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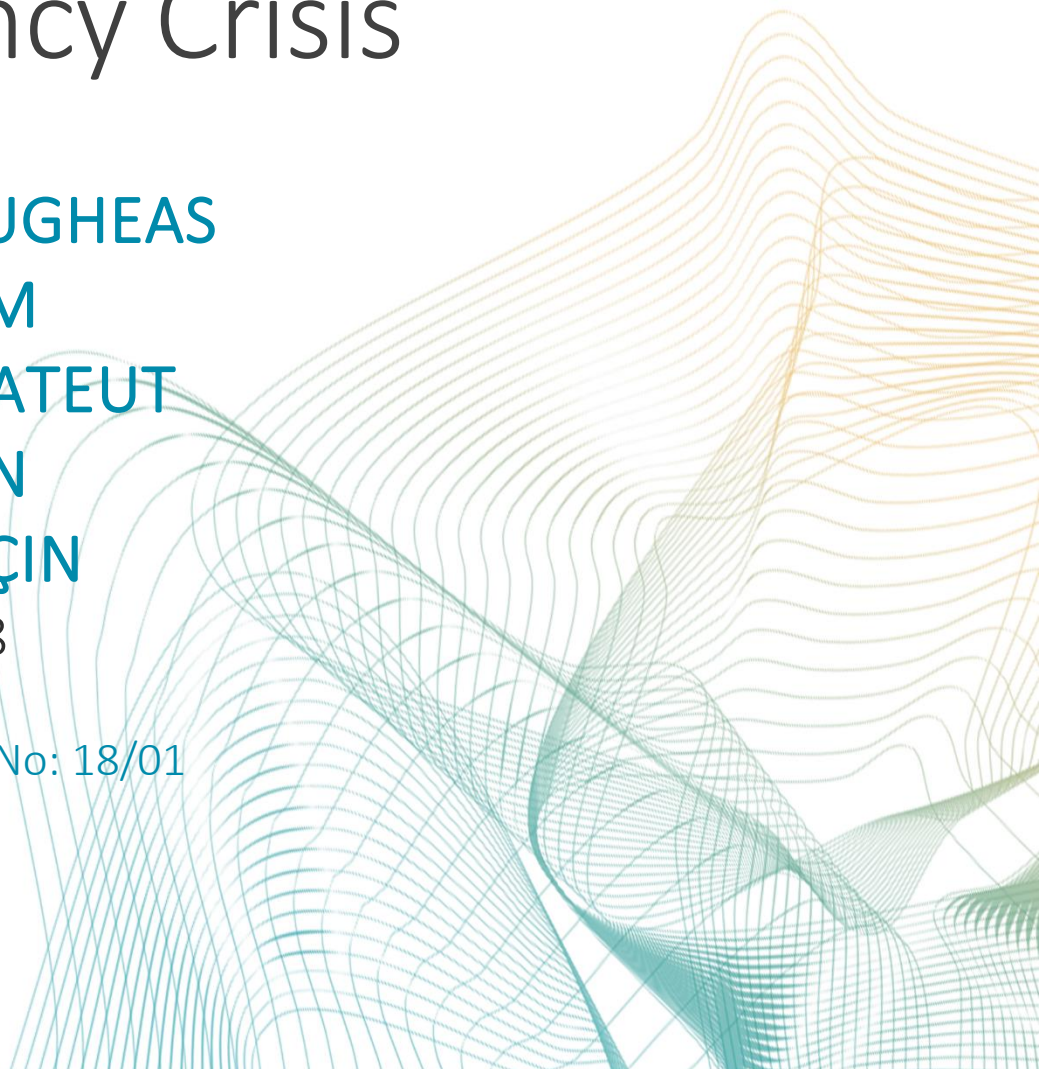

