Investment Following a Financial Crisis: Does Foreign Ownership Matter?

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Abstract

We investigate whether foreign ownership shields firms from liquidity constraints following a financial crisis. Recent crises in East Asia, Latin America, and Russia have been characterized both by large currency devaluations and widespread collapse of the banking sector. Although a currency devaluation should increase exporters' competitiveness and investment, a collapsing banking system may deny credit to the very firms that should lead the recovery. Foreign-owned firms, which have greater access to overseas financing, may be able to overcome these liquidity constraints faced by otherwise equivalent domestic rivals. We examine this possibility in Indonesia following the 1997 East Asian financial crisis, a period when domestic banks sharply reduced available credit in order to comply with new banking reform laws and avoid closure. Exporters' value added and employment increased following the crisis, suggesting that they profited from the devaluation and had sufficient cash flow to finance more workers. However, only exporters with foreign ownership increased investment significantly. The failure of domestic firms to invest under profitable conditions suggests that they faced liquidity constraints.

Keywords: Liquidity Constraints, Foreign Direct Investment, Financial Crisis.

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1. Introduction

A consequence of financial crises, such as recent events in East Asia, Latin America and Russia, is both a dramatic currency devaluation and a crippling decline of the banking sector. The combination of these two events can significantly curtail new investment. Whereas net exporting firms should benefit from better terms of trade and thus increase investment, the collapse of the banking sector may prevent access to needed credit. Although changes in the terms of trade affect firms equally, ceteris paribus, the degree to which liquidity constraints bind may vary by firms' ownership. In particular, firms with foreign ownership may overcome liquidity constraints if they can access overseas credit through their parent companies. This paper examines the effect of foreign ownership on investment following the 1997-1998 financial crisis in Indonesia.

The unprecedented scale of Indonesia's currency devaluation and the severity of its banking sector's troubles provide a unique setting for our study. The East Asian financial crisis had a devastating effect on the Indonesian economy. The official measure of GDP dropped 13 percent in 1998, and investment fell 45 percent in 1998 alone, followed by a smaller decline in 1999. Some of this devastation is surprising since the financial crisis was associated with the largest real devaluation in recorded history. A U.S. dollar could buy four to six times as much volume of Indonesian exports in early 1998 as in mid-1997. Although rapid Indonesian inflation eliminated roughly half the nominal devaluation, a 2:1 real devaluation remains almost unprecedented. With this large a change in the terms of trade, conventional trade theory suggests that Indonesian firms should have enjoyed an export boom.

At the same time, this event is not known as a currency crisis, but as a financial crisis (*krismon*, or monetary crisis, in Indonesian). Most banks in the nation were insolvent by 1998. Thus, press reports indicated that many firms, even those that wanted to export, were unable to access capital. Lenders had difficulty distinguishing between insolvent borrowers—for whom new loans would go toward old loan repayment rather than productive investments—and firms that legitimately needed funds for ongoing operations or attractive investments. Moreover, even if a lender could identify solvent firms, IMF banking reforms may have reduced many banks willingness to make *any* loans. Under threat of closure if they could not meet raised reserve requirements, in the short-run banks may have preferred holding cash over granting even highly profitably loans.

It is plausible that these problems were less severe at plants with foreign own-

ers, who presumably had access to the accounts and could confirm desirability of new investment and monitor where the money went. Foreign owners, particularly large multinationals, could finance their Indonesian factories internally or through lines of credit available the parent company.

We proceed as follows. The next section briefly reviews prior literature and Section 3 provides some background on Indonesia and the financial crisis. Section 4 discusses the theory that motivates our analysis and Section 5 introduces our data and methods. Section 6 presents our results and Section 7 concludes.

2. Prior Literature

The imperfection of capital markets and liquidity constraints are well documented (Fazzari, Hubbard, and Petersen 1988, Hoshi, Kashyap, and Scharfstein 1991 and Minton and Schrand 1999; see surveys by Hubbard 1998 and Caballero and Krishnamurthy 1999). The key insight of this work is that some firms are likely to have access to capital and, thus, their investment responds to future profit opportunities. Other firms are likely to have limited access to capital and, thus, investment responds to current cashflow more than to future profit opportunities. These articles have used a number of strategies to try to identify firms at high versus low risk of liquidity constraints. The current analysis extends this literature by using foreign ownership as an indicator of high probability of liquidity constraints—an assumption we discuss at length below.

A second literature examines financial crises, with an emphasis on how they reduce banks' willingness to lend to borrowers with weak balance sheets (Bernanke and Gertler 1989). Recent work has examined how currency and financial crises affect investment (Aguiar 2002, Forbes 2002, Agenor and Montiel 1996 and Reinhart and Calvo 2000). Many of these analyses have differentiated how the crisis affects the tradable sector (where a devaluation is likely to expand opportunities for profitable investment) from non-tradable sectors. Like Desai, Foley, and Forbes 2003, which looks at U.S. multinational investment during a variety of currency crises, we differentiate foreign-owned from locally-owned firms within the tradable sector. We find that foreign-owned firms respond to financial shocks in a very different manner than local firms.

A third literature examines how financial crises affect foreign direct investment (e.g., Lipsey 2001). We extend this literature by explicitly comparing the response of foreign-owned and comparable locally-owned firms. We thus see whether the differences previous analyses have discovered are largely due to size and industry,

or due to ownership itself. As such, we are part of the tradition of examining how FDI affects the host economy differently from locally-owned investment (e.g., Aitken and Harrison 1999).

3. Indonesia Background

In 1965 when Suharto took power, Indonesia was widely considered one of the developing world's basket cases. GDP per capita, for example, was only half that of India, Bangladesh, or Nigeria. By 1997, Indonesia was known as one of the Tiger Cubs. Its GDP per capita was 3.5 or more times that of India, Bangladesh, or Nigeria.

Although oil and other natural resources played a role, much of the GDP growth was led by export-oriented manufacturing. Starting from a very low base in 1980, manufacturing boomed up through the late 1999's. In contrast to the first years of Suharto's New Order, much of the manufacturing was either foreign owned, export-oriented, or both.

