these specifications, it is only possible to identify a set of depreciation dummies that capture the difference between the response of multinationals and local firms to depreciations, and the sample only includes firms in countries that experience depreciations. These specifications confirm the results presented in the paper.

[8] For other work on the growth of firms, see Evans (1987b) and Hall (1987).

Next, we link changes in operating profits and leverage to changes in investment through a specification that builds closely on the debt overhang specification in Lang, Ofek, and Stulz (1995). Since investment, leverage, and operating profits may be jointly determined, we employ depreciation episode dummies and these dummies interacted with the multinational dummy as instruments for changes in leverage and operating profits in order to obtain unbiased estimates. Investment of a firm in a particular year is the dependent variable in this specification and predicted values of operating profits and leverage are independent variables. Predicted values are based on specifications using equation (1). These instruments should be valid if depreciations impact investment exclusively through changes in competitiveness and financing constraints, as suggested in the literature.[9] In these specifications, the coefficient on operating profits indicates the importance of changed investment opportunities arising from competitiveness effects and the coefficient on leverage indicates the changed importance of financing constraints. As in the specification outlined in equation (1), we also employ interactions with a dummy variable for multinational firms to isolate distinct financing constraints and competitiveness effects for multinational firms.

Finally, we employ more detailed data on multinationals affiliates in isolation to examine if changed financing patterns might explain the distinct reactions to currency crises. The empirical setup is similar to the one outlined in equation (1) with the exception that the dependent variables are measures of intrafirm financing – such as related party lending and paid in capital – and there are no multinational dummy variables since similar data are not available for local firms.

3. The Firm-level Dataset and Depreciation Episodes

3.1. The Firm-Level Dataset

The firm-level data set used in this paper is compiled from two major sources: the Bureau of Economic Analysis (BEA), which provides information on affiliates of U.S. multinationals, and Worldscope, which provides information on local firms. The Bureau

[9] One potential shortcoming of this setup is that operating profits may not adequately capture investment opportunities. If local firms increase leverage because they face poor investment opportunities, then the coefficient on leverage may simply reflect the choice of leverage in response to competitiveness effects and not the consequences of changed financial constraints. This is unlikely to be the case since depreciations should boost the competitiveness of the tradable sector, thus creating limited incentive to increase leverage.

of Economic Analysis (BEA) annual survey of U.S. Direct Investment Abroad from 1991 through 1999 provides a panel of data on the financial and operating characteristics of U.S. firms operating abroad. These surveys ask reporters to file detailed financial and operating items for each affiliate, as well as information on the value of transactions between U.S. parents and their foreign affiliates. The International Investment and Trade in Services Survey Act governs the collection of the data. The Act ensures that "use of an individual company's data for tax, investigative, or regulatory purposes is prohibited." Willful noncompliance with the Act can result in penalties of up to $10,000 or a prison term of one year. As a result of these assurances and penalties, BEA believes that coverage is close to complete and levels of accuracy are high.

U.S. direct investment abroad is defined as the direct or indirect ownership or control by a single U.S. legal entity of at least ten percent of the voting securities of an incorporated foreign business enterprise, or the equivalent interest in an unincorporated foreign business enterprise. A U.S. multinational entity is the combination of a single U.S. legal entity that has made the direct investment, called the U.S. parent, and at least one foreign business enterprise, called the foreign affiliate.[10] The foreign affiliate survey forms that U.S. multinational firms are required to complete vary depending on the year, the size of the affiliate, and the U.S. parent's percentage of ownership of the affiliate. The most extensive data are available for 1994 and 1999, when BEA conducted Benchmark Surveys.[11] BEA collects identifiers linking affiliates through time, thereby permitting the creation of a panel.

The second major source of firm-level data is the Worldscope database produced by Thompson Financial. This database provides information on local firms and contains annual balance sheet, income statement, cash flow, and general company information for

[10] In order to be considered as a legitimate foreign affiliate, the foreign business enterprise should be paying foreign income taxes, have a substantial physical presence abroad, have separate financial records, and should take title to the goods it sells and receive revenue from the sale. In order to determine ownership stakes in the presence of indirect ownership, BEA determines the percentage of parent ownership at each link and then multiplies these percentages to compute the parent's total effective ownership.

[11] In non-benchmark years, reporting exemption levels were higher and less information is collected. Although wholly-owned and majority-owned affiliates report many accounting items and information concerning operations each year, minority-owned affiliates need only file information about sales, net income, assets, employment, employment compensation, and trade with the United States in non-benchmark years. Majority-owned affiliates are foreign affiliates in which the combined direct and indirect ownership claim by a U.S. parent exceeds 50 percent.

companies based around the world. Firms are identified as local based on the country in which they are incorporated. Since the database is derived from publicly-available information, virtually all of the sample consists of publicly-traded companies, so that smaller and government-owned companies are underrepresented.[12] Worldscope coverage of public companies, however, is fairly extensive. For example, the September 2002 CD-ROM includes information for over 20,000 firms from 55 countries, representing over 96% of global market capitalization. While most of the Worldscope data used in this paper are drawn from the September 2002 CD-ROM, we augment these data with information from the September 1997 CD-ROM since Worldscope reports no more than 10 years of historical company information on each CD-ROM.[13]

We merge the Worldscope and BEA data. Then we create a common set of industry codes by translating the SIC codes in the Worldscope data into the ISI codes used by the BEA, which are roughly equivalent to three-digit SIC codes. In order to limit the sample to those firms that might experience competitiveness effects from depreciations, we exclude all firms that produce non-tradable goods and services.[14] We also limit the sample to data from 1991 through 1999, which is the time period available for both data sources. Finally, we exclude firms missing information for key variables, such as sales.

3.2. Depreciation Episodes

[12] There are several limitations with this data. First, although Worldscope attempts to correct for major differences in cross-country accounting standards, significant differences may still exist for certain variables. The analysis below addresses this problem by controlling for firm fixed effects. Second, there are a number of extreme and unrealistic outliers that undoubtedly represent reporting errors. The analysis below addresses this problem by performing an extensive set of sensitivity tests that includes removing outliers. Third, there is some chance that local firms are actually affiliates of multinationals based elsewhere in the world. Since U.S. parents wholly own more than 80% of their affiliates and affiliates are rarely publicly traded, however, there is little chance that firms classified as local are in fact U.S. MNEs.

[13] We match companies across datasets based on company numbers, sedol numbers, and/or company names. Then we test if the time series across the two datasets is consistent for seven data series: cash and equivalents, total assets, total liabilities, equity, sales, net income, and sales in U.S. dollars. If the time series for each of these variables is not consistent across the two CD-ROMs, the company is not treated as a "match" across the two data sources.

[14] More specifically, the resulting sample includes firms whose main BEA industry classification is in all industries between 010 and 0390 except for 070, 108, 124, 138, 148, and 150. The sample therefore includes firms that are active in the following broad categories of activity: agriculture, forestry, and fishing; mining; and manufacturing.

In order to identify how depreciations affect multinational affiliates and local firms, it is necessary to identify a series of depreciation episodes in emerging markets. We compute real exchange rates by first obtaining daily U.S. dollar exchange rates reported by Datastream for all available emerging markets from January 1990 through January 2000. Then we adjust these nominal exchange rates for inflation differentials using interpolated price data drawn from the IMF (2003).[15] Since the focus of this paper is on how currency movements affect real measures of firm operating activity, we focus on permanent, instead of temporary, depreciations. We define a depreciation episode as any one-year period in which the real exchange rate increases by over 25%. [16] If a country's real exchange rate depreciates by over 25% for a short period and then recovers in less than a year, this does not qualify as a depreciation episode.

This method of identifying depreciation episodes has two advantages over the strategies frequently used in past work. First, by focusing on depreciations that persist for at least a 12-month period, it ignores short-lived currency movements that would be expected to have minimal impact on firm operating activities. Second, previous work using high frequency exchange rate data has not directly accounted for inflation. Studies often just exclude high-inflation countries, since large nominal depreciations combined with high inflation can be poor measures of real changes in competitiveness. By focusing on longer depreciation periods it is possible to adjust for differences in relative price movements and thereby calculate real, instead of nominal, depreciations. Moreover, since this analysis focuses on testing how depreciations affect firm activities, real depreciations are more relevant than nominal ones.

[15] Price adjustments are based on annual producer prices (line 63..zf) whenever possible. If producer prices are not available, we use consumer prices (line 64..zf), or the most relevant price data available. Quarterly or monthly price information is not available for a majority of countries in the sample.