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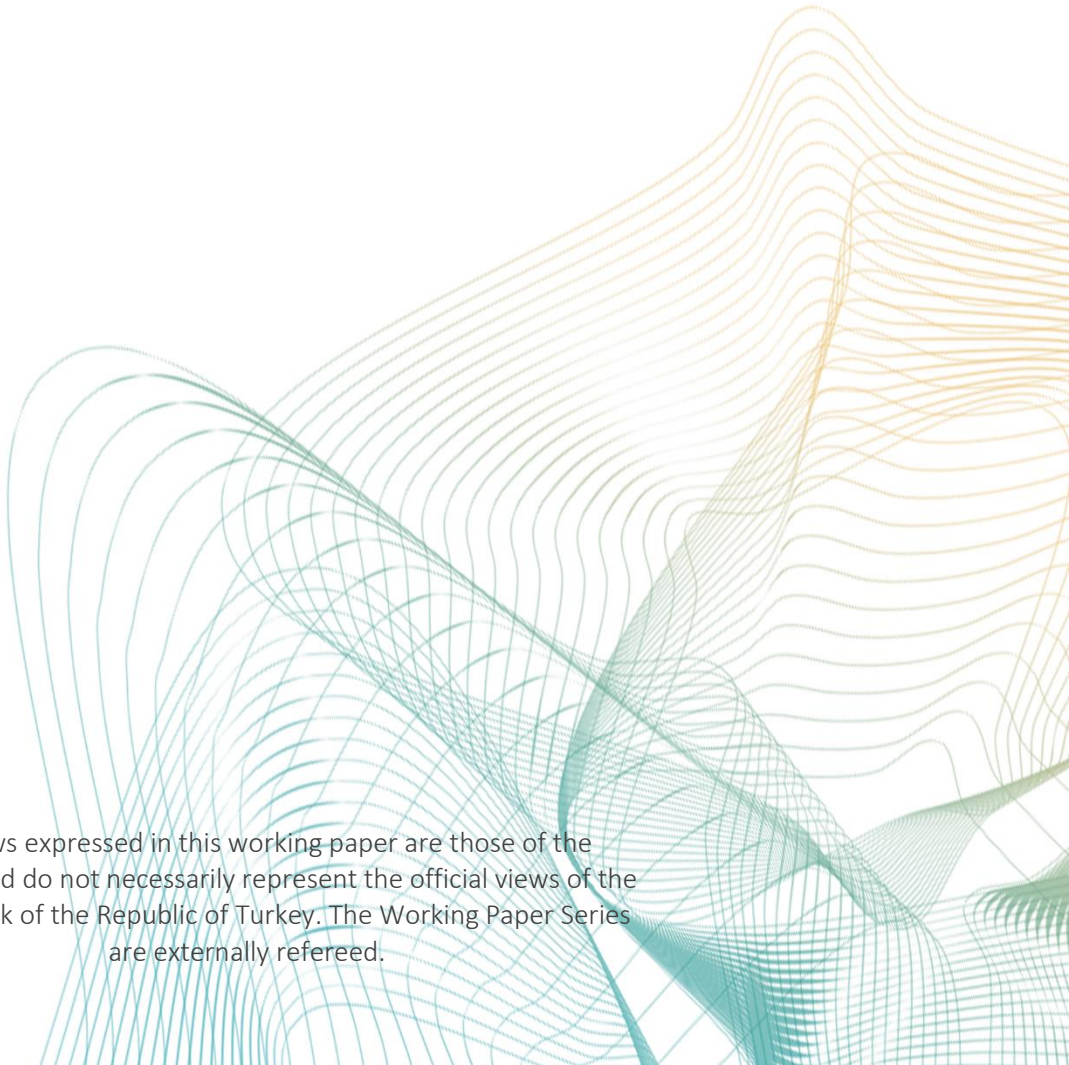

Foreign Currency Borrowing, Exports and Firm Performance: Evidence from a Currency Crisis

by

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Abstract

This paper develops a simple signalling model of foreign currency borrowing that yields predictions about firm survival and performance during a currency crisis. Using a large panel of firm level data for South Korea we offer empirical support for the predictions of our model. It demonstrates that although firms that borrow in foreign currency are more likely to exit after the currency collapses, those that survive perform better. Among them, the best performers are exporters whose foreign sales are now more competitive.

Keywords: currency crisis, exports, foreign currency borrowing

***JEL* Codes:** F34, F41, G21, L25

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Non-technical summary

Banks and firms in many East Asian economies had accumulated a significant amount of short-term foreign currency denominated debt when crisis hit in 1997. Those that have experienced currency mismatches in their balance sheets faced with a significant slowdown in their activity as a result of devaluation of currencies in these economies.