Starting in August 1997, Indonesia, like other nations severely affected by the Asian financial crisis, experienced a sudden and widespread financial panic. By January 1998, the Indonesian Rupiah (Rp) was worth 15 percent of its value six months earlier, and GDP growth fell from +8 percent in 1996 to -13 percent in 1998. Austerity measures, inflation, very high interest rates, and a massive credit crunch brought the crisis from the financial sector to manufacturing plants. Table 1 lays out a timeline of the crisis.

4. Theory

We first review what conventional trade theory predicts should follow a massive real devaluation. We then discuss theories of investment subject to financial constraints; a set of theories that are clearly relevant during a financial crisis. We close this section with a discussion of how foreign ownership might mitigate financial constraints and increase the relevance of the predictions of standard trade theory.

4.1. Trade Theory

Conventional trade theory assumes that relative prices are important, and no price is more important than the relative price of currency—the real exchange

rate. When a currency undergoes a real devaluation, exports become more competitive. In addition, firms that compete against imported goods become more competitive. These increases in competitiveness should have several testable implications: higher profits, more employment, and increased investment. A number of studies, such as Aguiar 2002, demonstrated such findings using firm data.

Working in the other direction, firms that import most of their raw and intermediate goods, in contrast, become less competitive. For firms that both import and export, trade theory predicts that net exports (exports minus imports) are what should predict shifts in competitiveness.

Trade theory predicts the expansionary effect of devaluation will muted if competitors also have devaluations. In Indonesia's case, Thailand and Malaysia, for example, also devalued around this time and China had undergone a large devaluation shortly before. As those real devaluation were much smaller than Indonesia's, one would still predict higher net exports for Indonesia.

Trade theory also suggests the expansionary effect of a nominal devaluation will muted if inflation eats up the improvement in competitiveness. Such inflation is a common occurrence after nominal devaluations and often implies the real exchange rate remains fairly stable (cite). Indonesia, as expected, had a massive spike in inflation with the price level (as measured by the wholesale price index) roughly doubling from December 1997 to December 1998. Inflation fell to low levels by the start of 1999 and the cumulative inflation from 1997 to 2000 left the majority of the initial real devaluation intact.

In fact, US dollar exports of manufactured goods rose from 50 billion in 1996-97 to 53 billion in 1999 (International Monetary Fund 2000, Table 42). Thus, while exports were roughly flat in dollar terms and (presumably) in quantity terms, their value roughly doubled in inflation-adjusted rupiah terms assuming the relative price of exports remained unchanged.

4.2. Financial Constraints

Why didn't the dollar volume of manufacturing exports increase? One reason may be the poor state of the banking industry.

Any downturn increases banks' lending risk because more of their customers are near bankruptcy. Indonesia's notorious lack of financial transparency and weak bankruptcy laws amplified this effect since banks were unable to verify which customers were already bankrupt. Loans to such customers were unlikely to ever be repaid.

In addition, after the financial crisis banks stated they preferred to lend to customers with whom they had an ongoing relationship (Agung, Kusmiarso, Pramono, Hutapea, Prasmuko, and Prastowo 2001). As numerous banks closed down during and after the financial crisis, relationship-specific ties were broken and some creditworthy firms may have lost access to credit.

As the crisis continued, Indonesia established new regulatory mechanisms that forced most banks to recognize their underperforming loans (Enoch, Baldwin, Frecaut, and Kovanen May 1, 2001). The resulting extremely low capital in banks further discouraged lending.

The outcome of the slower demand for and supply of credit was dramatic. Between 1996 and 2000 the real value of credit from commercial banks to the manufacturing sector fell by roughly half (comparing International Monetary Fund 2000, Table 35 on credit with the earlier tables on WPI and CPI). Presumably credit from foreign sources fell even faster as foreign capital poured out of Indonesia during the crisis.

Most of this decline in total credit was due to lower demand for credit. Nevertheless, if even a portion was due to constraints on credit supply by potentially credit-worthy borrowers, it is unsurprising that investment fell. Analyzing surveys of banks and of manufacturing plants, Agung, Kusmiarso, Pramono, Hutapea, Prasmuko, and Prastowo (2001) concluded that lack of bank capital (as opposed to high borrower risk) was responsible for much of the slowdown in lending.

4.3. Foreign Ownership and Financial Constraints

Above we argued that domestic banks may be unwilling to lend to firms that can now export profitably if the banks cannot determine which firms are already bankrupt and unlikely to produce their way out of their problems. An Indonesian plant with substantial foreign ownership should not have this problem, as the foreign owner can document that the plant is, in fact, making money. Indeed, evidence suggests that foreign affiliates often substitute internal borrowing for external borrowing when operating in environments with poorly developed financial markets (Desai, Foley, and Hines 2003).

For firms that primarily sell to the domestic market, the benefits of foreign ownership may be slight; such firms frequently should contract output regardless of liquidity constraints. Thus, the hypothesis of foreign ownership as an antidote to financial crisis should be most visible for firms that export or compete with imports.

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Three forces mitigate this hypothesis. First, some assembly plants import most of the value of sales. Even so, the devaluation greatly reduced the cost of labor—the main cost as a share of value added. Nevertheless, to the extent that the percentage of imports and exports is exogenous, standard trade theory suggests the share of sales that is net exports (that is, exports minus imports) should matter more than the export share in predicting desired expansion after the devaluation and financial crisis.

Second, the financial crisis was accompanied by an increase in political risk. Foreign firms might consider the weaker currency insufficient to counteract the risks of large capital losses. Particularly if managers were risk-averse, they might be loath to invest in Indonesia if the economy were likely to implode so badly that basic infrastructure eroded, a civil war break out, or other catastrophic event that would depreciate assets. Riots opposed to IMF programs presumably led all foreigners to fear for their personal safety and that of their assets.

Although plausible, it is not clear why rising political risk should have affected foreign owners more than many domestic investors. That is, a substantial majority of Indonesia's large companies are owned by those closely associated with Suharto (Fisman 2001), by the ethnic Chinese minority in Indonesia, or by businessmen who are both. These groups had strong reasons to fear that either a new government might take over their businesses or a mob might destroy them. These risks may have been larger than those faced by foreign investors.