[16] If a country experiences a depreciation episode in a given year, the next year is excluded, so that a country can experience, at most, one depreciation event in any 2-year period. Moderate adjustments to the cutoff to qualify as a depreciation episode do not significantly affect the key results.

Next, in order to identify which countries are emerging markets, we use the classification from the back of the *Economist*.[17] We then exclude all countries for which there is no information in either of the two sources of firm-level data. Finally, we also exclude any country-years in which a country experiences inflation of over 100 percent, because it is difficult to accurately measure operating activity during periods of hyperinflation.

It is of course the case that many other macroeconomic changes often accompany currency crises. For example, data from Beck, Demirguc-Kunt, and Levine (2003) and Caprio and Klingebiel (1999) indicate that banking crises often occur at the same time as currency crises in emerging markets. By using periods in which depreciations occur, we isolate instances in which firms in the tradeable sector have incentives to expand while deterioration of the balance sheets of firms that have borrowed in undepreciated currencies and conditions in the local financial sector may inhibit their ability to do so.

3.3. Summary Information

The resulting sample includes firms in 25 emerging markets, 15 of which experience a depreciation episode. Table 1 provides information on country coverage and the share of firms drawn from the BEA and Worldscope samples. The first column of the table shows that there is a strong clustering in depreciation episodes, with several depreciations around the time of the 1994 Mexican Peso Crisis, and another set of depreciations around the 1997-98 Asian/Russian crises.

The right-hand columns in Table 1 also show that there are a roughly equal number of local and multinational firms across the sample period. In the group of countries that experience depreciations, 49% of the sample is classified as local firms. In the control group of countries (which do not experience depreciations), 45% of the sample is classified as local firms. No more than 15% of the total observations are drawn from any single country. Although multinational affiliates dominate the samples in Mexico and Venezuela, local firms and multinational affiliates each comprise at least 20% of the sample in every other country.

[17] The only exception is the Slovak Republic that is not included in the section on emerging markets or developed countries in the back of the *Economist*. We classify the Slovak Republic as an emerging market (which is the classification as the Czech Republic).

Table 2 provides descriptive statistics for the variables used in the empirical analysis, separated for local firms and multinational affiliates. The bottom of Table 2 also reports descriptive statistics for the variables only available for multinational affiliates and used in Section 5. Appendix Table 1 provides information on the number of affiliates and local firms by industry.

4. Firm Performance during Currency Crises

In order to investigate the relative performance of multinational affiliates and local firms during currency crises, we begin with a simple, bivariate analysis of their differential reactions. Figure 1 suggests that the response of multinationals to depreciations, as measured by the growth in sales and assets, is quite distinctive from that of local firms. Panel A shows that the median sales growth of multinational affiliates is almost identical to that of local firms in the year prior to depreciations. In the year of, and each of the two years following depreciations, however, the median sales growth of multinational affiliates exceeds that of local firms by considerable margins. While median sales growth for multinational affiliates is higher after depreciations than before, median sales growth for local firms is lower after depreciations than before.

Panel B illustrates similar patterns for median asset growth rates. Although multinational affiliates have slightly lower asset growth than local firms in the year before depreciations, median asset growth is more than twice as large among multinational affiliates in the year of and the two years after depreciations. The asset growth of multinational affiliates exceeds its pre-depreciation level in the year of and the two years after depreciations, but the asset growth of local firms increases by only a modest amount in the year of a depreciation, and then falls below its pre-depreciation levels.

A similar analysis of leverage and operating profitability presented in Figure 2 also shows substantial differences across the two types of firms. These patterns support a potential role for both financing constraints and competitiveness benefits in explaining why affiliates increase assets and sales more than local firms during depreciations. Leverage is measured as the ratio of current liabilities and long term debt to assets and Panel A shows that affiliates have slightly lower levels of leverage than local firms in the

year before depreciations. Although local firms experience increases in leverage in the year of a depreciation that persist in the following two years, affiliates experience only a temporary increase in leverage in the year of a depreciation.

Panel B of Figure 2 illustrates patterns in operating profitability, which is defined as the ratio of sales less operating expenses to sales.[18] It shows that in the year before a depreciation, affiliates experience operating profitability that is approximately 1 percentage point greater than local firms. Operating profitability increases for both types of firms in the year of depreciations, suggesting that companies immediately benefit from competitiveness effects. In the year following depreciations, median operating profitability of both types of firms contracts but remains above pre-depreciation levels. The descriptive data for the two years after depreciations indicate that local firm and affiliate operating profitability diverge. Given that this analysis allows firms to drop in and out of the sample, it is critical to employ firm fixed effects in a regression framework to see if evidence of this divergent performance persists.

4.1 Do Multinational Affiliates Perform Differently During Currency Crises?

Table 3 analyzes the levels and growth of sales and assets around the time of depreciations using the specification outlined in equation (1). The dependent variable in columns 1 and 2 is the log of sales (measured in nominal local currency units), so that the coefficients on the depreciation dummies are interpreted as the value of sales relative to mean firm sales, after controlling for individual industry/year fixed effects. The coefficient estimates in column 1 indicate that sales of local firms increase slightly at the time of depreciations, and then fall below their pre-depreciation levels in the year after and two years after a depreciation. The coefficient estimates of -0.0787 and -0.1270 on the $\text{depreciation}_{t+1}$ and $\text{depreciation}_{t+2}$ dummies imply, relative to the -0.0712 coefficient on the $\text{depreciation}_{t-1}$ dummy, that sales are 0.7 and 5.6 percentage points lower in the year following and two years following a depreciation, as compared to the year before a depreciation. An F-test indicates that the difference between local firm sales in the year before a depreciation and the two years after a depreciation is only marginally significant

[18] Operating expenses include selling, general, and administrative expenses, but exclude interest expenses so they do not reflect financing costs but do include some fixed costs.

(at the 10% level). However, the coefficients on the multinational depreciation interactions indicate that sales of multinational affiliates do not decline after depreciations. The large, positive and significant coefficients on the post depreciation dummies for multinationals imply that affiliate sales increase relative to the sales of local firms after depreciations.

Column 2 of Table 3 presents results for the same specification as in Column 1, except the dummies for the year of a depreciation and the two subsequent years are combined into a single dummy variable that is equal to one for all three of these years. The -0.0852 coefficient on the post depreciation dummy is slightly less than the dummy capturing the pre-depreciation level of sales, indicating a small but statistically insignificant decline in sales for local firms, on average, after depreciations. The level of sales of multinational affiliates is indistinguishable from that of local firm sales in the year before a depreciation. The 0.0841 coefficient on the interaction between the multinational and post depreciation dummy, however, implies that the sales of affiliates are 8.4 percentage points higher than the sales of local firms after depreciations.

Columns 3 and 4 of Table 3 analyze sales' growth rates (measured as the difference in log values) instead of the level of sales.[19] This approach has the advantage of automatically excluding multinational affiliates that are extremely small and only appear in benchmark years, thereby ensuring that the results are not merely a byproduct of large changes in small affiliates. The coefficient estimates are deviations from average growth rates. The estimates suggest that multinational affiliates have faster sales growth than local firms after depreciations. More specifically, column 3 indicates that in the year of and year after depreciations, local firms experience significantly lower average sales growth than before depreciations. In contrast, multinational affiliates have higher sales growth than local firms after depreciations, and this difference is highly significant in the year following depreciations. These patterns are even more clear in Column 4 when the years following depreciation are considered jointly. Local firms have significantly lower

[19] Since lagged values are required to compute growth rates, all observations from 1991 and all other observations of local firms and multinational affiliates that did not report in the previous period are dropped from the analysis.

sales growth after depreciations while the sales growth of multinational affiliates is 5.4 percentage points faster than that of local firms following depreciations.

The last four columns of Table 3 repeat this analysis but employ the log of assets instead of sales as the dependent variable. Investigation of firm size as measured by assets allows us to investigate if the output effects identified above are also associated with greater firm scale. The results indicate that multinationals expand assets more than local firms subsequent to depreciations. Column 5 shows that local firms' asset levels increase in the year of a depreciation, and then contract in the two subsequent years, so that after a depreciation, asset levels are statistically indistinguishable from their pre-depreciation levels. In contrast, multinational affiliates' asset levels, however, increase significantly after depreciations and remain significantly above their pre-depreciation levels in the two years after depreciations. The results in column 6 confirm that the asset base of multinational affiliates expands by significantly more than the asset base of local firms after depreciations.

