

The effect of a currency depreciation on importers: a firm-level analysis of Indonesian firms

Anisha Sharma

September 2016

Abstract

I estimate the effect of a large exchange rate depreciation on the performance of importers. The ability to manage volatility in the cost of imported inputs is likely to depend on a firm's access to external sources of finance as well its ability to hedge against exchange rate movements. Using data from a census on Indonesian firms, I find that while domestic importers face lower value-added due to a rise in their costs of production, foreign-owned importers fare better: they are more likely to sustain higher value-added, hire more labour and use more materials than domestic owned firms. This suggests another channel through which FDI can add value to a firm in a developing country, particularly with the increasing importance of trade in intermediate goods.

JEL-Classification: D21, F23, 012, 014

Keywords: firms, exporters, importers, exchange rate depreciation, East Asian crisis, Indonesia

¹Ashoka University, Sonapat, Rai, Haryana 131029, India.
Email address: anisha.sharma@ashoka.edu.in

1 Introduction

The unexpectedly large decline in trade flows during the 2008 global recession has led to a renewed focus on the volatility of international trading activity (Ahn et al., 2011). International transactions are more uncertain and time-consuming than domestic transactions, and firms that trade are particularly vulnerable to fluctuations in the exchange rate. While the effect of exchange rate movements on exporters is well-documented, much less attention has been given to the effect on firms that import intermediate inputs. This is despite the fact that 40% of non-fuel world trade is accounted for by the import of intermediate manufactured goods (World Trade Organization, 2009). Even when considering only exports, 24% of the value of gross global exports is derived from imported intermediate inputs (World Trade Organization, 2014).

On account of exchange rate volatility, importers are especially reliant on access to external sources of finance to meet their working capital requirements and mitigate the effect of sudden shocks to the costs of their inputs. In this context, multinational firms are typically better placed to respond to cost shocks since they are both better able to access international capital markets, as well as raise internal finances from a network of multinational affiliates (Desai et al., 2004). Multinational firms may also be better able to hedge against exchange rate risks due to their exposure to multiple currencies.

In this paper, I identify the effect of a large and unexpected exchange rate depreciation on the profitability of firms that import intermediate inputs. I identify the differential impact on the profitability of foreign-owned firms compared to domestic firms, under the assumption that foreign-owned firms have better access to finance from their affiliates, trading partners and from banks, allowing them to mitigate the effect of higher input costs, as well as better management of exchange rate risks. The data I use is drawn from a census of all manufacturing firms in Indonesia with at least twenty employees. I consider the years 1991 to 1999, spanning the period of the East Asian financial crisis of 1997-98, which was characterised by a steep depreciation in the Indonesian rupiah in real terms, driving up costs for all Indonesian importers. By observing the same firms before and after the crisis event, I am able to identify the impact of the depreciation on foreign-owned importers relative to domestic-owned importers, after controlling for firm-specific time-invariant heterogeneity. Since the dataset is unusually rich for a developing country, I am able to control for a number of other potentially confounding firm characteristics as well.

I find that while domestic importers suffered a decline in profitability in response to the increase in input costs, foreign-owned importers fared relatively better. Foreign firms were able to use relatively more raw materials as well as hire more workers during the crisis. I find no evidence that foreign firms increased their capital stock during this period, suggesting that the main channel through which foreign firms benefited was specifically the use of trade finance intended to help them meet their working capital requirements, as opposed to bank loans to increase investment. I find no evidence that the results are driven by different probabilities of survival among domestic and foreign-owned firms.

This paper builds upon several strands of the existing microeconomic literature on internationally trading firms. Starting from the work of Aw and Hwang (1995) and Bernard and Jensen (1999), a large literature has developed that uses microdata on firms to determine the characteristics of firms that export, and the effect of exporting on firm performance. The importing activity of firms has received far less research attention, even though there exists a considerable overlap between exporters and importers (Bernard et al., 2009a). A recent literature presents empirical evidence on the import decision of firms, particularly of two-way traders who both export and import.¹ In the data on Indonesian firms, importers of intermediate inputs constitute close to 15% of all manufacturing firms, while a third of all exporters import some inputs. I document observable differences between non-trading firms, exporters, importers and two-way traders, and identify the effect of the import intensity of a firm on its performance in the face of a sudden increase in input costs.

Following the 2008 trade collapse, recent research has suggested that firms which are reliant on trade finance are adversely affected by a credit contraction (Iacovone and Zavacka, 2009; Berman and Martin, 2010; Chor and Manova, 2010; Amiti and Weinstein, 2011; Manova, 2013). Firms without access to trade credit are unable to finance short-term payments for inputs, or make payments for output. During the Asian crisis, the high reliance of Indonesian firms on imported inputs (Auboin, 2009) is likely to have had important effects on firm performance. Blalock et al. (2008) point out that international firms in Indonesia had better access to sources of external finance than domestic firms, with important implications for their performance. Using foreign-ownership as a proxy for access to international finance, I compare changes in

¹This research spans firms in countries such as the United States (Bernard et al., 2009b), France (MacGarvie, 2006), Germany (Vogel and Wagner, 2010), Belgium (Muûls and Pisu, 2009; Amiti et al., 2014), Hungary (Halpern et al., 2011), eastern Europe and transition economies (Aristei et al., 2013), Chile (Kugler and Verhoogen, 2009; Gibson and Graciano, 2011) and China (Wang and Yu, 2012).

the profitability of importers to non-importers as a result of the economic crisis and find strong evidence of heterogeneity by type of ownership.

The approach I use is similar to Blalock et al. with some important differences. Blalock et al. restrict their analysis to only large firms employing over 100 workers, while I consider the entire dataset of surveyed manufacturing establishments, which have a median size of only 50 workers. I also focus on the effect of the currency depreciation on importers relative to firms that do not import, as well as importers who export, relative to exporters who do not import. This perspective illuminates both the effect of the crisis on importers, as well as the phenomenon of two-way traders. I find foreign firms differ from domestic firms not in terms of increases in capital stock or investment, but in increases in the use of variable inputs, suggesting that the external finance they have access to is used to fund working capital.

The rest of the paper is organised as follows: section 2 provides the background to the crisis and the theoretical motivation for this paper. Section 3 describes the data. Section 4 presents the empirical framework and estimation results on the impact of the East Asian crisis on the profits of importers. Section 5 concludes.

2 Background and theoretical motivation

2.1 Background to the Indonesian crisis

For almost two decades before the East Asian crisis, the Indonesian authorities implemented a ‘managed float’ exchange rate regime where the rupiah was only permitted to move within a narrow band. International investors launched a speculative attack on the Thai baht in June 1997, following which the currencies of neighbouring countries came under speculative pressure as well. After widening the band proved to insufficient, the Indonesian government abandoned it altogether on August 14, leading to a sharp depreciation in the rupiah. In December, the regional crisis intensified as deposit runs ensued on almost half of the assets of the Indonesian banking system. In January 1998, the Indonesian rupiah depreciated from Rp 4,800/\$ to above 16,000/\$, plunging Indonesia into a deep and long-drawn economic crisis. While the real exchange rate gradually appreciated over the next two years, in mid-2000 it was still 40% lower than its mid-1997 level. GDP contracted by 13.1% in 1998 and marginally recovered the next year to 0.8%.²

The causes of the financial crisis have been widely debated and among the several reasons put forward are a balance sheet mismatch caused by a reliance on short-term

²Data from the IMF’s World Economic Outlook database.

dollar-denominated debt, excessive risk-taking by domestic firms and banks that was encouraged by implicit government guarantees, an inadequate regulatory system for the financial sector, critical policy errors in dealing with the crisis, and blind panic by international financial investors.³ Whatever the cause, the extent of the crisis was largely unanticipated. Figure 1 shows the sharp depreciation in the nominal exchange rate between the rupiah and the dollar that took place in 1997-98, and plots this change against the black market rate exchange rate. The black market rate closely tracks the nominal rate, suggesting that investors and firms were not aware of the dramatic forthcoming exchange rate movements that began in July 1997.