Finally, firms with foreign equity ownership, as well as those that export, may disproportionately have been those with foreign debt. The devaluation vastly increased the rupiah cost of servicing debt denominated in dollars, yen, or other hard currencies.

5. Data and Methods

5.1. Data

The analysis is based on data from the Republic of Indonesia's *Budan Pusat Statistik* (BPS), the Central Bureau of Statistics. The principal dataset is the *Survei Tahunan Perusahaan Industri Pengolahan* (SI), the Annual Manufacturing Survey. The SI dataset is designed to be a complete annual enumeration of all manufacturing establishments with 20 or more employees from 1975 onward. Depending on the year, the SI includes up to 160 variables covering industrial classification (5-digit ISIC), ownership (public, private, foreign), status of incor-

poration, assets, asset changes, electricity, fuels, income, output, expenses, investment, labor (head count, education, wages), raw material use, machinery, and other specialized questions. We use data from 1990 to 2000.

BPS submits a questionnaire annually to all registered manufacturing establishments, and field agents attempt to visit each non-respondent to either encourage compliance or confirm that the establishment has ceased operation.[1] Because field office budgets are partly determined by the number of reporting establishments, agents have some incentive to identify and register new plants. In recent years, over 20,000 factories have been surveyed annually. Government laws guarantee that the collected information will only be used for statistical purposes. However, several BPS officials commented that some establishments intentionally misreport financial information out of concern that tax authorities or competitors may gain access to the data. Because the fixed-effect analysis admits only within-factory variation on a logarithmic scale, errors of under- or over-reporting will not bias the results provided that each factory consistently misreports over time. Further, even if the degree of misreporting for a factory varies over time, the results are unbiased provided the misreporting is not correlated with other factory attributes in the right-hand-side of the regression.

Additional data include several input and output price deflators.

The particular data of interest in our study are the three left-hand-side variable we introduce below: labor, value added, and capital. Experience with the data suggests that labor is one of the more reliable variables reported. Value added is also well measured because both the total value of output and wages are well reported. There were higher rates of non-reporting or obvious erroneous reporting for materials, but we have used interpolation and imputation to make corrections or remove data as needed. Our third measure, capital, represents the biggest challenge with data, but because of the high levels of non-reporting firms and because of the poor accuracy of reported values. We used a number of methods to construct capital measures, as described in the appendix (to be added). More generally, however, we avoid problems of capital estimation by not relying on either capital levels of first differences. As shown below, our identification comes from second differencing—the change in capital over time in capital for one group of firms *relative* to another group.

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[1]Some firms may have more than one factory, we refer to each observation as an establishment, plant, or factory. BPS also submits a different questionnaire to the head office of every firm with more than one factory. Although these data were not available for this study, early analysis suggests that there are relatively few factories belong to multi-factory firms.

5.2. Methods

Our methodology is two-fold. First, we compare the effect of the crisis on wholly Indonesian-owned firms, both exporters and non-exporters. Our aim to establish exporters as beneficiaries of the rupiah devaluation. Second, we compare the post-crisis outcomes of Indonesian-owned exporters with those of foreign-owned exporters. The identifying assumption is that the rupiah devaluation should have affected foreign and domestic exporters in the same manner, all else being equal. We argue that changes in the investment patterns between foreign and domestic exporters, relative to their pre-crisis trends, could result from their different financing sources. Whereas domestic firms would either have to borrow from domestic banks struggling from insolvency or convince foreign banks of their credit worthiness, foreign firms could obtain internal credit through their parent companies.

As discussed above, it is likely that exporters and foreign firms were more likely to have had debts denominated in U.S. dollars, Japanese yen, and other hard currencies. In fact, because the Bank of Indonesia has historically supported a gradual depreciation of the rupiah against the dollar, many firms had borrowed abroad to take advantage of lower rates. With the implicit understanding that the exchange rate would not change dramatically in the short run, few firms had hedged their positions (Bluestien, 2001). In many cases, the change in the value of outstanding along left many companies insolvent following the devaluation. In contrast, those with loans in rupiah enjoyed a large discount in the cost of repaying their debt.

To control for the effect of debt on post-crisis outcomes, we constructed leverage measures, the ratio of debt to assets, for each firm. Unfortunately, the data do not reveal whether the debt was denominated in rupiah or hard currency. However, the data do reveal if a firm has received a loan from a foreign bank. To approximate foreign currency denominated debt, we labeled the leverage of firms that had received any foreign loans from 1990 to 1996 as foreign leverage. Firms that had never reported receiving foreign loans we designated as having domestic leverage, which is mutually exclusive of foreign leverage.

Equation 1 estimates the effect of the crisis on firm outcomes.

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\begin{aligned}
\ln Outcome_{it} = & \beta_0 (Exporter * Post)_{it} + \beta_1 (Foreign\_Leverage * Post)_{it} + \\
& \beta_2 (Domestic\_Leverage * Post)_{it} + \alpha_i + \gamma_t + \varepsilon_{it}
\end{aligned}
\tag{1}
$$

where $Outcome_{it}$ is the log of value added, the log of labor, and the log of capital in the respective specifications, $(Exporter * Post)_{it}$ is the interaction of indicators for

a pre-crisis (anytime during 1993 to 1995) exporting establishment i and post-crisis years (1999-2000), $(Foreign\_Leverage * Post)_{it}$ and $(Domestic\_Leverage * Post)_{it}$ are the interactions of foreign and domestic leverage, respectively, and post-crisis years, α_i is a fixed effect for factory i, and γ_t is a dummy variable for year t. We note that we intentionally do not use data from 1996 and 1998. Capital data are not available for 1996 and the rapid inflation and devaluation of the Rupiah during 1997-1998 made any interpolation of pecuniary terms difficult, if not impossible. By 1999, the currency had stabilized and we believe that variance in monetary values reflects true firm heterogeneity rather than spurious noise resulting from widely volatile exchange rates.