This paper explores the relationship between foreign currency borrowing, exporting and performance. Based on a simple signalling model of foreign currency borrowing, two predictions are derived. Firstly, firms that borrow in foreign currency are less likely to survive given the higher cost of servicing their debt and among these firms exporters have a higher survival rate as result of a collapse of the currency. These predictions have been widely supported by a recent empirical literature. Secondly, the model also predicts that conditional on survival the high productivity firms, which are the best performers, are most likely to have borrowed in foreign currency. These firms are also likely to be exporters, who benefit after a crisis from the fact that their foreign sales become more competitive after a crisis.

There appears to be little evidence in the literature on the last set of hypotheses given above. This paper, by using a large panel of about 30,000 observations for 5,000 South Korean manufacturing firms between 1990 and 2006, finds substantial evidence to support them. The first task is to check the prediction of the model that exporters are much more likely to obtain foreign currency loans, which is validated by the data. Then, the main predictions of the model is tested using the change in sales pre- and post-crisis for exporters versus non-exporters to document the differences in performance between these types of firms. It is estimated that foreign currency borrowing is associated with better firm performance post-crisis. In addition, exporters perform better after the crisis. In short, it seems that firms are benefitting from foreign currency debt by muting financial constraints if they are naturally hedged and productive enough.

This paper and related literature suggest that it is important to know precisely who is carrying the currency mismatch risk in order to provide necessary regulative framework and policy actions. In 2002, China, Japan and South Korea launched the Asian Bond Market Initiative (ABMI) to strengthen the resilience of the region's financial system by encouraging the development of local currency bond markets. Our study offers support for the initiative and, moreover, identifies the types of firms that are more likely to benefit from it.

1. Introduction

It is well documented that before the East Asian 1997 crisis both the banking and corporate sectors of many Asian economies had become fragile through the accumulation of short-term debt that was denominated in foreign currencies. The fragility was due to the currency mismatch in their balance sheets. While their liabilities were vulnerable to a potential currency depreciation their incoming revenues and assets where valued in domestic currency. When commercial bank credit inflows of $50bn to the region in 1996 shifted to outflows of $21bn in 1997 the mismatch in currencies led to a severe crisis. Since then, an extensive literature has analyzed the potential problems created by currency mismatch (Krugman, 1998; Furman and Stiglitz, 1998; Radlett and Sachs, 1998; Chang and Velasco, 1999; Eichengreen and Hausmann, 1999; Bleaney et al., 2008) and provided a fertile ground for new models of currency crises and contagion that have embedded these features in open economy credit channel models (see for example Aghion et al., 2004 and Cook and Devereux, 2006). More recently, renewed growth in foreign currency borrowing in Asia has been noted by many observers. At first, the exposure to a larger market with access to a wider group of investors was regarded as a positive step as many firms that issued debt or took out loans in international currencies were to some degree naturally hedged by their earnings in the same currency. However, there are also concerns about the consequences of the large borrowings in international currency when exchange rates are more volatile.

Making a correct assessment about the costs and benefits of borrowing in international currencies requires that we account for the incentives of both creditors to offer foreign currency loans and borrowers to accept them. In a recent empirical study Mora *et al.* (2013) have concluded that such loans are offered by formal lending sources, like banks, as they attempt to avoid currency mismatch on their balance sheets. In this paper, we concentrate on the demand side. We are particularly interested in examining those firm characteristics that increase the propensity to borrow in foreign currency. Working with a detailed panel of South Korean manufacturing firms we assess whether the ability to access foreign lending offered firms in general, and exporters in particular, any advantages around the East-Asian crisis of the 1990s.[1] We argue that understanding why some

[1] In many respects South Korea is an apt comparison for the recent global financial crisis. The East-Asian crisis brought about a 6.7 percent contraction of GDP growth in 1998, and a 40 percent reduction in fixed investment – the sharpest decline in real activity since 1950 – which is comparable in many respects to the severity of the recent global financial crisis. After short term rates fell dramatically with the devaluation of the South Korean won, credit to the private sector

firms borrow in foreign currency and others do not can also help us understand not only why some types of firms had higher survival rates, but also why some firms export and others do not and many other variations in post-crisis performance conditional on survival.