In a regional crisis, the predicted effects of an exchange rate depreciation in one country may not take place if the regional trading partners of the country are also affected. However, the sharp fall in the exchange rate was larger than that of any of the neighbouring countries of Thailand, Korea, Malaysia, Philippines. Figure 2 illustrates that even within the context of the East Asian crisis, the decline in the value of the rupiah was extraordinary.

2.2 Theoretical motivation

2.2.1 Changes in relative prices

Trade theory predicts that when the currency of a country depreciates, the relative price of the goods manufactured by its firms declines. For domestic firms, this would lead to a boost in foreign demand for their output, leading to higher foreign sales. However, for firms which import inputs, the relative increase in the price of inputs will lead to them facing higher costs. For firms that are both exporters and importers, the benefit from the increased price competitiveness of their output on international markets will be mitigated by the increase in production costs.

Some papers use firm-level data to examine the effect of a change in the price of imported inputs on firm performance, mostly estimating the effect of a reduction in the tariffs of imported intermediate goods on a measure of the firm's productivity (Schor, 2004; Amiti and Konings, 2007; Topalova and Khandelwal, 2011; Bas, 2012; Kasahara and Lapham, 2013). Amiti and Konings (2007) use the same firm-level dataset as I do in this paper to provide evidence of an increase in total factor productivity in response to a phased reduction in the import tariffs on intermediate inputs.

³There is a large literature on the causes of the East Asian currency crisis; some prominent reviews include Radelet and Sachs (1998), Mishkin (1999), Wade (1998), Corsetti et al. (1999), Krugman (1998).

In the closest setting to this paper, Gopinath and Neiman (2014) use data on Argentinian firms during the financial crisis of 2001 to identify the margins at which importing firms adjust to a large depreciation in the exchange rate. They find that much of the adjustment took place at the intensive margins; the entry and exit of firms and products into the import trade played a minor role.⁴

2.2.2 Financial constraints

The Indonesian exchange rate depreciation was also accompanied by a financial crisis precipitated by a run on bank deposits. By mid-1999, 64 of 237 banks had to be closed down, the share of non-performing loans to all loans peaked at 70%, and over three-quarters of the deposits in the banking system were owned by the state (Claessens et al., 1999; World Bank, 2000, chap. 2). The collapse in the banking system led to a 50% fall in the value of credit extended by banks to manufacturing establishments in the period between 1996 and 2000 (Blalock et al., 2008).

A large literature, surveyed by Bond and Van Reenen (2007), focuses on the effect of financial constraints on firm investment. In the wake of the 2008 global financial crisis, however, another channel for financial constraints has been proposed – a decline in the availability of trade finance. Importing and exporting firms face both higher shipping costs and times, as well as higher uncertainty over payment default compared to firms that only trade domestically. Trade finance comprises a number of credit instruments designed for firms to meet short term working capital requirements, such as letters of credit extended by banks to importers and exporters in order to pay for goods or bridge the period between supplying goods and receiving payment for them. As much as 90% of all international transactions could involve some component of trade finance (Auboin, 2009). Since most trade finance is supplied by banks, a decline in the health of the banking sector could reduce the availability of credit extended to banks to meet their working capital requirements, leading to a decline in the profits of individual firms, as well as a decline in the volume of international trade.

2.2.3 Foreign ownership and access to finance

Firms vary in their ability to access finance depending on whether they are foreign-owned. Desai et al. (2008) find that US-owned firms increased investments in overseas operations more than domestic firms, following a currency crisis. Blalock et al.

⁴There is a larger literature on the response of exporters to changes in the exchange rate. See, for example, Forbes (2002); Bugamelli and Infante (2003); Bernard and Jensen (2004b,a); Campa (2004); Bernard et al. (2009a); Berman et al. (2012); Greenaway et al. (2012); Fitzgerald and Haller (2014).

(2008) find that foreign-owned exporters in Indonesia increased investments relative to domestic-owned exporters during the East Asian crisis. Foreign firms also frequently own a portfolio of assets and liabilities in multiple currencies, and engage in transactions in a multiple currencies, which offsets the impact of the depreciation of any one currency. They may also explicitly hedge foreign exchange rate risk by trading on well-developed forward markets (Clark et al., 2004; Greenaway et al., 2012). Finally, for industries where firms are reliant on trade credit, foreign-owned firms will be more likely to be able to trade through access to internal finance.

Firms that export may also be better able to access external finance. In the presence of sunk costs necessary to start exporting, firms facing financial constraints will find it more difficult to become exporters, and exporters will have better financial health than non-exporters. Several theoretical and empirical papers develop models of the firm decision to export in the presence of costs, and find evidence of financial frictions (Roberts and Tybout, 1997; Campa, 2004; Bernard and Jensen, 2004b; Chaney, 2013). In the presence of costly screening of firms seeking finance, an exporter sends a positive signal about its financial health and may be better able to raise external finance (Ganesh-Kumar et al., 2001). Foreign exchange revenues also provide better collateral for loans (Tornell and Westermann, 2003). Greenaway et al. (2007) use data from a sample of UK firms to show that those firms that have been continuously exporting have better financial health than those that have just entered the export market. Since exporters may find it easier to raise external finances, I conduct the analysis to follow on two samples – one of all Indonesian manufacturing firms, and one of all Indonesian exporters.

3 Data

3.1 Statistik Industri

The data I use is drawn from the *Survei Tahunan Perusahaan Industri Pengolahan* (SI), which is an annual survey of all manufacturing plants in Indonesia that employ at least 20 workers. The data has been collected since 1975 by the *Badan Pusat Statistik* (BPS), the Central Bureau of Statistics of the Republic of Indonesia, and is designed to be a census, or a complete enumeration of all manufacturing units in the country. Enumeration strategies were substantially changed between the 1980s and the 1990s (Aswicahyono, 2009), so I only consider data from the period 1991 to 1999, spanning the six years leading up to the financial crisis (1991-96), and the three crisis years (1997-1999). The survey contains information on a firm's industrial classification

(at the 5-digit ISIC level), ownership shares (private, foreign, government), total output (domestic sales and exported volume), input use (domestic and imported raw materials, labour and capital), and other related data.