Each of the three outcome measures capture different responses to the crisis. Value added should mirror profitability and reflect the overall effect of the devaluation. That is, exporting firms with domestic materials should see value added rise even with no other changes in production. We expect that labor to also reflect the overall effect of the devaluation, but subject to access to short-term working capital. Lastly, capital should reflect the expected persistent effect of the devaluation subject to access to long-term capital.

We next estimate Equation 1 for the population of just exporting firms and substituting $(Foreign * Post)_{it}$ for $(Exporter * Post)_{it}$.

$$\ln Outcome_{it} = \beta_0 (Foreign * Post)_{it} + \beta_1 (Foreign\_Leverage * Post)_{it} + \\ \beta_2 (Domestic\_Leverage * Post)_{it} + \alpha_i + \gamma_t + \varepsilon_{it} \tag{2}$$

where $Foreign$ is an indicator for firms with foreign equity in 1993-1995.

It is important to note that the estimation uses only within-firm estimation. Time-invariant attributes of the firm, such as its management, industry, and location are all removed by the fixed effect. Equation 1 thus asks how the difference between domestic exporter and non-exporters changed after the crisis, *conditional on all the unobserved static characteristics of the firms.* Likewise, Equation 2 asks how the difference between foreign and domestic exporters changed following the crisis, again, controlling for firm unobservables.

Capital is a notoriously difficult in empirical studies of firms. In particular, one can imagine wide variation in the valuation of capital assets following the financial crisis. The advantage of our "differences in differences" approach is that we do not rely on changes in the absolute levels of capital. Rather, we ask how differences in capital changed before and after the crisis. Provided that changes in valuation are consistent across asset types, our estimates are consistent. Further, to reduce any possible bias introduced by the valuation of land and building

assets, which dramatically fell in value when the construction bubble burst, we have subtracted real estate assets from the capital measures. Hence, the remaining capital values only reflect tradeable assets, such as vehicles and machinery, which are less sensitive to speculative valuation.

Finally, to better ensure that our comparison of domestic exporters and non-exporters, and of domestic and foreign exporters, is considering otherwise similar firms, we have limited our sample in two ways. First, we consider only firms with more than 100 employees. Access to formal credit markets and overseas buyers is unlikely for smaller firms in Indonesia. Second, we consider only firms in industry-region cells for which there is at least both one domestic and foreign exporter.

6. Results

Table 2 shows some descriptive statistics for exporters and non-exporters, and foreign and domestic firms. As one would expect, domestic exporters tend to be bigger than domestic non-exporters, as measured by employees and capital. Similarly, foreign exporters are slightly bigger than their domestic counterparts. The foreign exporters are the most likely to survive the crisis. But, as we show later, this survival bias disappears when we condition on firm size and pre-crisis performance.

Table 3 shows descriptive statistics for leverage. It confirms out priors that exporting firms have greater leverage overall. In particular, domestic exporters are more foreign leveraged than domestic non-exporters. Further, domestic exporters have greater foreign leverage than foreign exporters.

Table 4 shows the estimation of Equations 1 and 2. Because of the rapid rupiah devaluation during 1997 and 1998, a difference of just a few weeks in the reporting date could dramatically affect values. To avoid this bias, the estimation admits only the pre- and post-crisis years and drops 1996 to 1998.[2] The odd columns (1), (3), and (5) show the effect of exporting on value added, labor, and capital for the population of all domestic firms. The even columns (2), (4), and (6) show the effect of foreign ownership on value added, labor, and capital for the population of all exporting firms, domestic and foreign.

Consider first the effect of exporting on post-crisis outcome. Among domestic firms, those that were exporters prior to the crisis saw their value added grow 14

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[2]Recall that we drop 1996 because we do not have a capital data for that year. 1997 and 1998 are dropped because of the crisis.

percent relative to those that did not export. Further, the same exporting firms saw labor grow about 9 percent more that that of non-exporting firms. However, the pattern does not repeat for investment—there is no significant difference in capital post-crisis for domestic exporters versus domestic non-exporters.

Next consider the same analysis for the population of domestic and foreign firms exporting before the crisis. Those with foreign ownership saw value added grow 45 percent over domestic exporters. Foreign exporters likewise saw labor grow about 21 percent over domestic firms. Finally, exporters with foreign equity saw an increase in capital 28 percent greater than that of domestic exporters. The key observation here is that *all* exporters increased their value added and employment after the crisis, but *only* exporters with foreign ownership increased investment.

We next turn to the leverage measures, which are most telling for the population of domestic firms (columns (1), (3) and (5)). Whereas foreign multinationals are likely hedged against exchange rate fluctuations and largely insulated from the rupiah's value since they export most output, Indonesian firms are more likely to get caught with a burgeoning foreign debt. Indeed, the interaction of foreign leverage and the post-crisis indicator in the capital estimation (column 5) suggests that firms with large foreign debts invested less post-crisis than others.

An identifying assumption in these estimations is that exporting activity pre-crisis is a predictor of exporting post-crisis. Table 5 provides some support for this assumption. Given the expense and time of establishing overseas marketing channels, our priors are that few firms that did not export before the crisis would be able to start exporters. Indeed, only six percent of non-exporters in the pre-crisis period started exporting later. The ability of these firms to switch to exporter status biases the coefficients in the odd columns down by a trivial amount compared to the true effect of being a *potential* exporter. Further, it is also important to note that, as shown in Table 2, the share of output exported is roughly equally across all exporting firms, regardless of ownership. We thus expect the currency devaluation to affect all exporting firms' investment prospects with about the same magnitude.

Overall, we were suprised by the large percentage of firms that exported in 1993-1995, that did not export after the crisis, as shown in Table 5. Overall, only about 55 percent of domestic exporters continued to export post-crisis. This may not be surprising if the firms lacked access to working capital needed to continue export operations. We are more surprised that a similar number, only 58 percent, of foreign exporters continued to export after the crisis. The continued shift of

multinational production to China is one possible explanation. The table includes only firms that survived the crisis, so firms exits do not explain the low rates of export continuation.