The last two columns in Table 3 employ asset growth as the dependent variable, instead of the log of assets. Column 7 suggests that average asset growth for local firms was slightly higher in the year of depreciations than before, but significantly below average (by 6.2 and 5.0 percentage points, respectively) in the two years following depreciations. In contrast, asset growth for multinational affiliates significantly exceeded that for local firms in the year of depreciations. The difference in growth rates is a statistically significant 15 percentage points. Column 8 confirms that the asset growth of multinational affiliates was significantly greater than that of local firms in the period during and after depreciations.

Table 4 analyzes the investment behavior of local and multinational firms during depreciations. It uses two measures of investment as dependent variables: the log of capital expenditures and capital expenditures scaled by net property plant and equipment. Column 1 shows that although capital expenditures are not significantly different from their mean levels for local firms in the year before or year of depreciations, investment falls significantly in the two years following depreciations. In contrast, capital expenditures increase significantly for multinational firms in the two years after

depreciations. The results in column 2, using a single post-depreciation dummy, confirm these conclusions. Investment by local firms falls by 21 percent after depreciations compared to its pre-depreciation level. Investment by multinational affiliates after depreciations, however, is 34% higher than investment by local firms, and F-tests indicate that the level of affiliate capital expenditures in the year of and year following a depreciation differ from the level in the year before a depreciation by amounts that are statistically significant at the 5% level.

Different levels of investment between multinational affiliates and local firms may simply reflect differences in their scope of activity following depreciations, instead of differences in the investment intensiveness of entities of a similar size. To rule out this possibility, Columns 3 and 4 of Table 4 use capital expenditures scaled by end-of-period net property, plant and equipment (PPE) as the dependent variable. The results confirm those reported in columns 1 and 2. After scaling by net PPE, local firm investment falls below pre-depreciation levels after depreciations but multinational affiliate investment does not.

In order to consider the possibility that the preceding analysis failed to adequately control for unobserved differences in investment opportunities, we performed two robustness checks. First, these differential responses to currency crises might reflect differences in the extent to which multinational affiliates and local firms serve the local market. Given that multinational affiliates might be more likely to serve export markets, it is useful to consider if multinational affiliates that *exclusively* serve the local market prior to depreciations also perform distinctively from local firms during and after currency crises. This evidence indicates both that multinational affiliates that exclusively serve local markets significantly outperform local firms and have responses that are not significantly different than those multinational affiliates that had non-local sales. Second, rather than use industry/year controls in these specifications, we also employed country/industry group/year controls in order to more precisely control for country-specific changes in investment opportunities.[20] The results are robust to these alternative

[20] While industry classifications are roughly equivalent to three-digit SIC codes, industry groups are roughly equivalent to two-digit SIC codes. Results of both of these robustness checks are available from the authors.

controls. Both sets of results suggest that distinctive changes in investment opportunities do not account for the differential performance of local firms and multinational affiliates.

4.2 The Determinants of Differential Investment Responses

The evidence presented in Tables 3 and 4 demonstrates the differential reaction of multinational affiliates and local firms to currency crises. As discussed in Section 2, the competitiveness benefits of sharp depreciations would be expected to boost firm sales, assets and investment but these effects could be outweighed by changed financing constraints. The results on the distinctive response to currency crises between these two types of firms are consistent with two alternative hypotheses. First, it is possible that both types of firms benefit from competitiveness effects but local firms experience large changes in financial constraints that counteract any competitiveness effects from depreciations. Alternatively, it is possible that competitiveness effects are stronger for multinational affiliates, and that these effects alone drive the difference in relative performance.

In order to disentangle these alternative explanations, we begin by examining the effects of depreciations on operating profits, which is a measure of competitiveness effects, and leverage, which is a measure of changed financing constraints. The specifications in columns 1 and 2 of Table 5 employ the log of operating profits as the dependent variable in specifications similar to those presented in Tables 3 and 4. The results indicate that in the year of and two years after depreciations, operating profits of local firms exceed their pre-depreciation levels.[21] The operating profits of multinational affiliates also increase after depreciations, but are not significantly different from the levels for local firms in the year before, the year of, and the year after depreciations. In short, sharp depreciations are associated with significant improvements in operating profits for both local firms and multinational affiliates, suggesting that competitiveness effects are important for both sets of firms.[22] These results stand in contrast to the

[21] F-tests indicate that these differences are significant at the 1% level for the year of depreciations, 10% level for the year after depreciations, and 5% level for the second year after depreciations.

[22] Since the results in Table 3 indicate that the sizes of local firms and affiliates change around the time of depreciations, it is informative to examine local firm and affiliate operating profitability, or operating profits scaled by sales. These results are broadly consistent with those presented for operating profits.

distinctive performance of multinational and local firms documented in Tables 3 and 4 with respect to sales, assets, and investment.

To test for the presence of distinctive changes in financial constraints, columns 3 and 4 of Table 5 employ leverage as the dependent variable in specifications similar to the specifications in columns 1 and 2. Leverage is measured as the ratio of a firm's current liabilities and long term debt to assets. The leverage of local firms increases significantly in the year of depreciations, but the leverage of multinational affiliates does not. In fact, local firm leverage increases to levels higher than both average and pre-depreciation levels in the year of and each of the two years following depreciations. These increases are expected if firms borrow in foreign currency and are not able to improve their balance sheets after a currency crisis. The coefficients on the interaction terms with the multinational dummy variables, however, show that leverage does not increase for affiliates. While both types of firms appear to experience similar competitiveness benefits after depreciations, as measured by changes in operating profits, local firms alone experience large changes in leverage suggesting that financing constraints are limiting local firm responses to depreciations.

To more rigorously test this interpretation, we extend the above analysis by linking the changed operating profits and leverage arising from depreciations to observed patterns of investment. As discussed above, investment, leverage, and operating profits may be jointly determined so we employ depreciation episode dummies and these dummies interacted with the multinational dummies as instruments for changes in leverage and operating profits. The log of capital expenditures is the independent variable in this specification and predicted values of operating profits and leverage are dependent variables. The first stage specifications used to obtain predicted values are the same as the specifications presented in Table 5. In the specifications provided in Table 6, the coefficient on operating profits indicates the importance of changed investment opportunities arising from competitiveness effects and the coefficient on leverage

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Similarly, gross profits, a measure of profits that does not incorporate overhead expenses but is only available for local firms, also provides evidence of increased profitability subsequent to depreciations.

indicates the importance of changed financing constraints.[23] The interactions with a dummy variable for multinational firms isolate the distinct effect of financing constraints and competitiveness benefits for multinational firms.

We first estimate specifications that only include controls for either leverage or operating profits (plus the standard controls for the price index, industry/year fixed effects and firm fixed effects). Column 1 of Table 6 indicates that firms with higher levels of leverage after depreciations tend to have significantly lower levels of investment. Column 2 shows that firms with higher operating profits after depreciations tend to have significantly higher levels of investment. Column 3 controls for both effects simultaneously. The –2.04 coefficient on leverage implies that when depreciations increase the ratio of debt to assets by 10 percentage points, investment declines by more than 20%. The 0.98 coefficient on the log of operating profits implies that when depreciations increase operating profits by 10%, capital expenditures increase by 9.8%.

Columns 4-6 repeat the specifications from columns 1-3 but allow the coefficients on leverage and/or operating profits to vary across multinational and local firms. The results in column 6 demonstrate that changes in leverage inhibit investment for local firms but this is not the case for multinational affiliates. The effects of operating profits are positive and significant for local firms and are statistically indistinguishable for multinational affiliates. Results are similar if we scale capital expenditures by end-of-period net property, plant and equipment, or if we use operating profitability instead of operating profits. These results provide further support for the implications of the previous analysis – that competitiveness benefits accrue to both types of firms and motivate greater investment but that debt overhang constrains investment of local firms but not multinational affiliates.

[23] Tobin's Q is often used in investment specifications to characterize investment opportunities. Not only is this measure problematic—especially in emerging markets where stock market valuations may not reflect underlying fundamentals—but clean measures of Tobin's Q are unavailable for multinational affiliates since these firms are not publicly traded. Therefore, we rely on operating profits and industry/year fixed effects to proxy for changed investment opportunities. As a robustness test, we have also included fixed effects for each country/industry group/year to capture investment opportunities more precisely. Specifications with these fixed effects are run using only firms in reforming countries and leverage and competitiveness effects are identified off of differences in the responses of local firms and affiliates. The results similarly show that changes in leverage induced by depreciations constrain investment.