The main variables in the analysis are profits, materials, labour, capital, export and import status, and ownership status of a firm. Profits are measured by the value-added reported by the firm for the year. I exclude firms with negative value added from the sample. Materials are divided into two categories – raw materials bought from domestic firms, and imported raw materials. Firms may also be importing indirectly, that is, by buying intermediate inputs imported by domestic wholesalers. However, indirect importing of inputs will be classified as domestic inputs in this data. Labour is measured by the average number of workers employed per day in a given year. Workers are categorised as either production workers or non-production workers, with the two divisions corresponding to blue-collar and white-collar workers, respectively. I construct a measure of the skill of the firm’s labour force as the percentage of non-production employees (or white-collar workers) as a share of total workers, and I use this measure of skill as one proxy for the firm’s productivity.

Capital is measured as the market value of all fixed capital owned by the firm at the end of the measurement year. Capital stock data was not collected in 1996, so I follow Hallward-Driemeier and Rijkers (2013) in imputing capital stock from 1991-95 data on output, raw materials, labour use, lagged capital stock, investment, whether a firm exports, and province where the firm is located.⁵ The results for capital stock are robust to the exclusion of data from the year 1996. All data is deflated to 1991 rupiahs, using sector-specific deflators; more details on the deflators are provided in the appendix.

A firm is considered a pre-crisis exporter if it exported any share of its output in the pre-crisis years (1991-1996). I follow Amity et al. (2014) in constructing a measure of the import intensity of a firm as the share of imported raw materials in total variable costs, which is comprised of a firm’s total material costs and its wage bill. I consider all firms with an import intensity of at least 10% at any time in the pre-crisis period to be importers. I consider any firm with a foreign ownership of at least 25% at any time in the pre-crisis years to be foreign owned. A firm is considered to be government-owned if any share of the firm is owned by the central government. I discuss the sensitivity of the results to these definitions in section 4.3.

⁵For firms that entered the survey only in 1996, lead data on the same variables from 1997-1999 is used to predict capital stock in 1996.

While the SI is intended to be a complete census of all manufacturing units, in practice, some firms may fail to complete the survey. However, the sampling error resulting from missing establishments is believed to be quite small (Aswicahyono et al., 2010) since the SI data closely tracks the aggregate national accounts data. As in most firm surveys, there is likely to be measurement error in the reporting of several variables, particularly the capital stock. In order to reduce the effect of measurement error, I exclude some problematic observations. This process is outlined in the appendix.

3.2 Overview of the data and summary statistics

A total of 29,674 unique establishments were surveyed 159,954 times over 9 years, with the median firm being surveyed five times. Table 1 shows the distribution of the pre-crisis panel of firms across import and export status, and foreign ownership. Between the years 1991 and 1996, 27,912 firms are classified as domestically owned and 1,762 firms as foreign-owned. More than 20% of domestic firms are exporters, while around 13% are importers, but over 1,400 firms, just over 5% of the sample, are two-way traders, both exporting a share of their output and importing intermediate inputs. The share of traders is much higher among foreign firms, with over 70% exporting some share of their output, 60% importing inputs, and close to half the sample participating in both importing and exporting activities. Considering all firms together, two thirds are non-traders, 18% are exporters only, 10% are importers only, while 10% are both importers and exporters. Two-way trading is an important feature of the firms in this sample.

Firms in different categories of trading are different from one another. Table 2 reports summary statistics of the sample firms by trading and ownership category. As has been well-documented in the empirical literature, including in Indonesia (Arnold and Javorcik, 2009), foreign-owned firms make higher profits and are more productive than domestic firms. They use more inputs, employ more labour, including skilled labour, and use more capital. Foreign firms also export a greater share of their output than domestic firms. Along the dimension of trade, trading firms are both more profitable and productive than non-trading firms, with importers being more productive than non-importers. The performance gap between foreign and domestic firms is narrowest for the two-way traders – firms that both export and import. The analysis that will follow will focus on two samples – all manufacturing firms surveyed by the SI and a sample of exporters only, which allows me to compare foreign importers to relatively similar domestic importers.

4 The impact of exchange rate movements on firm profits

4.1 Empirical framework

The key question asked by this paper is whether foreign owned firms are better able to mitigate the effect of a trade shock on their costs of production due to better access to finance or a better ability to hedge currency risk. The unexpected and large exchange rate depreciation of 1997 and 1998 led to an increase in the production costs for all importers of intermediate inputs. The exchange rate movement would have also benefited exporters, but within this group, exporters reliant on intermediate inputs would benefited to a lesser extent.

The first hypothesis I test is whether the profits of Indonesian importers were reduced by the East Asian crisis. I estimate the following equation:

$$y_{it} = \beta_1(Importer * Post)_{it} + \lambda_i + d_t + \varepsilon_{it} \quad (1)$$

where y_{it} is a measure of the value-added of firm i in year t , as a proxy for its profits. $Importer * Post_{it}$ is an interaction of two indicator variables – an indicator for whether a firm was a pre-crisis importer of intermediate inputs and a post-crisis time indicator (for the years 1997-1999), λ_i is a firm fixed effect, d_t is a year effect and ε_{it} is a disturbance. β_1 is the estimated coefficient of interest. Under the assumption that firms that import intermediated inputs are no different from firms that do not, β_1 is an estimate of the effect of the crisis on the profits of firms that imported intermediate inputs compared to those that did not. Since the crisis led to an increase in the price of imported inputs, importing firms should face lower profits, that is, β_1 should be negative.

The second hypothesis I test is whether importers are adversely affected by the trade shock even after controlling for a firm's access to finance. Foreign-owned firms are more likely to have greater access to finance, both from banks and from within the multinational corporation network of which they are a part, compared to domestic-owned firms. Since access to finance is one of the most important tools available to firms to mitigate the effect of an unexpected increase in the costs of production, I control for whether a firm was under foreign ownership during the pre-crisis period. I estimate the following equation:

$$y_{it} = \beta_1(Importer * Post)_{it} + \beta_2(Foreign * Post)_{it} + \lambda_i + d_t + \varepsilon_{it} \quad (2)$$

where $Foreign * Post_{it}$ is an interaction of two indicator variables – an indicator for whether a firm was foreign-owned in the pre-crisis years and a post-crisis time indicator (for the years 1997-1999). β_1 measures the effect of the crisis on the profits of importing firms compared to non-importing firms, having controlled for the foreign ownership premium. β_2 is an estimate of the profits premium earned by foreign-owned firms during the crisis years. If foreign firms were less financially constrained than domestic firms and this affected the profits they earned, the sign of the estimated β_2 will be positive.

The third hypothesis I test is whether foreign firms were better able to manage the increase in input costs compared to domestic firms. If, due to differences in the level of trade finance or access to outsourced raw materials available to them, foreign firms are able to mitigate the effect of expensive imported inputs, their profits should fall by less than domestically owned importers. I estimate the following equation:

$$y_{it} = \beta_1(Importer * Post)_{it} + \beta_2(Foreign * Post)_{it} + \beta_3(Importer * Foreign * Post)_{it} + \lambda_i + d_t + \varepsilon_{it} \quad (3)$$

where $Importer * Foreign * Post_{it}$ is the triple interaction between indicators for whether the firm was a pre-crisis importer, for whether it was a pre-crisis foreign-owned firm, and an indicator for the post-crisis years. In this equation, β_1 is an estimate of the effect of the crisis on domestic-owned importers compared to domestic-owned non-importers. β_2 is the estimate of the effect of the crisis on foreign-owned non-importers compared to domestic-owned non-importers. β_3 , the triple difference estimator, measures the estimated impact of the crisis for importers among foreign firms, over and above the estimated impact of the crisis for importers among domestic firms. In other words, β_3 measures the relative effect of the crisis on foreign importer performance compared to domestic importer performance, after controlling for the foreign firm performance premium for non-importers. If, due to greater access to finance and better strategies for managing exchange rate risk, foreign-owned firms were better able to mitigate the effects of increase in their input costs than domestic firms, the estimated β_3 will be positive.