A concern in our analysis is that differing investments patterns between foreign and domestic exporters before and after the crisis simply reflect a long-term time trend. To test for this possibility, we divided our pre-crisis sample into two time periods and repeated the analysis with 1993-1995 substituting for the real post-crisis years. That is, we took 1990-1992 to be the pre-crisis years and assumed the crisis to have occurred between 1993 and 1995. Table 6 shows the results of this "falsification exercise," from which me make two observations. First, although the trend in value added and labor is mixed, there is no significant difference in capital between domestic exporters and non-exporters. Second, although foreign exporters do appear to have a growing differential relative to domestic exporters in value added and labor, there is no differential in capital. In other words, the difference we investment patterns we observe between foreign and domestic exporters following the crisis does not reflect a simple time trend.

Table 7 further explores the possibility that foreign and and domestic exporters were following separate time trends. Here, we kept the post-crisis period, but divided the pre-crisis period into two periods: 1990-1992 and 1993-1995. We then interact the outcomes of interest with indicators for both the 1993-1995 period and 1999-2000 period. The results capital remain unchanged.

A second concern in our analysis is that our treatment group, exporting and foreign firms, may have had different responses to the crisis than our control group, domestic firms. For example, the treatment group may have been clustered in regions and industries that benefited from the crisis and there might have been no similar controls to use as a counterfactual. To establish further equivalency between the treatment and control groups, we estimated Equations 1 and 2 with the sample of just firms in the common support of propensity scores for exporting and foreign ownership. We used region and industry indicators, along with the endowment of capital prior to the crisis as predictors of exporting and foreign ownership. Table 8 shows the results, which are consistent with our base results, suggesting that heterogenous treatment effects do not motivate our results.

In the estimations so far, we have constrained the effect of domestic and foreign leverage to be constant acros firm types. Table 9 relaxes this assumption and allows the effect of leverage to vary by firm type. Operationally, we achieve by a triple interaction of leverage, firm type, and the post-crisis period. One would expect the balance sheet effects of foreign leverage to be less severe for domestic

exporters than domestic non-exporters. Although both firm types would incur an increased rupiah denominated debt, the exporters would also benefit from the competitive effect of the exchange rate devaluation. As column (5) shows for the effect of capital investment, this is the case, although the magnitude is not statistically significant. A priori, we would not expect foreign or domestic ownership to affect leverage. The debt is the same regardless of the nationality of the firm's owner. We would expect to see a different effect only if balance sheet effects somehow vary by ownership, which would occur only if domestic firms operated in more constraining financial market. Column (6) tests this possibility. In fact, foreign leverage mitigates investment by domestic firms more than investment by foreign firms.

A consequence of the financial crisis was a large decline in public expenditures mandated by the IMF. Many government run firms in Indonesia were notoriously inefficient and operated under soft budget constraints afforded by public subsidy. Many of these firms had political connections with the ruling Suharto family, who prior to the crisis could guarantee advantageous financing terms. Following the decline of public subsidies and the demise of the Suharto family, we would expect these firms to contract. Table 10 interacted the post-crisis period with government ownership in 1993-1995. As we expect, government-owned firms contracted dramatically across all outcomes.

Lastly, Table 11 shows the effect of pre-crisis exporting on foreign ownership on firm survival. The dependent variable is survival until the year 2000 estimated by a probit with coefficients expressed as probabilities. Although exporting and foreign firms are more likely to survive than other firms, this effect disappears when conditioned on size. Indeed, when including the log of capital, neither exporters nor foreign exporters, columns (1) and (3) respectively, are more likely to survive. This finding is unexpected for domestic exporters. For foreign firms, the finding is less surprising since our data do not distinguish between plants closed by bankruptcy and plants that relocated. Some works suggests that foreign firms, which has less deeply rooted commitment to operate in Indonesia, are more likely than domestic firms to relocate when conditions become comparatively more attractive in other countries (Bernard and Sjöholm 2003).

Columns (2) and(4) of Table 11 consider the effect of a firm's pre-crisis performance on survival. *Productivity* is the difference between a firms "fixed-effect" in a translog production function estimation minus the mean fixed effect of other firms in the same 4-digit ISIC industry. That is, positive value indicates a relative strong performer and a negative value indicates the weak performer. Reassuringly,

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strong performers pre-crisis are more likely to survive post-crisis.

7. What have we learned

Trade theory suggests that exporting firms should increase profits, expand employment, and invest in new capital following a real devaluation. For domestic exporters, we observe the first two effects, but do not see evidence of increased investment even though conditions warrant it. Liquidity constraints are a likely explanation. Whereas increases in employment could be financed through cash flow, capital investment required obtaining credit from a struggling financial sector. In contrast, exporters with foreign ownership did expand investment. A priori, we see no reason why investment would depend on ownership other than financing availability. While domestic exporters may have faced a credit crunch, exporters with foreign ownership could access credit through their parent company and thus insure themselves against liquidity constraints. Finally, we note that a surprisingly large share, 45 percent, of pre-crisis domestic exporters did not continue exporting following the crisis. Although this fact requires further investigation, liquidity constraints, an overall decline in the regional economy, or competition from Thai and other East Asian exporters may by an explanation.

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A. Tables

1997	
July 2	Thai Baht is floated and depreciates by 15-20 percent.
July 11	Widening of rupiah band.
July 24	Currency meltdown with severe pressure on baht, ringgit, peso and rupiah.
August 14	Ending of rupiah band and immediate plunge.
November 1	16 banks closed, with promise of more to follow. Deposits were not guaranteed.
November 5	Three-year standby agreement with IMF approved.
Mid-December	Almost half of Indonesian bank deposits exit the system.
1998	
Mid-January	Further downward pressure on the rupiah.
January 27	Bank deposits formally guaranteed by the new super-agency: Indonesia Bank Reconstruction Agency.
March 11	President Suharto re-elected.
Mid-May	Widespread rioting.
May 21	Vice president Habibe succeeds Suharto as president.