5. The Financing of Multinational Affiliates During Currency Crises

While more granular data on local firms is not available, a closer look at the behavior of multinational affiliates provides further evidence on precisely how they circumvent financing constraints. Table 7 presents regressions that examine growth in different components of affiliate financing subsequent to depreciations. The results in columns 1-3 demonstrate that local debt, foreign debt (debt borrowed from non-local persons), and related party debt (debt borrowed from an affiliate's parent) all increase significantly in the year of depreciations. There are two interpretations of these results. First, new capital may flow to affiliates in one of these forms of debt. Second, if debt is denominated in foreign currency, then the reported increase in debt may simply reflect a revaluation of existing loans to incorporate the depreciation. This revaluation of existing debt would not necessarily include any new flows of capital. Since increases in debt occur in the year of depreciations and are larger for debt from foreign sources (which is more likely to be denominated in foreign currency), this revaluation effect may explain some part of the growth in debt to multinational affiliates.

In order to test for the importance of this revaluation effect in driving the increase in debt for multinational affiliates after depreciations, we next examine changes in paid-in-capital. Paid-in-capital consists of the initial capital stock of an affiliate and any new equity infusions. This measure does not include retained earnings. Since this component of financing is measured in dollars, using historic exchange rates for translation when necessary, changes in the growth of paid-in-capital cannot be explained by changes in currency valuations. More generally, analysis of paid-in-capital allows insight into the behavior of parents who can infuse new capital into their affiliates.

Column 4 of Table 7 reports regression results where the dependent variable is the growth in paid-in-capital. The paid-in-capital of multinational affiliates increases in the years following depreciations, although this increase is only significant in the year after a depreciation. The coefficient estimates suggest that the paid-in-capital of multinational affiliates increases by 10.8% in the year after depreciations. This result provides direct evidence that new equity infusions from parent companies enable multinational affiliates in emerging markets to capitalize on investment opportunities after depreciations. In

combination with the evidence provided on changes in leverage and its role in influencing investment, this evidence further confirms the role of internal capital markets in allowing multinational firms to overcome financial constraints that handicap local firms.

6. Conclusion

This paper isolates the differential performance of multinational affiliates and local firms during currency crises in emerging markets and examines the sources of this distinctive performance. Affiliates of multinational firms expand sales, assets and investment subsequent to depreciations while local firms show little change or a decrease in each of these measures of operating activity. Local firms and multinational affiliates experience similar changes in operating profits after currency crises indicating that competitiveness benefits from depreciations are similar for the two types of firms. Local firms, but not multinational affiliates, tend to experience large increases in leverage indicating that local firms are more vulnerable to financing constraints after depreciations. Investment specifications that employ depreciation dummies as instruments confirm that changes in local firm financial constraints induced by depreciations lead to the distinctive investment performance of local firms relative to multinational affiliates. A more detailed analysis of multinational affiliates also demonstrates that multinationals receive equity infusions from their parent companies further confirming the importance of internal capital markets to multinationals in overcoming the financing constraints that hinder local firms in the aftermath of currency crises.

These findings point to an underappreciated, salutary effect of foreign direct investment. The internal capital markets of multinational firms allow their affiliates to expand output after severe depreciations, precisely when economies are fragile and prone to severe economic contractions. As a consequence, multinational affiliates mitigate some of the aggregate effects of currency crises. Further work could usefully examine the degree to which multinational and local firms exhibit different responses to less severe economic events. In addition, our results raise important questions about the long run distributional consequences of currency crises. Increased multinational activity

might help support local firms through larger spillover effects, increased trade credit, or other channels. Alternatively, increased multinational activity may crowd out activity by local firms during currency crises, and these effects may persist. While output effects of severe depreciations may be mitigated as a result of the presence of multinational firms, the extent to which local firms benefit from the presence of affiliates remains an open question.

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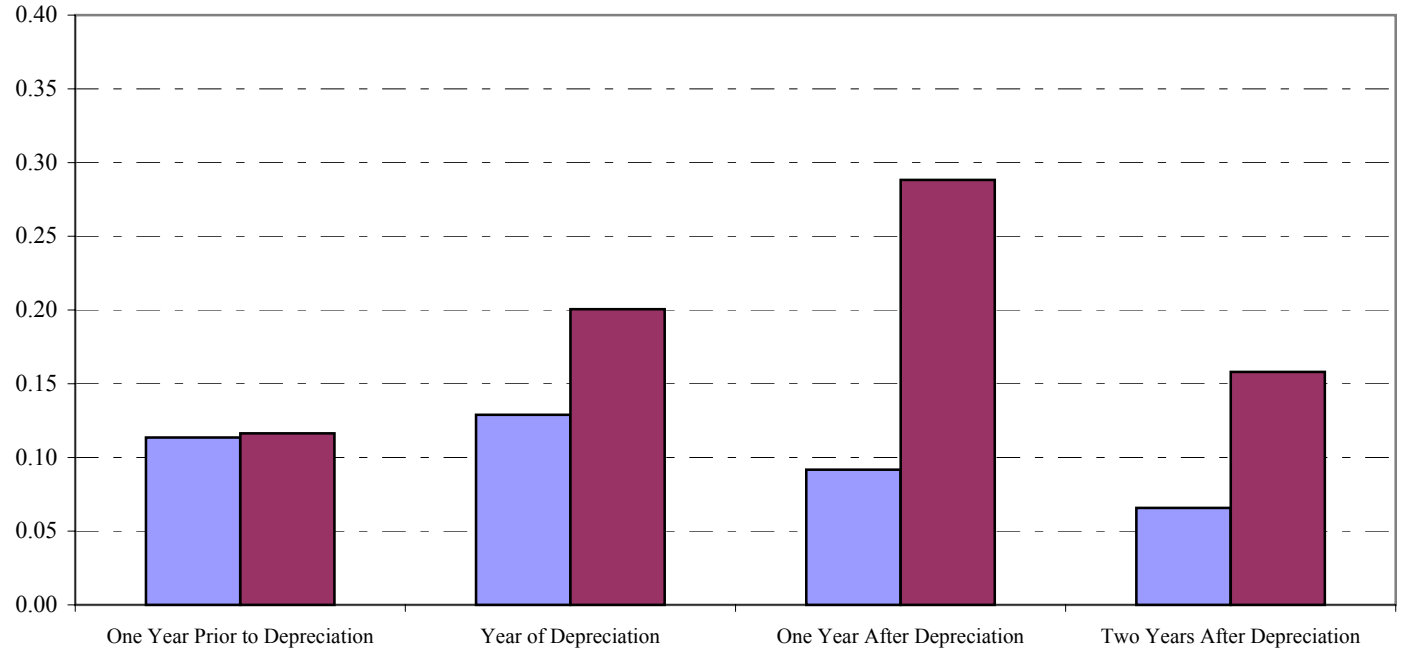
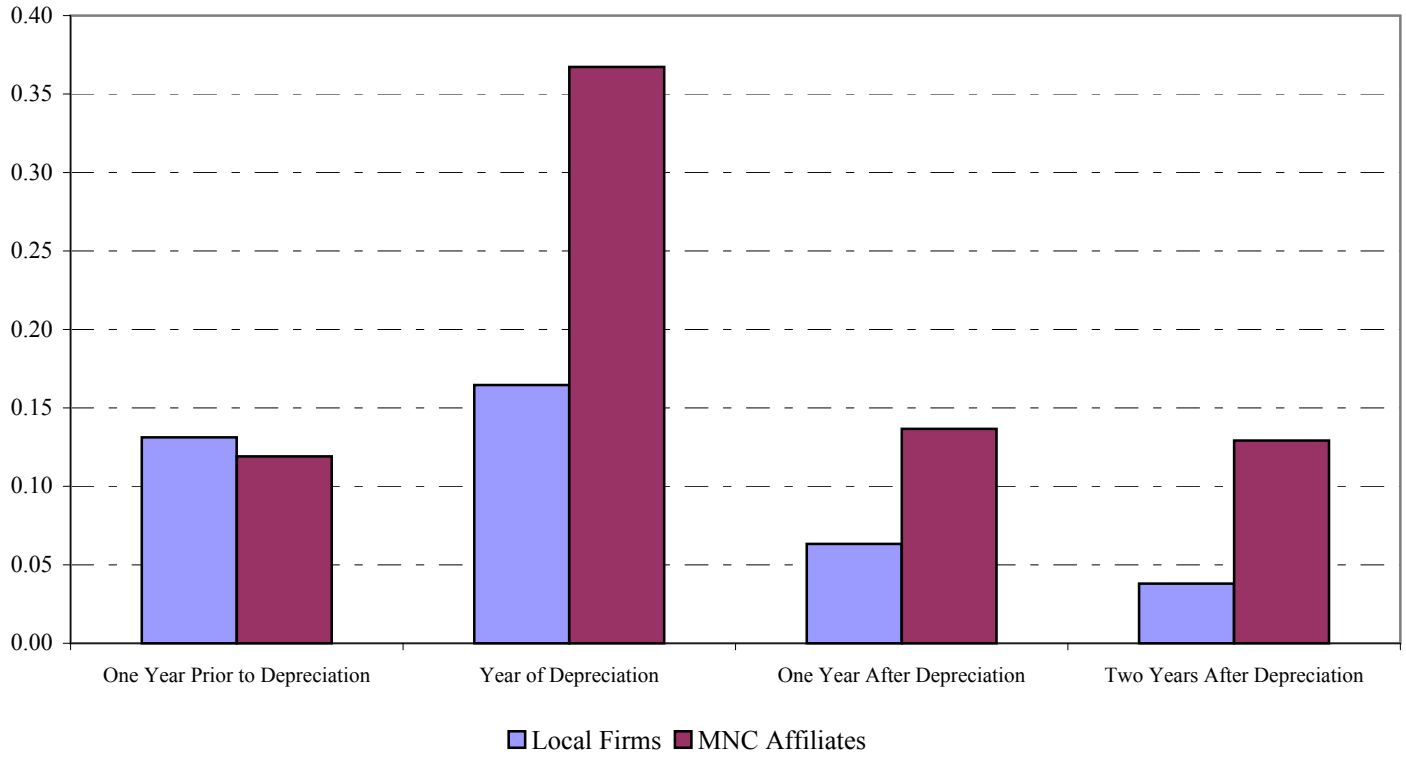
Figure 1: The Differential Response of U.S. Multinational Affiliates and Local Firms During Currency Crises