We motivate our empirical methodology by analyzing a simple signaling model of the loanable funds market.[2] In our model, there are two types of firms separated according to their productivity. Financial markets are characterised by imperfect information, therefore lenders cannot observe productivity directly, but high-productivity firms can signal their type by borrowing in foreign currency and thus can obtain better financing terms. A firm that borrows in foreign currency takes the risk of being unable to service its debt following a depreciation of the domestic currency and thus being liquidated. We establish conditions that show only high productivity firms would choose to borrow in foreign currency. We then link this result to the heterogeneous firms' literature in international trade (following the work of Melitz, 2003) which has established that exporters are on average more productive than non-exporters. Thus, the first prediction of our model is that exporters are more likely to obtain loans denominated in foreign currency.

Then we compare the performance of firms before and after a sharp depreciation of the currency. Our model yields two sets of predictions. The first set of predictions is about firm survival. Firms that borrow in foreign currency are less likely to survive given the higher cost of servicing their debt and among these firms exporters have a higher survival rate. These predictions have been supported by a recent empirical study by Kim et al. (2015). More specifically, they find that small firms with large holdings of short-term foreign debt and small ratios of exports to total sales are significantly more likely to go bankrupt during the crisis than other firms. The second set of predictions are related to firm performance. Our model predicts that conditional on survival firms that borrowed in foreign currency are less likely to be affected by the crisis and the least affected firms are likely to be exporters who benefit from the currency collapse making their goods more competitive in foreign markets. There appears to be little evidence on this last set of hypotheses and our paper finds substantial evidence to support them.

declined, and banks were subject to greater, externally imposed regulation, further diminishing the incentives to lend. The devaluation in the currency provided a competitive advantage to exporters, however, as this paper documents. See Sohn (2010) for an overview of the reforms implemented on the financial system after the crisis.

[2] The broad literature on signaling in financial markets is comprehensively reviewed in Tirole (2006, Ch. 6).

For this empirical work we use a large panel of about 30,000 observations for 5,000 South Korean manufacturing firms between 1990 and 2006.[3] We distinguish between pre-crisis, crisis and post-crisis outcomes for firms identified as exporters and non-exporters. Our data, provided by the Korean Information Service, document both the export share of sales and the foreign currency liabilities of individual firms. Our first task is to check the prediction of our model that exporters are much more likely to obtain foreign currency loans, which is validated by our data. Then, we test the main predictions of our model using the change in sales pre- and post-crisis for exporters versus non-exporters to document the differences in performance between these types of firms. We find that foreign currency borrowing is associated with better firm performance post-crisis. In addition, exporters perform better after the crisis.

Our work is related to a strand of the financial economics literature that uses firm level data to assess the consequences of financial crises for firm performance. Much of this research has been motivated by the East-Asian Crisis. For example, Claessens et al. (2000) analyze corporate performance before the crisis across a sample of East-Asian countries that includes economies both affected and unaffected by the crisis. Claessens et al. (2012) do a similar comparison for the period after the 2007-2009 crisis. To our knowledge the only detailed studies of the Asian crisis using firm level data from South Korea are Borensztein and Lee (2003), which explores the role of financial intermediaries in providing credit to corporations, and Gilchrist and Sim (2004), which considers the impact of balance sheet factors on investment. We complement the above studies by taking into account the export status of firms and the currency denomination of their loans.

Work related to the recent financial crisis has identified the drop in trade finance as a plausible cause for the collapse in global exports (Bricogne et al., 2012, France; Chor and Manova, 2012, US). Amiti and Weinstein (2011) provide similar evidence using 1990s data from Japan, as do Askenazy et al. (2011) and Engel et al. (2013) for France, and Wagner (2015) for Germany. Lastly, Bougheas et al. (2015), in a study closely related to ours, compare the performance of exporters and non-exporters around the Brazilian 1999 crisis. None of the above studies considers the currency denomination of funds which is the main focus of the current work. A notable exception is a recent empirical paper by Castagnino et al. (2013) that analyzes exporting and access to finance in Argentina, where they find that once firms become exporters, access to foreign finance

[3] Data stop at 2006 to ensure that our analysis is not affected by the global financial crisis that began in Fall 2007.

is positively correlated with their performance. However, their study focuses on a period of time where there were no financial crises.