I estimate all three equations on two samples – a sample of all firms, and a sample of only exporters. The descriptive statistics in table 2 indicate that the observable performance gap between foreign and domestic firms is narrowest for exporter-importers.

In an estimation of (3) on a sample of only exporters, β_3 will be estimated by comparing domestic importer-exporters to foreign-owned importer-exporters in the post-crisis period, which is arguably a closer counterfactual than the comparison between foreign importers and foreign exporters. These estimations will provide a useful check on the robustness of the main result as well as shed light on the ambiguous effect of exchange rate movements on the important category of two-way traders.

As all three estimations include firm fixed effects, the β s are estimated by the within-firm variation in value-added before and after the crisis. This rules out any variation due to time-invariant firm characteristics that could be affecting the firm's response to the crisis. In all cases, I cluster standard errors by firm to allow for any correlation in the observations within a firm over time.

4.2 Results

The main results of this paper are presented in table 3. Columns 1-3 show the results of all three estimations on the sample of all firms, while columns 4-6 show the results for the sample of exporters only. For both samples, the sign of the estimated β_1 of equation (1) is positive, rather than negative, which is a counter-intuitive result, suggesting that importers benefited from the increase in input costs. This, however, conceals considerable heterogeneity. The inclusion of a control for foreign ownership reduces the estimated β_1 to zero in columns 2 and 4, while the estimated β_2 is large and positive, signifying a large foreign ownership premium on profits earned by firms during the crisis, similar to evidence presented in Blalock et al. (2008). The core result, presented in columns 3 and 6, show the estimated effect of the crisis on foreign-owned importers relative to domestic-owned importers, and the difference is striking. The estimated β_1 measures the effect of the crisis on domestic importers compared to domestic non-importers, which is negative. The estimated β_3 measures the gap between foreign importers and non-importers, over and above the gap between domestic importers and non-importers, which is positive, suggesting that foreign importers were better able to manage the effect of input costs shock, compared to domestic importers.

4.3 Robustness to added controls

The results in section 4.2 are robust to the inclusion of a number of variables which could potentially bias the estimated β s. First, the results presented so far compare firms that import to firms that do not, on the extensive margin. I investigate variation

on the intensive margin of imports as well, by including a variable for the import intensity of a firm, conditional on the firm being an importer. These results are in columns 1 of tables 4 and 5 for the sample of all firms and exporters. The effect of import intensity is non-linear as domestic firms that were importers faced a large reduction in profits as a result of the crisis, but as the share of imports in total costs rises, the effect of the cost shock on profits declines. This suggests that firms facing higher import costs may have switched away from more expensive inputs, perhaps to domestically-sourced inputs, mitigating the effect on profits. I examine this possibility further in section 4.4.

There is potentially significant heterogeneity with respect to the size of the firm. Larger firms may be more able to hedge against movements in the exchange rate, or may be better placed to exploit the export opportunities associated with a depreciation in the real exchange rate. Since foreign-owned firms are larger, on average, than domestic firms, the foreign-ownership dummy may be partially picking up an effect associated with firm size. To control for this, I include an interaction of the size of the firm in 1996 with the post crisis variable. These results are presented in columns 2 of tables 4 and 5; larger importers are indeed associated with smaller declines in value added with the average-sized domestic importer facing a decline in profits in response to the crisis. However, the main results – an attenuated effect on profits on foreign-owned firms compared to domestic firms – continues to hold.

Government-owned firms may respond differently to the exchange rate movement than privately owned firms, given the collapse in public finances during the crisis. During the years preceding the crisis, relatively unproductive government-owned firms with strong personal connections to President Suharto’s family were supported by explicit and implicit public subsidies, including favourable interest rates for loans (Fisman, 2001; Blalock et al., 2008). In October 1997, however, after the crisis had begun, the government of Indonesia agreed on a package with the IMF that required it to maintain a budget surplus of 1% from 1998-99 (Soesastro and Basri, 1998). In May 1998, Suharto resigned as president, potentially leaving many government-owned firms bereft of support. Such firms could have faced a sudden decline in access to credit and been forced to scale back operations; driving the negative effect we see on domestic firms. The survey includes 3,356 firms with some government ownership, of which 2,689 are fully owned by the government. To control for any confounding effects related to government ownership, I include in the regression the interaction of an indicator for government ownership with post-crisis years. These results are presented in columns 3 of tables 4 and 5. Government-owned firms did suffer a

greater decline in profits during the crisis, but the estimated negative coefficients are not significantly different from zero.

Pre-crisis productivity may affect post-crisis responses of the sample firms, particularly if more productive firms are better able to raise finances or increase investments during a crisis. Hallward-Driemeier and Rijkers (2013) find that the relationship between productivity and firm exit was attenuated during the crisis, suggesting that firms were indiscriminately forced into financial difficulties. Nonetheless, I include an estimated measure of total factor productivity (TFP) as a control in the main regression.⁶ The results, reported in columns 4 of tables 4 and 5, interestingly find that more productive firms in the pre-crisis period faced a greater decline in profits during the crisis. The estimates of β_1 and β_3 , however, do not change substantially.

To control for sector-specific time trends and to guard against measurement error in the deflators used to convert all values to 1991 rupiahs, I include interactions of the sector dummies with the year variable. The core results, presented in columns 5 of tables 4 and 5, are robust to their inclusion. The estimated β_1 in the sample of exporters declines with the addition of controls but continues to be negative, while β_3 is positive, implying that foreign-owned importers do not face the same downward pressure on profits as domestic-owned importers.

Among exporters, there may be heterogeneity across firms that export varying shares of their output. Foreign-owned firms are more likely to export a higher share of their output: foreign-owned exporters export 45% of their output while domestic-owned exporters export 36% of their output, on average. Firms which export a greater share of their output may have stronger connections to overseas markets and be better placed to take advantage of the terms of trade movement in their favour. I include a control for the pre-crisis share of output interacted with the post-crisis indicator. These results are presented in column 5 of table 5, and show that export shares do not affect the core results.