Panel A: Sales Growth



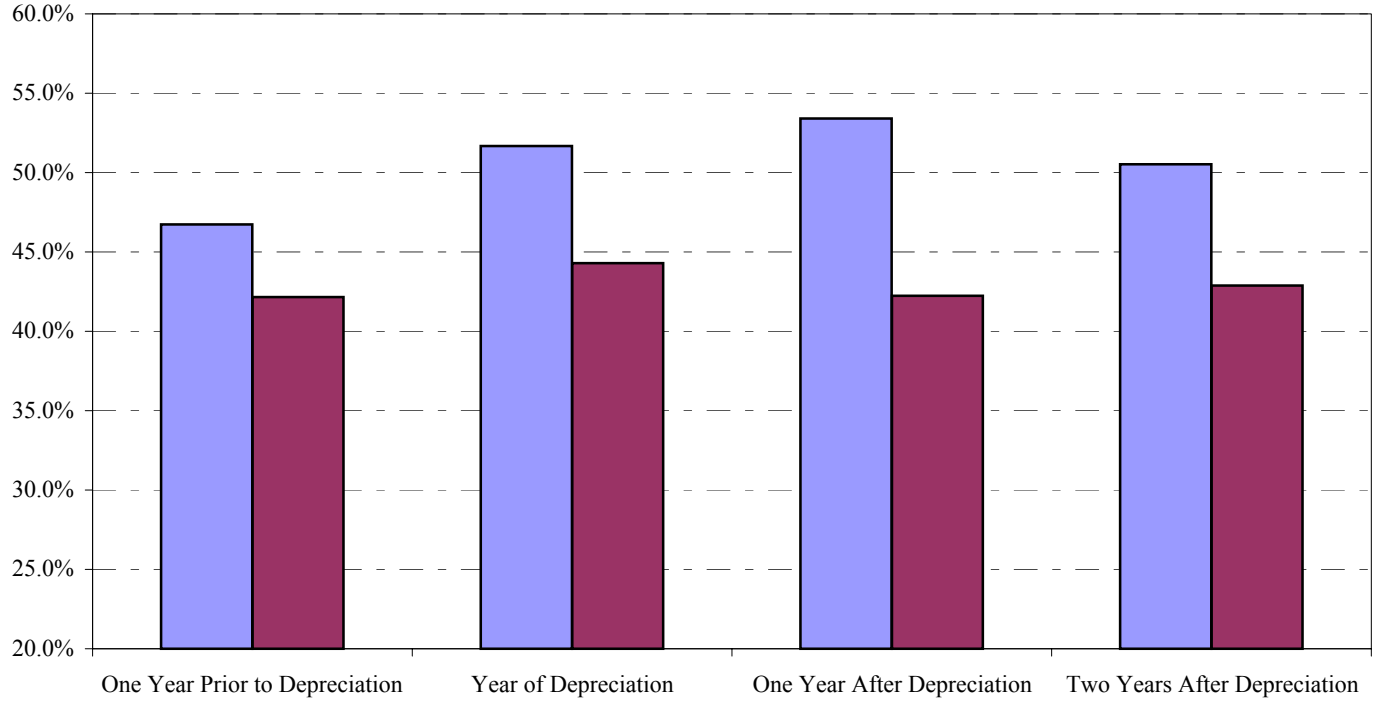
Panel B: Asset Growth



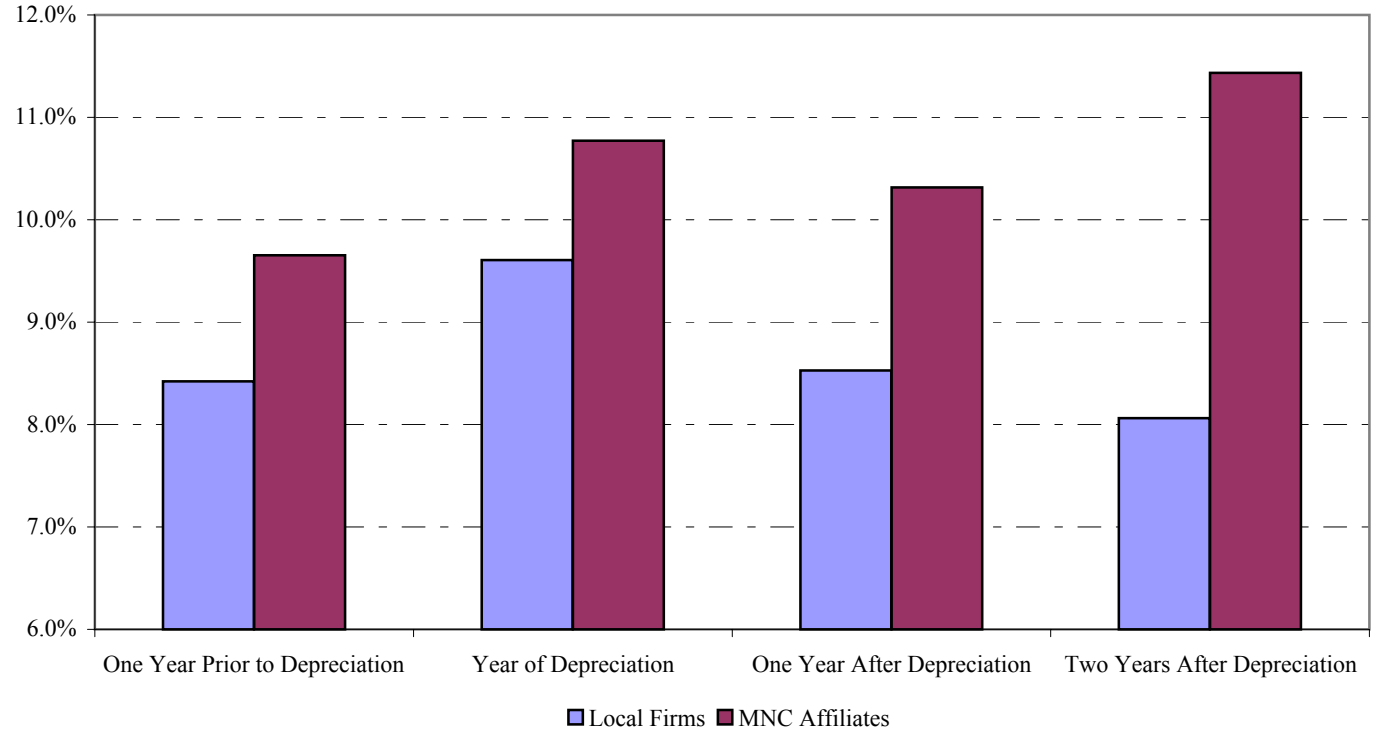
Note: The panels compare the median growth rates of sales and assets of local firms and U.S. multinational affiliates. In each panel, the pairs of bars correspond to years relative to a currency crisis. Within each pair, the first bar represents the median growth rate for local firms and the second bar represents the median growth rate for the multinational affiliates.