Our work is also related to a group of theoretical papers that analyze a firm's choice of the currency denomination of its loans. In Jeanne (2000, 2002) foreign currency borrowing protects firms against the lack of commitment by monetary authorities to support the currency peg. In contrast, the role of foreign currency in Chamon (2001) and Aghion et al. (2004) is to mitigate a moral hazard problem arising as a consequence of the possibility of default.[4] In contrast, we offer a signaling explanation for the choice of currency denomination of loans and we also take it to the data.

Lastly our work is related to a group of studies that identify the advantages of firms that sell their products across national boundaries. For example, it is well established that exporting firms are more resilient than non-exporting firms (Bernard and Jensen, 1999). Explanations commonly offered for this observation is that exporters have more access to external funds (Campa and Shaver, 2001; Girma et al., 2004; Greenaway et al., 2007; Muûls, 2010; Spaliara and Tsoukas, 2013; Görg and Spaliara, 2013, 2014), are less exposed to demand fluctuations as their sales are more diversified (Denis et al., 2002), and have access to foreign loans as they can use their revenues from exports as collateral (Caballero and Krishnamurthy, 2001). Despite the growth of empirical research assessing the relative performance of firms, lack of data on international borrowing has limited the evaluation of any advantage that foreign lending confers to exporting firms. We would also expect that any such advantage be more pronounced around periods of financial crises, however, as we argue below, our knowledge of relative firm performance around periods of financial turmoil is very thin.

We organize the paper as follows. In Section 2 we present the open-economy model of the credit channel that we use to analyze the relationship between firm-specific characteristics and the composition of external finance as well as to evaluate post-crisis performance. In Section 3 we explain our empirical methodology which we follow by a description of our dataset in Section 4. In Section 5 we present our results, and in Section 6 we conclude.

[4] All of these papers are purely theoretical.

2. A Simple Model of Foreign Currency Borrowing

The model has three periods (0, 1, 2). Period 0 is the planning period when all financial contracts are agreed and investments are made. Period 1 is an interim period when early investment returns are realized and creditors decide on whether to liquidate firms or let them survive for another period. The final period captures all the future benefits derived by surviving firms. All agents are risk-neutral and they do not discount the future.[5]

There are two countries: a small open economy (domestic economy) and the rest of the world. Let e denote the exchange rate (domestic currency units per unit of foreign currency). We assume that in period 0 the government pegs the exchange rate at $e = 1$ and that all agents expect that in period 1 with probability θ this value will be maintained but with probability $1 - \theta$ the domestic currency will depreciate, $e = 1 + x$, $(x > 0)$.

There are two types of firms: high-productivity (h) and low-productivity (l). Firm types are private information. Let π denote the proportion of type h firms. In period 0 all firms need to borrow an amount D to invest in a project. The revenues of each project in period 1 depend on (a) firm type, (b) an idiosyncratic shock, and (c) the exchange rate. With probability $1 - p_i$ a type i firm $(i = l, h)$ fails, where $p_h > p_l$, and its revenues are equal to zero. Thus, when this idiosyncratic shock is negative the performance of the firm is independent of the exchange rate regime. With probability $p_i\theta$ a type i firm succeeds while the exchange rate stays fixed in which case revenues are equal to R_{i0}. Lastly, with probability $p_i(1 - \theta)$ a type i firm succeeds but the exchange rate depreciates in which case revenues are equal to R_{ix}. In period 2 the expected revenues of all firms conditional on survival are equal to V.[6] We impose the following two restrictions on the revenues of successful firms:

$$p_h(\theta R_{h0} + (1 - \theta)R_{hx} + V) > p_l(\theta R_{l0} + (1 - \theta)R_{lx} + V) > D \quad (1)$$

$$R_{lx} < \min\{R_{h0}, R_{hx}, R_{l0}\} \quad (2)$$

[5] Given that the sample we use to test our model includes unlisted firms whose owners might not have the same diversification opportunities as those of listed firms, the assumption of risk neutrality is not necessarily without consequence. When we discuss our main results we also consider the implications of allowing for risk aversion.