Indonesia joined the World Trade Organisation in 1995 and embarked upon a ten year process of trade liberalisation, with a phased reduction in output and input tariffs. Part of what I term the pre-crisis period – 1995 and 1996 – and the entire post-crisis period, is also marked by a reduction in import tariffs, which would ameliorate the effects of the large increase in input prices. However, the depreciation of the exchange rate dwarfs the reduction in tariff rates, and input prices rose substantially

⁶I estimate TFP using the Akerberg et al. (2006) procedure as proposed by Loecker and Warzynski (2012) from pre-crisis 3-digit ISIC production functions. Further details on this estimation are provided in the appendix.

during the crisis period (Amiti and Konings, 2007). I test for sensitivity of the results to the trade liberalisation programme by including interactions of the firm-level import indicator with individual years in the dataset, rather than a post-crisis indicator. The resulting coefficients are plotted in figure 3. The results indicate that domestic-owned importers faced a significant reduction in value-added in the crisis year of 1998, as a result of the increase in input costs, net of any reductions in import tariffs. The full results are presented in the appendix in table A1.

Finally, the results are not sensitive to the definition of foreign ownership. In this paper, I classify all firms which have at least 25% ownership as foreign, where 25% is the median value of the foreign shareholding among firms with any foreign ownership. The results are unchanged if a limit of 10% (the 40th percentile of foreign shareholding) or 50% (the 70th percentile of foreign shareholding) is used.

4.4 Components of value added

To develop a better understanding of the mechanisms through which this differential impact may be taking place, I examine the effect of the exchange rate movement on the use on inputs such as raw materials, labour and capital stock. I also consider the effect of the crisis on two measures of the productivity – value-added per worker, and the ratio of white-collar workers to all workers among a firm’s employees. These results are presented in table 6.

Foreign importers used more materials and hired more labour during the crisis period compared to domestic importers. They were both able to increase input use during a period of higher input costs as well as exploit the drop in real wages precipitated by the crisis to increase hiring relative to domestic firms. In particular, foreign firms increased their hiring of white collar workers, who faced a bigger relative decline in wages during this period. As a result, foreign importers sustained a higher level of productivity during this period compared to domestic importers. However, there is no gap between the two in changes made to the capital stock during the crisis. Since capital stock data is partially imputed and potentially more prone to errors in calculation, it may be difficult to draw inferences from this estimation, but there is no evidence to suggest that foreign firms were building up capital stock during the crisis period, relative to domestic firms.

I also consider the effect of the crisis on the decision to import, and the firm’s import intensity. Columns 1 and 3 of table 7 show the results of the estimation of the probability that a firm continues to import during the crisis period. Domestic pre-crisis importers are less likely to import during crisis period than foreign-owned

pre-crisis importers. However, all firms, domestic and foreign, reduce their reliance on imported inputs; columns 2 and 4 show that importers reduced their import intensity ratio – the ratio of imported material costs to total variable costs – by between 4 and 6 percentage points in response to the crisis.

This evidence is consistent with the hypothesis that foreign-owned firms had relatively greater access to finance that allowed them to mitigate the effect of higher costs. They were more likely to be still importing during the crisis, and, while all firms reduced their reliance on imported intermediates, foreign-owned firms were able to relatively increase input use and sustain a higher level of profits. They were also able to increase hiring, particularly of more productive workers that guarded against a decline in productivity faced by domestic importers.

4.5 The survival of firms

Finally, I consider the effect of having been an importer heading into the crisis on the probability that the firm survived the crisis and was observed in the data in 1999.⁷ The results are in table 8. The first two columns show the effect of the crisis on the survival of importers compared to all other firms using a pooled sample of all pre-crisis observations, with standard errors clustered by firm. Columns 3 and 4 show the effect of the crisis on the survival of importers, and foreign-owned importers in a pooled sample of pre-crisis exporting firms only. Older firms employing more labour and capital are less likely to exit, which agrees with evidence from other parts of the developing world (Bernard and Sjöholm, 2003; Frazer, 2005; Soderbom et al., 2006; Hallward-Driemeier and Rijkers, 2013).

Hallward-Driemeier and Rijkers find in Indonesia that while more productive firms were less likely to exit, this correlation became attenuated during the crisis, as relatively productive firms had a proportionally higher chance of exit. To control for productivity, I include a measure of TFP as well: these results are presented in columns 2 and 4 of table 8 and show that more productive firms are more likely to survive till 1999.

Survival probabilities do not vary by ownership of the firm. In fact, importers are more likely to survive than non-importing firms as well as non-importing exporters. There is no difference in the probability of survival between foreign-owned importers

⁷Firms are considered to have survived the crisis if they were surveyed by the BPS for the year 1999. The survey, however, is designed to only cover firms with at least twenty employees. It may be the case that firms have dropped out of the survey but continue to operate with fewer than twenty employees. In this analysis, firms that are no longer covered by the SI are treated as having exited.

and domestic importers. This suggests that non-random exits are not likely to be driving the main results in this paper.

5 Conclusion

The findings in this paper suggest that foreign-owned firms are better able to manage a sudden increase in the cost of their inputs, compared to domestic firms. Typically, foreign firms with strong international links have access to external sources of finance, as well as the ability to hedge exchange rate risk. This is particularly important during a financial crisis, when a developing country is struck by both a depreciation in the currency as well as a contraction in the availability of credit. Foreign importers in Indonesia were able to earn higher profits, use more raw material, hire more labour and maintain higher productivity than domestic firms during the East Asian crisis. They were more likely to continue to import, even though they were no more likely to survive the crisis, than domestic firms. These findings are common across both the sample of all Indonesian firms, as well as a sample of Indonesian exporters only. However, foreign firms were not increasing investments or capital stocks relative to domestic firms; even exporters who arguably benefited from the movement in exchange rates did not significantly increase investment. This suggests another channel for mitigating the effect of higher input costs – the use of trade finance to meet working capital requirements. This possibility is consistent with recent evidence on the trade collapse during the global recession of 2008, and suggests an important role for finance in sustaining international trade volumes and firm performance during a credit crunch.

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A Appendix

A.1 Data and construction of samples

A.1.1 Problematic observations

I exclude or correct some invalid, missing or extreme observations in the data using techniques similar to Blalock et al. (2008) and Hallward-Driemeier and Rijkers (2013). For example, a few firms which have incorrectly reported basic data, such as number of employees, output or value added, are removed. I trim the data to exclude firms in the top and bottom 1% of value added labour productivity. I also correct data where percentage values, such as share of exports or share of foreign ownership are reported to fall outside the 0-100 range. The data for capital stock in 1996 has not been collected, so I follow Hallward-Driemeier and Rijkers (2013) by using 1991-95 data on output, raw materials, labour use, lagged capital stock, investment, whether a firm exports, and province where the firm is located to predict the level of capital stock in 1996. For firms that entered the survey only in 1996, lead data on the same variables from 1997-1999 is used to predict capital stock in 1996.

A.1.2 Deflators

All data is deflated to 1991 rupiahs, using sector-specific deflators. Output is deflated using a 5-digit sector deflator, inputs by a 2-digit sector deflator, and capital and investment are deflated by using a manufacturing sector deflator on an annual basis. Where capital stock is disaggregated into its constituent components, I deflate capital by parts, using annual manufacturing sector deflators for construction, machinery, and vehicles. The wage bill is deflated using the national consumer price index.

A.2 Estimation of productivity

The value added regressions also control for a measure of total factor productivity as a proxy for unobserved firm quality. I estimate TFP using the Akerberg et al. (2006) procedure as proposed by Loecker and Warzynski (2012), where TFP is estimated from 3-digit sector-specific value-added translog production functions, and the lagged values of inputs as well as import status and foreign ownership are used as proxies for productivity.