Figure 2: Changes in Leverage and Operating Profitability for U.S. Multinational Affiliates and Local Firms During Currency Crises

Panel A: Leverage



Panel B: Operating Profitability



Note: The panels compare the median leverage and the median operating profitability of local firms and U.S. multinational affiliates. In each panel the pairs of bars correspond to years relative to a currency crisis. Within each pair, the first bar represents the median value for local firms and the second bar represents the median value for the multinational affiliates.

Table 1
Sample Composition by Year and by Type of Firm for Emerging Markets with Currency Crises and Control Countries

	Number of Observations										% of Sample	
	1991	1992	1993	1994	1995	1996	1997	1998	1999	*All Years*	Worldscope	BEA
Depreciation Countries	1,224	1,555	1,740	2,674	2,342	2,466	2,569	2,935	4,085	21,590	49%	51%
Brazil (1999)	0	0	0	0	284	276	292	341	489	1,682	35%	65%
China (1994)	32	42	57	176	150	191	243	281	413	1,585	26%	74%
India (1991)	41	191	227	261	302	325	312	319	353	2,331	81%	19%
Indonesia (1997)	109	121	121	193	132	143	145	148	189	1,301	54%	46%
Malaysia (1997)	119	152	159	214	229	252	255	253	284	1,917	67%	33%
Mexico (1994)	277	284	289	578	275	290	297	343	585	3,218	14%	86%
Peru (1993)	0	23	33	49	30	37	38	47	70	327	56%	44%
Philippines (1997)	53	63	65	108	83	86	84	84	118	744	41%	59%
Russia (1998)	0	0	0	0	0	7	13	47	63	130	29%	71%
Singapore (1997)	110	121	127	215	163	180	186	189	242	1,533	38%	62%
South Africa (1998)	123	130	143	171	147	126	112	195	226	1,373	63%	37%
South Korea (1997)	143	154	202	281	236	229	241	301	568	2,355	70%	30%
Thailand (1997)	93	140	165	219	175	177	178	185	230	1,562	64%	36%
Turkey (1994)	54	63	77	89	67	77	96	109	139	771	58%	42%
Venezuela (1996)	70	71	75	120	69	70	77	93	116	761	13%	87%
Control Group	283	419	508	847	792	900	955	992	1,247	6,943	45%	55%
Argentina	72	79	89	139	105	109	123	133	174	1,023	22%	78%
Chile	50	59	64	103	78	82	88	100	151	775	48%	52%
Colombia	52	60	64	104	66	67	72	71	87	643	20%	80%
Czech Republic	0	0	0	0	29	56	60	61	81	287	40%	60%
Hong Kong	0	89	92	153	159	214	196	201	244	1,348	57%	43%
Hungary	0	0	21	40	31	41	44	48	66	291	28%	72%
Israel	16	35	41	61	37	34	48	50	74	396	44%	56%
Poland	0	0	26	42	58	65	73	83	106	453	39%	61%
Slovak Republic	0	0	0	5	2	7	17	17	22	70	54%	46%
Taiwan	93	97	111	200	227	225	234	228	242	1,657	64%	36%

Note: The sample includes data on U.S. multinational affiliates and local firms from all of the listed countries over the 1991-1999 period. The top panel provides sample information on the number of entities operating in emerging markets that undergo depreciations and the share of these entities that are drawn from Worldscope and BEA data. The bottom panel provides similar information on entities operating in emerging markets that do not undergo depreciations. Years in which countries experience "hyperinflation" of over 100% and country/year observations for which inflation or exchange rate data is unavailable are excluded. Country/years that are removed from the sample due to either of these criteria are: Brazil (1991-94), Czech Republic (1991-94), Hong Kong (1991), Hungary (1991-92), Peru (1991), Poland (1991-92), Russia (1991-95), Slovak Republic (1991-93). Depreciation episodes are defined as any real depreciation of the U.S. dollar exchange rate over 25% during any one-year period from January 1991 through December 1999. Nominal exchange rates are adjusted for inflation differentials using producer prices (whenever possible). If a country experiences a depreciation episode in the current year, the next year is excluded as a possible episode.

Table 2
Descriptive Statistics for Local Firms and Multinational Affiliates

	Local Firms			Multinational Affiliates		
	Mean	Standard Deviation	Median	Mean	Standard Deviation	Median
Log of Sales	15.0488	3.0231	14.5613	13.3198	2.9091	12.8418
Sales Growth	0.1266	0.3144	0.1096	0.1969	0.3759	0.1494
Log of Assets	15.4664	2.9699	14.9050	13.5045	2.7861	12.8514
Asset Growth	0.1460	0.2448	0.1128	0.1689	0.2958	0.1405
Log of Capital Expenditures	12.4075	3.1360	12.0052	10.2501	3.0486	9.7854
Capital Expenditures/ Net PPE	0.1967	0.1697	0.1522	0.2303	0.2259	0.1696
Log of Operating Profits	13.0989	3.1087	12.4497	12.0271	2.9005	11.4914
Operating Profitability	0.0939	0.1629	0.0877	0.1201	0.1699	0.1083
Leverage	0.4730	0.2307	0.4617	0.4559	0.2672	0.4168
Price Index	115.3496	75.1014	103.2000	115.8554	67.7326	100.0000
Inflation	0.0796	0.1272	0.0459	0.1082	0.1434	0.0656
Growth in Local Debt				0.1401	0.6110	0.1291
Growth in Foreign Debt				0.1228	0.7418	0.0690
Growth in Related Party Debt				0.0852	0.8119	0.0000
Growth in Paid in Capital				0.0624	0.3446	0.0000

Note: Values of sales, assets, capital expenditures, net ppe, operating revenues, local sales, foreign sales, related party sales, local debt, foreign debt, and related party debt are measured in thousands of local currency units. The growth rates are calculated as differences in log values. Operating revenues are the difference between sales and operating expenses. Operating Profitability is the ratio of the difference between sales and operating expenses to sales. Leverage is the ratio of debt to assets. The price index and inflation are taken from Datastream and measure prices and changes in prices in the host country. Local debt is borrowing by an affiliate from persons in the affiliate's host country. Foreign debt is borrowing by an affiliate from person's outside the affiliate's host country. Related party debt is borrowing by an affiliate from the affiliate's parent. Paid in capital includes equity capital investments in an affiliate, and this item is measured in U.S. dollars.