[6] We can allow for different V values across firm types as long as the difference is not too large so that type l firms have an incentive to strategically default.

The inequalities in (1) state that all projects are profitable and that the expected revenues of high-productivity firms are higher than the expected revenues of low-productivity firms. Inequality (2) states that the currency depreciation has a strong negative impact on low-productivity firms. Given that exporting firms are, on average, more productive (Melitz, 2003), a depreciation of the currency is more likely to benefit high-productivity firms. The currency depreciation will also affect the cost of intermediate inputs but there is no *a priori* reason to believe that this effect would be correlated with productivity. Given that the size of the loan is agreed with creditors before the potential change in the value of the currency, the extra fund that would be needed after a currency depreciation will be self-financed.[7]

Financial markets are competitive and the risk-free interest rate is equal to zero. Following Bolton and Scharfstein (1990) we assume that returns are not verifiable which implies that borrowers will default in period 2. However, they might have incentives to repay their loans in period 1 if the lenders threaten to liquidate the projects in which case they will forgo all future profits. Let L denote the liquidation value of a project.

2.1 Domestic Currency Borrowing and Pooling Equilibrium

For the moment we assume that loans are only denominated in domestic currency units. Given that types are private information any lending offer will be a pooling contract. Let Z_p denote the loan repayment in period 1 and $\hat{p} = \pi p_h + (1-\pi)p_l$. Then the repayment must satisfy the zero-profit condition of the lenders:

$$\hat{p}Z_p + (1-\hat{p})L = D$$

Lenders offer identical contracts to all borrowers. Therefore, the repayment, $Z_p = \frac{D-(1-\hat{p})L}{\hat{p}}$, is evaluated using the expected probability of success. This contract is feasible as long as two conditions are satisfied. The first condition is that revenues in all states where firms succeed are sufficiently high to cover the repayment:

$$R_{lx} \geq Z_p \qquad (3)$$

[7] We will demonstrate that for the existence of a signaling equilibrium we do not need to impose any further restrictions on revenues.

The second condition is that the contract must be incentive compatible, that is, borrowers do not have an incentive to strategically default. A borrower who defaults avoids the period 1 repayment but forgoes the continuation payoff.

$$V \geq Z_p \tag{4}$$

When these conditions are satisfied a pooling equilibrium exists. Both types of firms pay their debt when their projects succeed and survive to the next period. When their projects fail they get liquidated. However, there is cross-subsidization as all firms are charged the same interest rate.

2.2 Foreign Currency Borrowing and Signaling

Assume now that loans may be denominated in both domestic and foreign currency. When the currency depreciates the cost of servicing loans denominated in the foreign currency increases. High-productivity firms might be willing to take this risk if borrowing in foreign currency becomes a signal that separates them from low-productivity firms and thus allows them to borrow at lower interest rates. For this signaling strategy to work it must be too costly for low-productivity firms to borrow in foreign currency.

Given that in period 0 the exchange rate is equal to 1, the size of the loan is still equal to D. Under successful separation the zero-profit condition of lenders offering loans denominated in foreign currency is given by:

$$p_h Z_h + (1 - p_h)L = D$$

One necessary condition for the existence of a signaling equilibrium is that high-productivity firms prefer to borrow in foreign currency than borrowing under the pooling contract:

$$Z_p > Z_h(1 + (1 - \theta)x) \tag{5}$$

Clearly, $Z_p > Z_h$, given that separation is feasible. However, under foreign currency borrowing with probability $(1 - \theta)$ the currency depreciates in which case the repayment in domestic currency units rises. A second condition that a signaling equilibrium must satisfy is that only the high-productivity firms generate sufficient revenues when the currency depreciates to cover the loan repayment.

$$R_{hx} \geq Z_h(1 + x) > R_{lx} \tag{6}$$

When the above condition is satisfied, a low-productivity firm that has raised funds by borrowing in foreign currency will have to default when the currency depreciates and thus forgo all future revenues. Next, we compare the payoffs to a low-productivity firm from each currency borrowing option.