Table 1: Timeline of financial crisis. Adopted from Enoch, Baldwin, Frecaut, and Kovanen May 1, 2001

```
-------------------------
        | foreign factory
exported |   in 93-95?
93-95?   |     no    yes
---------+---------------
    no | 15,881     370      No. factories
       |  96.94  335.83      No. employees
       |  11.63   15.22      Log (capital)
       |   0.66    0.80      Prob. survived until 2000
       |   0.0     0.0       Share output exported
       |
   yes |  3,787     792
       | 445.50  579.26
       |  13.55   15.16
       |   0.76    0.85
       |   0.52    0.57
-------------------------
```

Table 2: Descriptive statistics by firm type in 1995. Foreign factories are those that had foreign equity anytime from 1993 to 1995. Exporters are those that exported anytime from 1993 to 1995.

```
---------------------
        |  foreign
exported |   93-95?
93-95?   |   0     1
---------+-----------
     0 | 2.18  1.57      Avg. leverage
       | 0.27  0.58      Avg. foreign leverage
       | 1.91  0.99      Avg. domestic leverage
       |
     1 | 2.99  1.75
       | 1.35  0.88
       | 1.64  0.87
---------------------
```

Table 3: Leverage statistics by firm type in 1995. Foreign factories are those that had foreign equity anytime from 1993 to 1995. Exporters are those that exported anytime from 1993 to 1995.

	(1) log(va)	(2) log(va)	(3) log(labor)	(4) log(labor)	(5) log(capital)	(6) log(capital)
Exported in 1993-1995*Post-crisis	0.137 (4.29)		0.089 (6.34)		-0.041 (1.16)	
Foreign in 1993-1995*Post-crisis		0.454 (8.45)		0.218 (9.05)		0.281 (4.25)
Foreign Leverage*Post-crisis	-0.000 (1.16)	-0.000 (1.08)	-0.000 (0.51)	-0.000 (0.41)	-0.001 (1.96)	-0.000 (1.76)
Domestic Leverage*Post-crisis	0.001 (1.25)	0.005 (1.04)	-0.001 (2.25)	0.005 (2.53)	0.005 (2.77)	0.009 (1.14)
YEAR==1991	0.164 (5.43)	0.059 (1.20)	0.063 (4.73)	0.045 (2.05)	0.157 (5.47)	0.098 (2.01)
YEAR==1992	0.301 (10.17)	0.201 (4.20)	0.150 (11.42)	0.146 (6.80)	0.323 (11.57)	0.323 (6.89)
YEAR==1993	0.418 (14.32)	0.394 (8.42)	0.240 (18.50)	0.271 (12.79)	0.435 (15.71)	0.450 (9.72)
YEAR==1994	0.549 (18.91)	0.525 (11.29)	0.302 (23.48)	0.358 (17.07)	0.564 (20.54)	0.580 (12.60)
YEAR==1995	0.521 (18.05)	0.521 (11.27)	0.322 (25.23)	0.391 (18.73)	0.673 (24.54)	0.734 (15.98)
YEAR==1999	0.321 (9.73)	0.481 (9.74)	0.166 (11.46)	0.289 (12.97)	1.101 (31.23)	1.080 (19.42)
YEAR==2000	0.215 (6.50)	0.319 (6.43)	0.166 (11.40)	0.279 (12.48)	1.208 (34.89)	1.175 (21.72)
Constant	12.672 (562.94)	13.537 (367.16)	5.231 (524.35)	5.595 (335.80)	13.382 (623.03)	14.146 (384.74)
Observations	23031	9495	23800	9715	19639	8166
No. establishments	4305	1431	4392	1432	3945	1421
R-squared	0.03	0.05	0.05	0.09	0.14	0.15

Absolute value of t statistics in parentheses

Table 4: Fixed-effect estimation on domestic establishments (columns 1, 3, 5) and exporting establishments (columns 2, 4, 6).

```
---------------------
          |  foreign
exported  |   93-95?
93-95?    |   no  yes
----------+----------
      no | 0.06  0.22        Probability of exporting in post-crisis 1999-2000
      yes| 0.55  0.58
---------------------
```

Table 5: Probability that firms exported in post-crisis years 1999-2000, by firm type.

	(1) log(va)	(2) log(va)	(3) log(labor)	(4) log(labor)	(5) log(capital)	(6) log(capital)
Exported in 1990-1992*False "post-crisis" in 1993-1995	-0.078 (3.16)		0.051 (4.87)		0.007 (0.28)	
Foreign in 1990-1992*False "post-crisis" in 1993-1995		0.249 (5.60)		0.139 (6.69)		0.036 (0.75)
YEAR==1991	0.134 (6.27)	0.100 (2.95)	0.082 (9.09)	0.080 (5.07)	0.143 (6.38)	0.129 (3.55)
YEAR==1992	0.223 (10.41)	0.235 (6.97)	0.140 (15.55)	0.184 (11.65)	0.316 (14.22)	0.358 (9.99)
YEAR==1993	0.306 (12.85)	0.289 (8.17)	0.109 (10.87)	0.194 (11.67)	0.354 (14.05)	0.439 (11.65)
YEAR==1994	0.391 (16.54)	0.343 (9.55)	0.137 (13.74)	0.224 (13.35)	0.459 (18.37)	0.447 (11.72)
YEAR==1995	0.412 (17.37)	0.296 (8.19)	0.164 (16.37)	0.230 (13.53)	0.567 (22.57)	0.567 (14.63)
Constant	12.211 (731.30)	13.652 (541.64)	4.995 (707.66)	5.757 (486.81)	13.024 (739.64)	14.295 (526.28)
Observations	32216	9203	33476	9432	28878	8497
No. establishments	10678	1831	10939	1835	9891	1799
R-squared	0.02	0.03	0.02	0.06	0.04	0.05

Absolute value of t statistics in parentheses

Table 6: Falsification exercise in which 1990-1993 are pre-crisis years and 1994-1996 substitute for the actual post-crisis years of 1999 and 2000. The results suggest that investment outcomes in Table 4 do not merely represent a pre-existing time trend. Fixed-effect estimation on domestic establishments (models 1, 3, 5) and exporting establishments (models 2, 4, 6).