Figure 1: Exchange rate movements and consumer prices

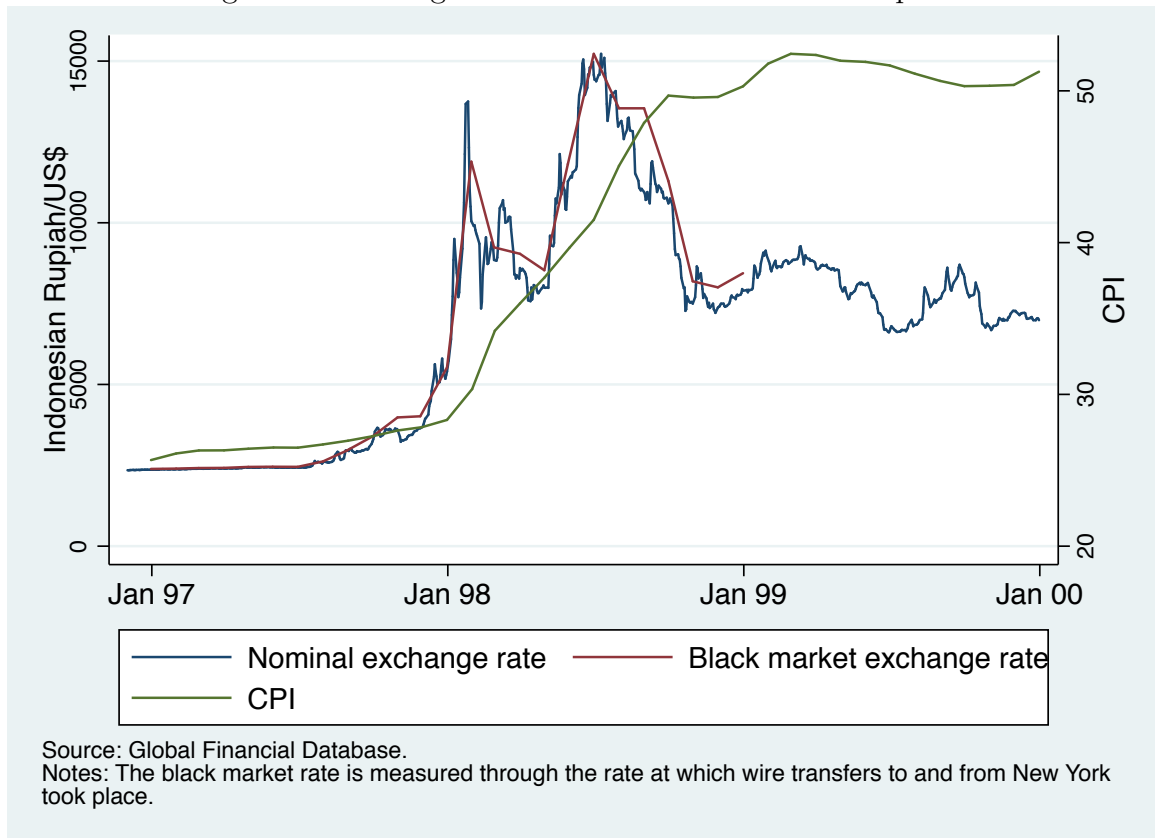


Figure 2: Real Exchange Rate movements in East Asia (1994-2001)

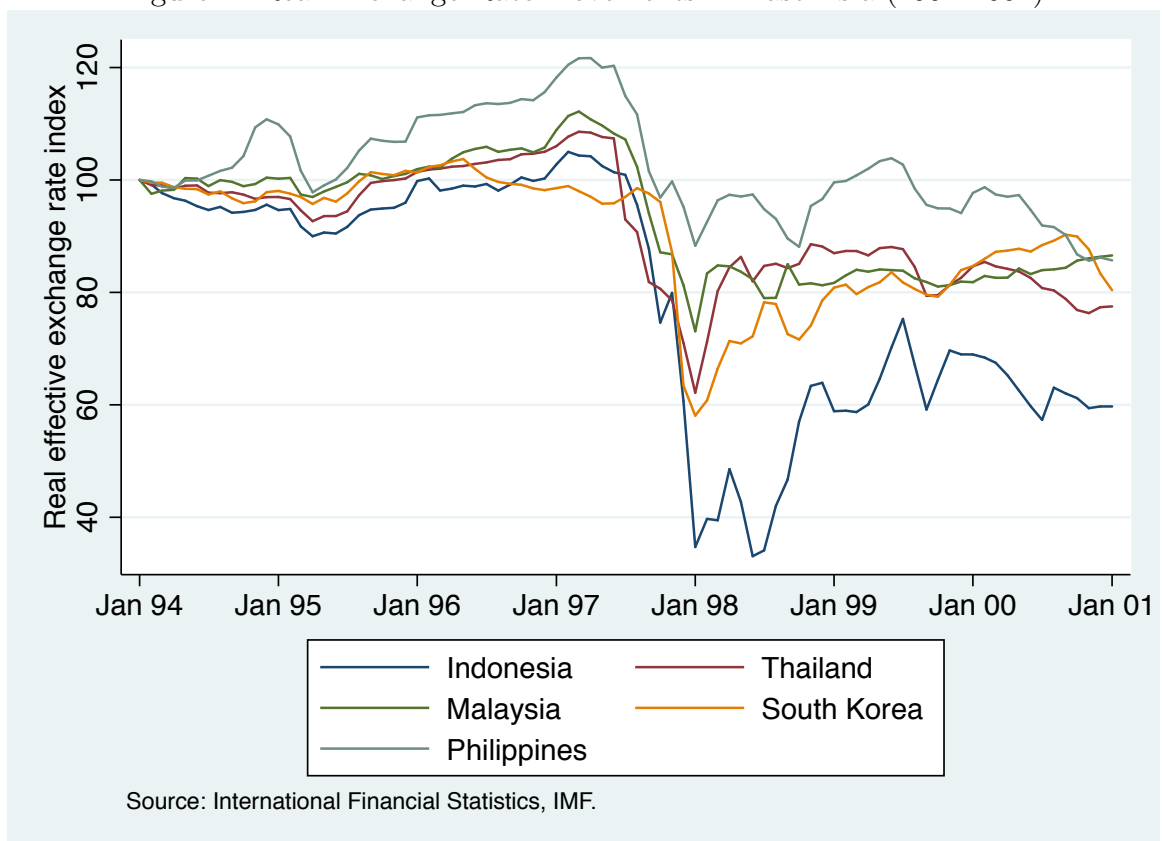
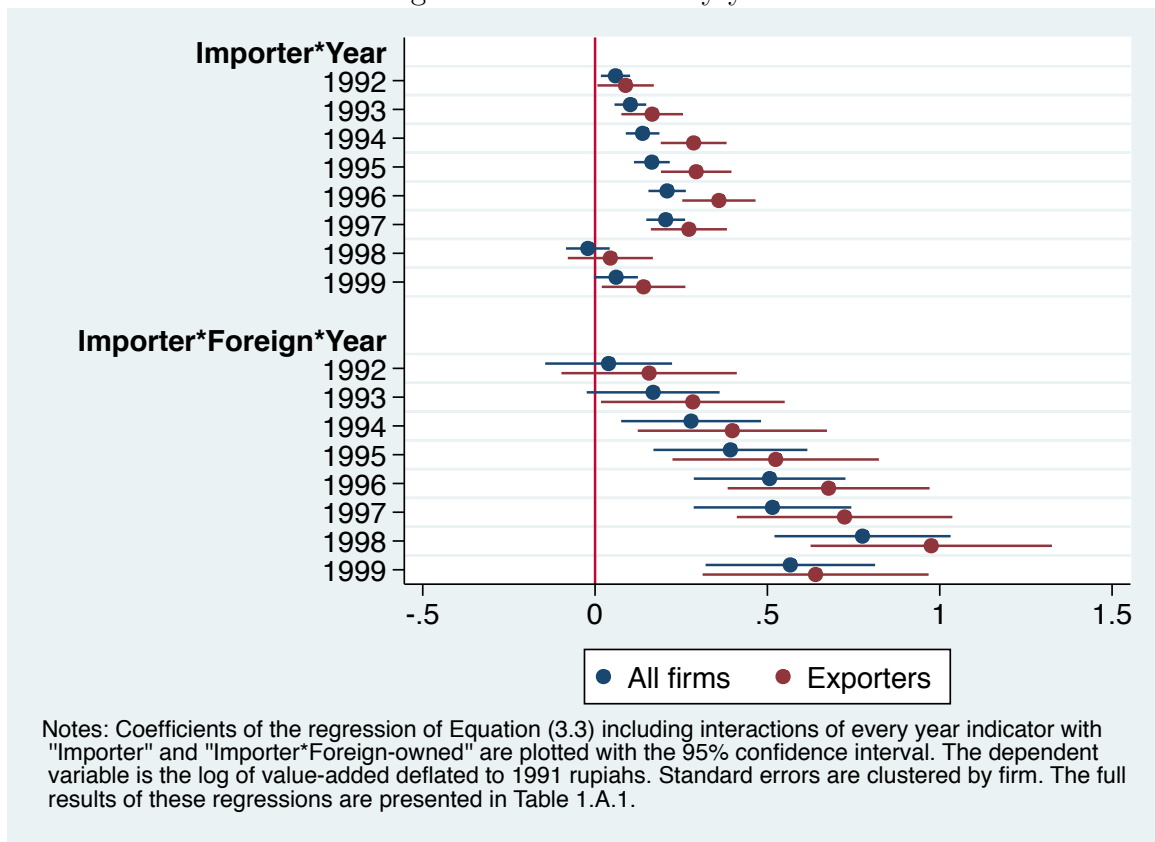