Table 3
Responses of Multinationals and Local Firms to Currency Crises

Dependent Variable:	Log of Sales		Sales Growth		Log of Assets		Asset Growth	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	12.8621	12.8581	1.3997	1.4149	12.8046	12.8235	2.8180	2.9006
	(0.6518)	(0.6531)	(0.4276)	(0.4269)	(0.7287)	(0.7511)	(0.3849)	(0.4061)
Price index	0.0048	0.0049			0.0044	0.0043		
	(0.0003)	(0.0003)			(0.0002)	(0.0002)		
Inflation			0.7361	0.7236			0.2050	0.1456
			(0.0534)	(0.0528)			(0.0375)	(0.0374)
Lag of Sales			-0.1419	-0.1424				
			(0.0200)	(0.0200)				
Lag of Assets							-0.2181	-0.2275
							(0.0112)	(0.0114)
$Depreciation_{t-1}$	-0.0712	-0.0782	-0.0185	-0.0147	-0.0286	-0.0265	-0.0223	-0.0217
	(0.0265)	(0.0262)	(0.0146)	(0.0145)	(0.0188)	(0.0186)	(0.0111)	(0.0111)
$Depreciation_{t}$	-0.0437		-0.0284		0.0376		0.0199	
	(0.0283)		(0.0154)		(0.0209)		(0.0127)	
$Depreciation_{t+1}$	-0.0787		-0.0845		-0.0219		-0.0624	
	(0.0316)		(0.0179)		(0.0228)		(0.0136)	
$Depreciation_{t+2}$	-0.1270		-0.0247		-0.0579		-0.0499	
	(0.0327)		(0.0144)		(0.0242)		(0.0114)	
Post Depreciation		-0.0852		-0.0414		-0.0143		-0.0266
		(0.0272)		(0.0114)		(0.0207)		(0.0098)
Mulinational* $Depreciation_{t-1}$	0.0073	0.0174	-0.0580	-0.0593	-0.0147	-0.0168	-0.0147	-0.0218
	(0.0404)	(0.0397)	(0.0193)	(0.0192)	(0.0243)	(0.0240)	(0.0162)	(0.0163)
Multinational* $Depreciation_{t}$	-0.0447		0.0248		0.1256		0.1488	
	(0.0528)		(0.0210)		(0.0285)		(0.0183)	
Multinational* $Depreciation_{t+1}$	0.1466		0.1415		0.1019		0.0104	
	(0.0546)		(0.0251)		(0.0327)		(0.0197)	
Multinational* $Depreciation_{t+2}$	0.1898		0.0088		0.0779		0.0250	
	(0.0580)		(0.0242)		(0.0362)		(0.0176)	
Multinational* Post Depreciation		0.0841		0.0544		0.1130		0.0753
		(0.0456)		(0.0158)		(0.0278)		(0.0136)
Industry/Year Fixed Effects?	Y	Y	Y	Y	Y	Y	Y	Y
Firm Fixed Effects?	Y	Y	Y	Y	Y	Y	Y	Y
No. of Obs.	27,969	27,969	19,627	19,627	27,767	27,767	19,476	19,476
R-Squared	0.9684	0.9683	0.5250	0.5235	0.9898	0.9898	0.5345	0.5221

Note: The dependent variable is the logarithm of sales in columns (1) and (2), growth in sales in columns (3) and (4), the logarithm of assets in columns (5) and (6), and growth in assets in columns (7) and (8). The sample used in all specifications includes U.S. multinational and local firms operating in emerging markets. Each specification includes industry/year and firm fixed effects. "Price index" is an index of producer prices (or consumer prices if producer prices are unavailable) in the host country; the base year of 1995 has a price index of 100. "Inflation" is the change in the producer price index over the period. Changes in consumer price indicies are used if changes in producer price indicies are not available. "Lag of Sales" is the log of sales in the previous period, and "Lag of Assets" is the log of beginning of period assets. The time sub-scripted "Depreciation" variables are a set of dummies equal to one in the year prior to, the year of, and the two years following a depreication. "Post Depreciation is a dummy equal to one in the year of and the two years following a depreciation. "Multinational" is a dummy set equal to one for affiliates of U.S. multinationals. Heteroskedasticity-consistent standard errors that correct for clustering of errors by firm appear in parentheses.

Table 4
Investment Responses of Multinationals and Local Firms to Currency Crises

Dependent Variable:	Log of Capital Expenditures	Log of Capital Expenditures	Capital Expenditures/ Net PPE	Capital Expenditures/ Net PPE
	(1)	(2)	(3)	(4)
Constant	7.5609	7.6623	0.2267	0.2228
	(0.9240)	(0.9401)	(0.2081)	(0.2162)
Price Index	0.0048	0.0047	0.0001	0.0001
	(0.0004)	(0.0004)	(0.0000)	(0.0000)
$Depreciation_{t-1}$	0.0362	0.0253	0.0122	0.0103
	(0.0522)	(0.0518)	(0.0074)	(0.0073)
$Depreciation_{t}$	0.0650		0.0070	
	(0.0570)		(0.0072)	
$Depreciation_{t+1}$	-0.2820		-0.0326	
	(0.0604)		(0.0073)	
$Depreciation_{t+2}$	-0.3942		-0.0373	
	(0.0625)		(0.0071)	
Post Depreciation		-0.2101		-0.0220
		(0.0506)		(0.0058)
$Mulinational*Depreciation_{t-1}$	-0.0173	-0.0011	-0.0031	-0.0003
	(0.0719)	(0.0711)	(0.0111)	(0.0110)
$Multinational*Depreciation_{t}$	0.0790		-0.0215	
	(0.0797)		(0.0116)	
$Multinational*Depreciation_{t+1}$	0.5311		0.0619	
	(0.0887)		(0.0136)	
$Multinational*Depreciation_{t+2}$	0.4133		0.0460	
	(0.0934)		(0.0122)	
Multinational*Post Depreciation		0.3448		0.0257
		(0.0700)		(0.0095)
Industry/Year Fixed Effects?	Y	Y	Y	Y
Firm Fixed Effects?	Y	Y	Y	Y
No. of Obs.	23,950	23,950	25,524	25,524
R-Squared	0.9382	0.9379	0.5817	0.5801

Note: The dependent variable in columns (1) and (2) is the log of capital expenditures, and the dependent variable in columns (3) and (4) is capital expenditures scaled by net property, plant, and equipment. The sample used in all specifications includes U.S. multinational and local firms operating in emerging markets. Each specification includes industry/year and firm fixed effects. "Price index" is an index of producer prices (or consumer prices if producer prices are unavailable) in the host country; the base year of 1995 has a price index of 100. The time sub-scripted "Depreciation" variables are a set of dummies equal to one in the year prior to, the year of, and the two years following a depreication. "Post Depreciation is a dummy equal to one in the year of and the two years following a depreciation. "Multinational" is a dummy set equal to one for affiliates of U.S. multinationals. Heteroskedasticity-consistent standard errors that correct for clustering of errors by firm appear in parentheses.

Table 5
The Determinants of Investment Responses

Dependent Variable:	Log of Operating Profits		Leverage	
	(1)	(2)	(3)	(4)
Constant	14.2066	14.1739	-0.0616	-0.0575
	(0.5273)	(0.5251)	(0.2092)	(0.2132)
Price Index	0.0043	0.0043	0.0001	0.0001
	(0.0004)	(0.0004)	(0.0000)	(0.0000)
$\text{Depreciation}_{t-1}$	-0.0953	-0.1026	0.0240	0.0245
	(0.0453)	(0.0444)	(0.0056)	(0.0056)
Depreciation_{t}	0.0790		0.0753	
	(0.0452)		(0.0068)	
$\text{Depreciation}_{t+1}$	0.0035		0.0825	
	(0.0453)		(0.0082)	
$\text{Depreciation}_{t+2}$	0.0315		0.0521	
	(0.0434)		(0.0092)	
Post Depreciation		0.0366		0.0703
		(0.0348)		(0.0068)
Mulinational*	-0.0029	0.0056	-0.0311	-0.0312
$\text{Depreciation}_{t-1}$	(0.0654)	(0.0643)	(0.0104)	(0.0102)
Multinational*	-0.0256		-0.0750	
Depreciation_{t}	(0.0713)		(0.0134)	
Multinational*	0.0684		-0.1118	
$\text{Depreciation}_{t+1}$	(0.0838)		(0.0154)	
Multinational*	0.1292		-0.0812	
$\text{Depreciation}_{t+2}$	(0.0840)		(0.0167)	
Multinational* Post		0.0505		-0.0865
Depreciation		(0.0602)		(0.0120)
Industry/Year Fixed Effects?	Y	Y	Y	Y
Firm Fixed Effects?	Y	Y	Y	Y
No. of Obs.	16,562	16,562	19,642	19,642
R-Squared	0.9648	0.9647	0.7926	0.7921

Note: The dependent variable is the log of operating revenues in columns (1) and (2), operating profitability in columns (3) and (4), and leverage in columns (5) and (6). Operating profits are equal to sales less operating expenses, and operating profitability is the ratio of operating profits to sales. Leverage is measured as the ratio of current liabilites and long term debt to assets. The sample used in all specifications includes U.S. multinational and local firms operating in emerging markets. Each specification includes industry/year and firm fixed effects. "Price index" is an index of producer prices (or consumer prices if producer prices are unavailable) in the host country; the base year of 1995 has a price index of 100. The time sub-scripted "Depreciation" variables are a set of dummies equal to one in the year prior to, the year of, and the two years following a depreication. "Post Depreciation" is a dummy equal to one in the year of and the two years following a depreciation. "Multinational" is a dummy set appear in parentheses.