	(1) log(va)	(2) log(va)	(3) log(labor)	(4) log(labor)	(5) log(capital)	(6) log(capital)
Exported in 1993-1995*Post-crisis	0.191 (5.79)		0.106 (7.33)		-0.013 (0.35)	
Exported in 1993-1995*1993-1995 period	-0.195 (6.30)		-0.063 (4.60)		-0.101 (3.40)	
Foreign in 1993-1995*Post-crisis		0.374 (6.54)		0.192 (7.49)		0.277 (4.03)
Foreign in 1993-1995*1993-1995 period		0.241 (4.11)		0.077 (2.93)		0.012 (0.21)
Foreign Leverage*Post-crisis	-0.000 (1.26)	-0.000 (1.07)	-0.000 (0.58)	-0.000 (0.40)	-0.001 (2.01)	-0.000 (1.76)
Domestic Leverage*Post-crisis	0.001 (1.20)	0.005 (1.04)	-0.001 (2.29)	0.005 (2.54)	0.005 (2.75)	0.009 (1.14)
YEAR==1991	0.163 (5.43)	0.062 (1.27)	0.063 (4.72)	0.046 (2.10)	0.157 (5.47)	0.098 (2.02)
YEAR==1992	0.302 (10.21)	0.206 (4.33)	0.150 (11.45)	0.148 (6.89)	0.323 (11.59)	0.324 (6.90)
YEAR==1993	0.512 (15.64)	0.338 (6.97)	0.270 (18.60)	0.253 (11.51)	0.483 (15.51)	0.448 (9.30)
YEAR==1994	0.643 (19.71)	0.469 (9.70)	0.332 (23.01)	0.340 (15.60)	0.613 (19.78)	0.577 (12.07)
YEAR==1995	0.615 (18.95)	0.466 (9.67)	0.352 (24.56)	0.373 (17.19)	0.722 (23.33)	0.731 (15.33)
YEAR==1999	0.387 (11.19)	0.448 (8.97)	0.187 (12.32)	0.278 (12.34)	1.135 (30.98)	1.078 (19.21)
YEAR==2000	0.281 (8.11)	0.286 (5.69)	0.187 (12.27)	0.269 (11.87)	1.243 (34.47)	1.174 (21.47)
Constant	12.657 (559.81)	13.539 (367.54)	5.226 (521.21)	5.596 (335.96)	13.375 (620.40)	14.146 (384.70)
Observations	23031	9495	23800	9715	19639	8166
No. establishments	4305	1431	4392	1432	3945	1421
R-squared	0.03	0.05	0.05	0.09	0.14	0.15

Absolute value of t statistics in parentheses

Table 7: Estimation allowing for differing time trends between exporters and non-exporters, and between foreign and domestic firms. The results suggest that investment outcomes in Table 4 do not merely represent a pre-existing time trend. Fixed-effect estimation on domestic establishments (models 1, 3, 5) and exporting establishments (models 2, 4, 6).

	(1) log(va)	(2) log(va)	(3) log(labor)	(4) log(labor)	(5) log(capital)	(6) log(capital)
Exported in 1993-1995*Post-crisis	0.212 (4.80)		0.055 (2.74)		-0.021 (0.42)	
Foreign in 1993-1995*Post-crisis		0.410 (6.31)		0.134 (4.70)		0.082 (1.09)
Foreign Leverage*Post-crisis	-0.016 (1.32)	-0.000 (1.18)	-0.004 (0.69)	-0.000 (0.51)	-0.012 (0.84)	-0.001 (1.94)
Domestic Leverage*Post-crisisT	0.004 (1.54)	-0.006 (0.32)	0.000 (0.36)	0.015 (1.80)	-0.014 (1.95)	-0.004 (0.20)
YEAR==1991	0.159 (3.80)	0.028 (0.50)	0.085 (4.48)	0.045 (1.81)	0.180 (4.34)	0.094 (1.70)
YEAR==1992	0.323 (7.82)	0.194 (3.56)	0.176 (9.45)	0.157 (6.54)	0.340 (8.49)	0.376 (7.09)
YEAR==1993	0.418 (10.29)	0.394 (7.36)	0.255 (13.82)	0.282 (11.90)	0.415 (10.47)	0.477 (9.09)
YEAR==1994	0.576 (14.25)	0.529 (9.95)	0.322 (17.64)	0.365 (15.53)	0.553 (14.05)	0.622 (11.97)
YEAR==1995	0.529 (13.21)	0.559 (10.57)	0.336 (18.48)	0.394 (16.82)	0.644 (16.53)	0.781 (15.15)
YEAR==1999	0.301 (6.49)	0.519 (8.84)	0.210 (10.05)	0.307 (11.84)	1.111 (21.11)	1.189 (18.35)
YEAR==2000	0.176 (3.78)	0.338 (5.72)	0.213 (10.16)	0.309 (11.88)	1.241 (24.33)	1.266 (20.12)
Constant	12.928 (416.59)	13.571 (323.43)	5.372 (382.58)	5.622 (303.21)	13.667 (446.45)	14.108 (339.73)
Observations	10639	6878	10829	6995	9403	6087
No. establishments	1558	1016	1558	1016	1558	1016
R-squared	0.04	0.05	0.06	0.09	0.14	0.16

Absolute value of t statistics in parentheses

Table 8: Estimation with sample of support for propensity scores predicting exporting and foreign owner-ship. Fixed-effect estimation on domestic establishments (columns 1, 3, 5) and exporting establishments (columns 2, 4, 6).