Figure 3: Coefficients by year



Source: Coefficients of the regression of equation (3) with interactions of "Importer" and "Importer*Foreign-owned" with every year are plotted with 95% confidence interval. The dependent variable is the log of value added deflated to 1991 rupiahs. Standard errors are clustered by firm. The full results of this regressions are presented in table A1.

Table 1: Pre-crisis distribution of trading and non-trading firms

Export status	Import status			
	Domestic Non-importer	Importer	Foreign Non-importer	Importer
Non-exporter	18,797 (67.3)	3,203 (11.5)	230 (13.1)	276 (15.7)
Exporter	4,086 (14.6)	1,826 (6.5)	312 (17.7)	944 (53.6)
Total firms	27,912		1,762	

Notes: Sample includes all firms in the pre-crisis period from 1991-1996. Values reported are sample means with standard deviations in parentheses.

Table 2: Descriptive statistics of sample firms

	Domestic firms				
	Non-trader	Exporter only	Importer only	Two-way trader	Total
Log value-added	12.50 (1.51)	13.95 (1.92)	13.54 (2.02)	15.44 (2.02)	13.11 (1.93)
Log value-added/worker	9.82 (1.11)	10.37 (1.24)	10.49 (1.26)	10.99 (1.24)	10.10 (1.23)
Log materials	12.64 (1.79)	14.22 (2.09)	13.97 (1.99)	15.82 (2.08)	13.35 (2.14)
Employment	70.31 (182.87)	239.79 (456.43)	145.38 (306.54)	651.55 (1,183.57)	155.47 (457.13)
Log Capital	12.99 (1.63)	14.43 (1.99)	14.19 (1.96)	15.98 (2.00)	13.67 (2.01)
Share of output exported	0.00 (0.00)	47.17 (43.48)	0.00 (0.00)	35.70 (40.11)	10.37 (27.89)
	Foreign firms				
	Non-trader	Exporter only	Importer only	Two-way trader	Total
Log value-added	13.88 (1.95)	15.28 (1.77)	16.05 (1.98)	16.15 (1.77)	15.71 (1.97)
Log value-added/worker	10.60 (1.37)	11.10 (1.34)	12.19 (1.39)	11.47 (1.26)	11.41 (1.38)
Log materials	14.02 (2.27)	15.57 (1.96)	16.29 (2.11)	16.57 (1.77)	16.07 (2.09)
Employment	148.25 (226.13)	359.91 (449.93)	287.27 (559.83)	725.80 (1,026.79)	527.76 (855.01)
Log Capital	14.68 (2.02)	15.46 (1.78)	16.28 (1.81)	16.66 (1.65)	16.19 (1.87)
Share of output exported	0.00 (0.00)	57.25 (43.32)	0.00 (0.00)	49.63 (43.20)	37.17 (43.44)

Notes: Sample includes all firms in the pre-crisis period from 1991-1996. Values reported are sample means with standard deviations in parentheses.

Table 3: Effect of exchange rate depreciation on firm value added

	All firms			Exporters		
	(1)	(2)	(3)	(4)	(5)	(6)
Importer*Post-crisis	0.036** (0.016)	-0.012 (0.017)	-0.041** (0.017)	0.060** (0.029)	-0.017 (0.030)	-0.072** (0.032)
Foreign*Post-crisis		0.276*** (0.031)	0.055 (0.051)		0.290*** (0.041)	0.035 (0.073)
Importer*Foreign*Post-crisis			0.327*** (0.064)			0.360*** (0.087)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	159,954	159,954	159,954	43,502	43,502	43,502
No. of firms	29,674	29,674	29,674	7,168	7,168	7,168
Adj. R^2	0.0192	0.0209	0.0215	0.0278	0.0309	0.0319

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variable is the log of value added deflated to 1991 rupiahs. Standard errors are in parentheses, clustered by firm.

Table 4: Effect of exchange rate depreciation on firm value added with additional controls – all firms

	(1)	(2)	(3)	(4)
Importer*Post-crisis	-0.052*** (0.018)	-0.053*** (0.018)	-0.041** (0.017)	-0.044** (0.018)
Foreign*Post-crisis	0.042 (0.052)	0.042 (0.052)	0.024 (0.052)	0.050 (0.054)
Importer*Foreign*Post-crisis	0.329*** (0.064)	0.329*** (0.064)	0.354*** (0.065)	0.291*** (0.068)
Firm size*Post-crisis	0.013** (0.006)	0.014** (0.007)	0.025*** (0.006)	0.026*** (0.007)
Government-owned*Post-crisis		-0.026 (0.045)	-0.026 (0.043)	0.089** (0.044)
Productivity*Post-crisis			-0.011*** (0.002)	-0.019*** (0.004)
Year effects	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes
Year-sector effects	No	No	No	Yes
Observations	159,954	159,954	137,949	137,949
No. of firms	29,674	29,674	23,515	23,515
Adj. R^2	0.0215	0.0215	0.0249	0.0557

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variable is the log of value added deflated to 1991 rupiahs. Standard errors are in parentheses, clustered by firm.