Table 6
Instrumental Variables Analysis of the Determinants of Investment Responses

Dependent Variable:	Log Capital Expenditures					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	12.1656	1.3634	-1.7350	11.9299	3.4188	-1.4944
	(1.3820)	(3.5442)	(4.6111)	(1.5090)	(3.5846)	(5.5624)
Leverage	-2.5728		-2.0398	-2.5126		-2.3131
	(0.3989)		(0.5254)	(0.4292)		(0.7461)
Multinational * Leverage				-1.0830		9.1130
				(2.5082)		(4.2359)
Log Operating Profits		0.7352	0.9847		0.4556	1.0366
		(0.2667)	(0.3139)		(0.2923)	(0.4492)
Multinational * Log Operating Profits					0.3670	0.1467
					(0.1770)	(0.3158)
Price Index	0.0049	0.0003	-0.0008	0.0049	0.0007	-0.0015
	(0.0003)	(0.0015)	(0.0018)	(0.0003)	(0.0015)	(0.0021)
IV using Depreciation Episodes?	Y	Y	Y	Y	Y	Y
Industry/Year Fixed Effects?	Y	Y	Y	Y	Y	Y
Firm Fixed Effects?	Y	Y	Y	Y	Y	Y
No. of Obs.	18,089	15,470	15,223	18,089	15,470	15,223

Note: The dependent variable in columns (1) through (6) is the log of capital expenditures, and the dependent variable in columns (7) through (12) is capital expenditures scaled by net property, plant, and equipment. The sample used in all specifications includes U.S. multinational and local firms operating in emerging markets. Each specification includes industry/year and firm fixed effects. Leverage is measured as the ratio of current liabilites and long term debt to assets. Operating profits are equal to sales less operating expenses, and operating profitability is the ratio of operating profits to sales. "Multinational" is a dummy set equal to one for affiliates of U.S. multinationals. All columns employ a set of dummies equal to one in the year prior to, the year of, and the two years following a depreication, and the multinational dummy interacted with each of these time dummies as instruments for leverage, the log of operating profits, and operating profitability, and these variables interacted with the multinational dummy. "Price index" is an index of producer prices (or consumer prices if producer prices are unavailable) in the host country; the base year of 1995 has a price index of 100. Standard errors appear in parentheses.

Table 7

Financing Responses of Multinationals to Currency Crises

Dependent Variable:	Growth in Local Debt	Growth in Foreign Debt	Growth in Related Party Debt	Growth in Paid in Capital
	(1)	(2)	(3)	(4)
Constant	1.1335	-0.6397	0.6131	0.3137
	(0.4222)	(0.4869)	(0.4159)	(0.3391)
Lagged Value	-0.0787	-0.0597	-0.0663	-0.0915
	(0.0282)	(0.0175)	(0.0164)	(0.0283)
Inflation	0.5428	0.1361	0.3679	0.0300
	(0.3385)	(0.4265)	(0.4013)	(0.1034)
$Depreciation_{t-1}$	-0.0165	-0.0427	-0.0774	-0.0077
	(0.0687)	(0.0895)	(0.0937)	(0.0288)
$Depreciation_{t}$	0.1798	0.3517	0.2480	0.0276
	(0.0792)	(0.1055)	(0.1160)	(0.0298)
$Depreciation_{t+1}$	-0.1092	-0.0472	-0.1568	0.1079
	(0.0952)	(0.1187)	(0.1223)	(0.0411)
$Depreciation_{t+2}$	0.0092	0.0135	-0.0504	0.0281
	(0.0971)	(0.1167)	(0.1370)	(0.0436)
Industry/Year Fixed Effects?	Y	Y	Y	Y
Firm Fixed Effects?	Y	Y	Y	Y
No. of Obs.	3,153	3,153	3,153	4,377
R-Squared	0.5127	0.4912	0.4644	0.4310

Note: The dependent variable is the growth in debt borrowed from local persons in column (1), the growth in debt borrowed from foreign persons in column (2), the growth in debt borrowed from related parties in column (3), and the growth in paid in capital in column (4). The sample used in all specifications is comprised of U.S. multinational operating in emerging markets. Each specification includes industry/year and firm fixed effects. "Lagged Value" is the log of the value of the component of sales or financial capital in the previous period. "Inflation" is the change in the producer price index over the period. Changes in consumer price indicies are used if changes in producer price indicies are not available. The time sub-scripted "Depreciation" variables are a set of dummies equal to one in the year prior to, year of, and the two years following a depreication. Heteroskedasticity-consistent standard errors that correct for clustering of errors by firm appear in parentheses.

Appendix Table 1
Sample Information By Industry and Data Source

Industry name	Total Obs	% in BEA sample	% in WS sample
Agricultural production-crops	206	53%	47%
Agricultural production--livestock and animal	122	25%	75%
Forestry	107	16%	84%
Fishing, hunting, and trapping	22	14%	86%
Iron ores mining	34	12%	88%
Copper, lead, zinc, gold, and silver ores mining	539	33%	67%
Other metallic ores mining	134	19%	81%
Coal mining	78	32%	68%
Crude petroleum (no refining) and natural gas	873	82%	18%
Nonmetallic minerals mining, except fuels	142	24%	76%
Meat products Mfg	139	35%	65%
Dairy products Mfg	179	51%	49%
Preserved fruits and vegetables Mfg	323	71%	29%
Grain mill products Mfg	723	58%	42%
Bakery products Mfg	71	56%	44%
Beverages Mfg	815	52%	48%
Other food and kindred products Mfg	1328	43%	57%
Tobacco products Mfg	282	55%	45%
Textile mill products Mfg	1022	10%	90%
Apparel and other textile products Mfg	474	37%	63%
Lumber and wood products Mfg	236	14%	86%
Furniture and fixtures Mfg	244	65%	35%
Pulp, paper, and board mills Mfg	330	22%	78%
Other paper and allied products Mfg	680	64%	36%
Newspapers Mfg	144	8%	92%
Miscellaneous publishing Mfg	164	70%	30%
Commercial printing and services Mfg	124	47%	53%
Industrial chemicals and synthetics Mfg	1964	59%	41%
Drugs Mfg	1308	67%	33%
Soap, cleaners, and toilet goods Mfg	909	91%	9%
Agricultural chemicals Mfg	467	41%	59%
Chemical products, nec Mfg	829	76%	24%
Integrated petroleum refining and extraction	189	9%	91%
Petroleum refining without extraction	100	100%	0%
Petroleum and coal products, nec	117	69%	31%
Rubber products Mfg	580	48%	52%
Miscellaneous plastics products Mfg	590	62%	38%
Leather and leather products Mfg	130	18%	82%
Glass products Mfg	362	52%	48%
Stone, clay, concrete, gypsum, etc. Mfg	973	9%	91%
Ferrous Metals Mfg	766	11%	89%
Nonferrous Metals Mfg	531	22%	78%
Metal cans, forgings, and stampings Mfg	378	56%	44%
Cutlery, hardware, and screw products Mfg	172	90%	10%
Heating equipment, plumbing fixtures, etc Mfg	201	45%	55%
Metal services, ordnance, & fabricated metal Mfg	213	68%	32%
Engines and turbines Mfg	113	59%	41%
Farm and garden machinery Mfg	62	50%	50%
Construction, mining, & materials handling Mfg	396	80%	20%
Metalworking machinery Mfg	104	36%	64%

Appendix Table 1
Sample Information By Industry and Data Source

Industry name	Total Obs	% in BEA sample	% in WS sample
Special industry machinery Mfg	179	59%	41%
General industrial machinery Mfg	197	55%	45%
Computer and office equipment Mfg	579	59%	41%
Refrigeration and service industry machinery Mfg	267	77%	23%
Industrial machinery and equipment, nec Mfg	111	76%	24%
Household appliances Mfg	296	52%	48%
Household audio & video, & communications Mfg	655	26%	74%
Electronic components and accessories Mfg	1737	68%	32%
Electronic and other electric equipment, nec Mfg	771	52%	48%
Motor vehicles and equipment Mfg	1451	68%	32%
Other transportation equipment, nec Mfg	283	29%	71%
Measuring, scientific, & optical instruments Mfg	232	49%	51%
Medical instruments & supplies & ophthalmic Mfg	310	89%	11%
Photographic equipment and supplies Mfg	80	73%	28%
Miscellaneous manufacturing industries	396	65%	35%

Note: The table provides the number of firm observations in each industry covered in the sample. The share in the BEA sample indicates the share of observations that are observations of multinational affiliates while the share in the WS sample refers to the share of observations of locally owned firms taken from Worldscope.