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	(1) log(va)	(2) log(va)	(3) log(labor)	(4) log(labor)	(5) log(capital)	(6) log(capital)
Exported in 1993-1995*Post-crisis	0.124 (3.85)		0.089 (6.23)		-0.039 (1.07)	
Foreign in 1993-1995*Post-crisis		0.335 (5.39)		0.176 (6.31)		0.205 (2.67)
Foreign Leverage*Post-crisis	-0.015 (1.23)	-0.000 (1.14)	-0.010 (1.90)	-0.000 (0.45)	-0.021 (1.50)	-0.001 (1.80)
Domestic Leverage*Post-crisis	0.000 (0.31)	0.004 (0.94)	-0.001 (1.74)	0.005 (2.26)	0.006 (2.86)	0.009 (1.10)
Foreign Leverage*Post-crisis*Exported in 1993-1995	0.014 (1.20)		0.010 (1.88)		0.020 (1.46)	
Foreign Leverage*Post-crisis*Foreign in 1993-1995		0.097 (4.63)		0.022 (2.64)		0.063 (2.64)
Domestic Leverage*Post-crisis*Exported in 1993-1995	0.005 (1.84)		-0.001 (0.69)		-0.004 (0.99)	
Domestic Leverage*Post-crisis*Foreign in 1993-199		0.048 (1.47)		0.031 (2.11)		0.019 (0.53)
YEAR==1991	0.164 (5.43)	0.059 (1.22)	0.063 (4.72)	0.045 (2.05)	0.157 (5.47)	0.098 (2.02)
YEAR==1992	0.301 (10.17)	0.202 (4.24)	0.149 (11.41)	0.146 (6.82)	0.323 (11.56)	0.324 (6.91)
YEAR==1993	0.418 (14.33)	0.395 (8.47)	0.240 (18.49)	0.271 (12.81)	0.434 (15.70)	0.451 (9.74)
YEAR==1994	0.550 (18.92)	0.528 (11.37)	0.301 (23.47)	0.358 (17.11)	0.564 (20.53)	0.581 (12.63)
YEAR==1995	0.522 (18.06)	0.525 (11.36)	0.322 (25.22)	0.392 (18.79)	0.673 (24.53)	0.736 (16.02)
YEAR==1999	0.326 (9.85)	0.484 (9.80)	0.167 (11.52)	0.290 (13.03)	1.103 (31.16)	1.081 (19.44)
YEAR==2000	0.220 (6.63)	0.322 (6.49)	0.167 (11.46)	0.281 (12.54)	1.210 (34.79)	1.176 (21.70)
Constant	12.671 (562.96)	13.535 (367.50)	5.231 (524.37)	5.595 (335.89)	13.382 (623.04)	14.145 (384.83)
Observations	23031	9495	23800	9715	19639	8166
No. establishments	4305	1431	4392	1432	3945	1421
R-squared	0.03	0.05	0.05	0.09	0.14	0.15

Absolute value of t statistics in parentheses

Table 9: Marginal effects of exporting status and foreign ownership in 1993-1995 on the effects of leverage in the post-crisis period.

	(1) log(va)	(2) log(va)	(3) log(labor)	(4) log(labor)	(5) log(capital)	(6) log(capital)
Exported in 1993-1995*Post-crisis	0.144 (4.52)		0.094 (6.68)		-0.034 (0.95)	
Foreign in 1993-1995*Post-crisis		0.446 (8.32)		0.212 (8.81)		0.271 (4.11)
Govn-owned in 1993-1995*Post-crisis	-0.303 (4.75)	-0.448 (4.71)	-0.194 (6.96)	-0.349 (8.22)	-0.294 (4.01)	-0.424 (3.68)
Foreign Leverage*Post-crisis	-0.000 (1.20)	-0.000 (1.12)	-0.000 (0.56)	-0.000 (0.49)	-0.001 (1.99)	-0.001 (1.81)
Domestic Leverage*Post-crisis	0.001 (1.33)	0.004 (0.92)	-0.001 (2.13)	0.005 (2.32)	0.005 (2.90)	0.008 (1.00)
YEAR==1991	0.164 (5.44)	0.060 (1.23)	0.063 (4.75)	0.046 (2.09)	0.157 (5.47)	0.099 (2.03)
YEAR==1992	0.302 (10.20)	0.202 (4.24)	0.150 (11.46)	0.147 (6.89)	0.323 (11.57)	0.324 (6.92)
YEAR==1993	0.418 (14.35)	0.395 (8.47)	0.240 (18.57)	0.273 (12.92)	0.434 (15.70)	0.452 (9.76)
YEAR==1994	0.550 (18.96)	0.528 (11.37)	0.302 (23.57)	0.360 (17.26)	0.564 (20.56)	0.581 (12.65)
YEAR==1995	0.523 (18.11)	0.525 (11.36)	0.323 (25.34)	0.394 (18.94)	0.674 (24.57)	0.736 (16.04)
YEAR==1999	0.338 (10.19)	0.517 (10.35)	0.177 (12.17)	0.317 (14.11)	1.115 (31.49)	1.112 (19.78)
YEAR==2000	0.232 (6.97)	0.354 (7.06)	0.177 (12.11)	0.308 (13.64)	1.223 (35.13)	1.208 (22.05)
Constant	12.669 (562.98)	13.535 (367.55)	5.229 (524.63)	5.593 (336.99)	13.381 (623.19)	14.145 (385.04)
Observations	23031	9495	23800	9715	19639	8166
No. establishments	4305	1431	4392	1432	3945	1421
R-squared	0.03	0.05	0.06	0.10	0.14	0.15

Absolute value of t statistics in parentheses

Table 10: Effects of government ownership in 1993-1995 on post-crisis outcomes.

Dep. var: Survived until 2000	(1)	(2)	(3)	(4)
Exported in 1993-1995	-0.008	-0.011		
	(0.42)	(0.53)		
Foreign in 1993-1995			0.039	0.035
			(1.25)	(1.08)
Foreign Leverage	0.000	0.000	-0.003	-0.004
	(0.13)	(0.13)	(0.53)	(0.70)
Domestic Leverage	0.000	0.000	0.002	0.001
	(0.43)	(0.39)	(0.72)	(0.70)
Productivity in 1990-1995		0.052		0.103
		(2.00)		(2.77)
mean log(K) in 1993-1995	0.034	0.030	0.046	0.039
	(5.82)	(4.77)	(5.37)	(4.42)
Observations	1872	1934	1034	1002
Absolute value of t statistics in parentheses				

Table 11: Probit estimation of aprobability of surviving until the next year, 1996-1999. Domestic establishments (1-2) and exporting establishments (3-4). 5-digit ISIC industry indicators and province indicators are included but not reported.