Table 5: Effect of exchange rate depreciation on firm value added with additional controls – exporters

	(1)	(2)	(3)	(4)	(5)
Importer*Post-crisis	−0.059*	−0.062*	−0.037	−0.049	−0.025
	(0.035)	(0.035)	(0.031)	(0.036)	(0.036)
Foreign*Post-crisis	0.042	0.039	0.016	0.091	0.083
	(0.073)	(0.073)	(0.087)	(0.081)	(0.082)
Importer*Foreign*Post-crisis	0.356***	0.356***	0.378***	0.216**	0.197*
	(0.087)	(0.087)	(0.096)	(0.104)	(0.104)
Firm size*Post-crisis	−0.014	−0.012	0.000	0.006	0.000
	(0.012)	(0.012)	(0.013)	(0.014)	(0.014)
Government-owned*Post-crisis		−0.073	−0.077	0.164***	0.164***
		(0.062)	(0.059)	(0.063)	(0.063)
Productivity*Post-crisis			−0.013**	−0.020***	−0.020***
			(0.006)	(0.006)	(0.006)
Export share*Post-crisis					0.002***
					(0.000)
Year effects	Yes	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes	Yes
Year-sector effects	No	No	No	Yes	Yes
Observations	43,502	43,502	40,116	40,116	40,116
No. of firms	7,168	7,168	6,292	6,292	6,292
<i>Adj.R</i> ²	0.0320	0.0320	0.0347	0.0708	0.0717

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variable is the log of value added deflated to 1991 rupiahs. Standard errors are in parentheses, clustered by firm.

Table 6: Effect of exchange rate depreciation on components on input use and productivity

	Dependent variable			
	Materials	Labour	Capital	Value added per worker
Importer*Post-crisis	−0.067***	−0.005	−0.066***	−0.036**
	(0.018)	(0.008)	(0.023)	(0.016)
Foreign*Post-crisis	0.117**	0.002	0.003	0.053
	(0.050)	(0.026)	(0.075)	(0.045)
Importer*Foreign*Post-crisis	0.225***	0.166***	0.051	0.161***
	(0.063)	(0.030)	(0.089)	(0.057)
Year effects	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes
Observations	153,605	159,954	119,080	159,954
No. of firms	28,956	29,674	26,572	29,674
<i>Adj.R</i> ²	0.0199	0.0115	0.0339	0.0139

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variable is the log of value added deflated to 1991 rupiahs. Standard errors are in parentheses, clustered by firm.

Table 7: Effect of exchange rate depreciation on the import decision

	All firms		Exporters	
	Importing	Import Intensity	Importing	Import Intensity
Importer*Post-crisis	-0.145*** (0.006)	-4.187*** (0.322)	-0.105*** (0.011)	-2.187*** (0.512)
Foreign*Post-crisis	0.065*** (0.012)	2.292*** (0.579)	0.073*** (0.018)	2.541*** (0.815)
Importer*Foreign*Post-crisis	0.019 (0.018)	0.268 (0.977)	-0.019 (0.024)	-1.964 (1.250)
Year effects	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes
Observations	159,954	159,954	43,502	43,502
No. of firms	29,674	29,674	7,168	7,168
<i>Adj.R</i> ²	0.0238	0.0105	0.0107	0.0034

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variable is the log of value added deflated to 1991 rupiahs. Standard errors are in parentheses, clustered by firm.

Table 8: Effect of exchange rate depreciation on firm survival

	All firms		Exporters	
	(1)	(2)	(3)	(4)
Pre-crisis importer	0.037*** (0.008)	0.038*** (0.008)	0.041*** (0.015)	0.040*** (0.015)
Pre-crisis foreign-owned	0.041** (0.021)	0.038* (0.021)	0.037 (0.027)	0.028 (0.024)
Pre-crisis importer and foreign-owned	-0.006 (0.024)	-0.009 (0.023)	-0.011 (0.032)	-0.006 (0.027)
Log Labour	0.306*** (0.017)	0.300*** (0.019)	0.204*** (0.029)	0.191*** (0.028)
Log Capital	0.077*** (0.012)	0.082*** (0.016)	0.047** (0.021)	0.077*** (0.030)
Log Labour ²	-0.046*** (0.003)	-0.046*** (0.004)	-0.027*** (0.005)	-0.026*** (0.005)
Log Capital ²	-0.005*** (0.001)	-0.005*** (0.001)	-0.002* (0.001)	-0.004** (0.002)
Government-owned	-0.012 (0.016)	-0.016 (0.017)	-0.006 (0.019)	-0.011 (0.017)
Firm age	0.001*** (0.000)	0.001*** (0.000)	0.002*** (0.000)	0.002*** (0.000)
Productivity		0.006*** (0.002)		0.004 (0.004)
ISIC 3 sector effects	Yes	Yes	Yes	Yes
Province effects	Yes	Yes	Yes	Yes
Observations	82,519	80,626	23,783	23,113
<i>Adj.R</i> ²	0.0980	0.0974	0.1044	0.1047

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variable is the probability that the firm survives till 1999. Standard errors are in parentheses, clustered by firm.

Table A1: Effect of exchange rate depreciation on value added – interactions by year

	Dependent variable: Log of value added	
	All firms	Exporters
Importer*		
1992	0.059*** (0.022)	0.089** (0.042)
1993	0.102*** (0.023)	0.166*** (0.046)
1994	0.138*** (0.025)	0.286*** (0.049)
1995	0.165*** (0.027)	0.293*** (0.052)
1996	0.209*** (0.028)	0.359*** (0.054)
1997	0.205*** (0.029)	0.272*** (0.056)
1998	-0.021 (0.032)	0.044 (0.063)
1999	0.061* (0.032)	0.141** (0.062)
Importer*Foreign*		
1992	0.039 (0.094)	0.157 (0.130)
1993	0.169* (0.098)	0.284** (0.136)
1994	0.279*** (0.104)	0.398*** (0.140)
1995	0.393*** (0.114)	0.524*** (0.153)
1996	0.506*** (0.112)	0.678*** (0.149)
1997	0.515*** (0.117)	0.724*** (0.160)
1998	0.776*** (0.130)	0.975*** (0.179)
1999	0.567*** (0.125)	0.640*** (0.167)
Year effects	Yes	Yes
Firm effects	Yes	Yes
Observations	159,954	43,502
No. of firms	29,674	7,168
<i>Adj.R</i> ²	51.4121	21.9819
r2.a	0.0257	0.0421

Notes: *, **, *** denote significance at the 10%, 5%, and 1% confidence levels, respectively. The dependent variable is the log of value added deflated to 1991 rupiahs. Standard errors are in parentheses, clustered by firm. Interactions of an indicator for foreign-ownership and year are omitted.