The expected payoff of a low productivity firm that borrows in foreign currency is given by $p_l(\theta R_{l0} + (1-\theta)R_{lx} - \theta Z_h + \theta V)$. With probability $p_l(1-\theta)$ the firm is successful but because of the currency depreciation it cannot service its debt, defaults and gets liquidated. Thus, the firm repays the debt only when it is successful and there is no currency depreciation (probability $p_l\theta$) in which case it also receives the future payoff V. Consider now the expected payoff of a low-productivity firm that borrows in domestic currency. Under successful separation of types, repayment is calculated using the probability of success of type l firms, and the corresponding expected payoff is given by $p_l(\theta R_{l0} + (1-\theta)R_{lx} - Z_l + V)$. Then, if the following condition holds, a low-productivity firm will prefer to borrow in domestic currency:

$$Z_l - \theta Z_h < V(1-\theta) \qquad (7)$$

where Z_l satisfies the lender's zero-profit condition $p_l Z_l + (1-p_l)L = D$.

When (5), (6) and (7) are satisfied, there exists a signaling equilibrium where high-productivity firms borrow in foreign currency and low-productivity firms borrow in domestic currency. Comparing these conditions we find that, for any given values of x and θ, a signaling equilibrium becomes more likely as the differences $p_h - p_l$ and $R_{hx} - R_{lx}$ and the future payoff V increase.

The above results have been derived under the supposition that all agents are risk-neutral. However, risk-neutrality might not be appropriate for owners of unlisted firms that might not have the same diversification opportunities as those of listed firms. However, in our case allowing for risk aversion would strengthen our conclusions. This is because there is evidence that productivity is correlated with risk tolerance (see Miller *et al.*, 2013). In our model it is the high-productivity firms, i.e. the more risk tolerant, which are willing to bear the risk of the costly signal.

2.3 Model Predictions

In this section, we describe the predictions of our model on the links between foreign currency borrowing, sales performance and firm survival.

2.3.1 Foreign Currency Borrowing, Productivity and Exports

Condition (2) is crucial for the existence of a signaling equilibrium and in particular the inequality $R_{lx} < R_{hx}$. When the currency depreciates it can directly affect revenues through two channels. The first channel is related to the costs of production: if firms have to import some proportion of their inputs their unit cost of production measured in units of domestic currency will rise in relation to this proportion as the currency depreciates. Unless they can raise more funds (possibly through trade credit, Manova et al., 2015) to cover the higher costs they will have to cut-down production and thus sales. Cost of sales will be increased by a depreciation of the currency (*Cost channel*). The second channel is directly related to the impact of depreciation on revenues and thus is only relevant for exporters who would face a boost in demand for their output following the currency depreciation. As is well known from the trade literature that followed the work of Melitz (2003), high-productivity firms are more likely to be exporters and thus our model predicts that these firms are more likely to borrow in foreign currency. The first hypothesis we will test with our data is that exporters are more likely to borrow in foreign currency (H1).

2.3.2 Sales Performance

The third prediction of our model relates to sales performance. Conditional on survival, firms that have borrowed in foreign currency will have stronger sales performance after a currency depreciation, with exporters being better performers than non-exporters. Therefore we can test the hypothesis that sales performance (growth) improves for firms that are foreign currency borrowers and exporters after conditioning on other firm characteristics (H2).

2.3.3 Survival

A final testable prediction from our simple model is that high-productivity firms can survive in more states than low-productivity firms when both types of firms borrow in foreign currency.[8] In this case the failure rate of low-productivity firms increases for those firms that have borrowed in foreign currency. They fail in states where the rate of depreciation is high just as was the case during the East-Asian 1997 crisis. Furthermore, given our earlier comments about exporters, our

[8] Strictly speaking in our simple model firms fail because of negative idiosyncratic shocks and therefore the rates of failure for the two types of firms are not affected by the depreciation of the currency. But it is possible to consider a more general environment allowing for more states in which high-productivity firms can survive in more states than low-productivity firms when both types of firms borrow in foreign currency. Put differently, the cost of default is higher for low-productivity firms to allow separation of the two types to be feasible.

model also predicts that among those firms that borrow in foreign currency exporters are more likely to survive. This is because R_{hx} will be higher on average for exporters. These hypotheses have been tested by the recent study by Kim et al. (2015) who examine survival of South Korean firms after the crisis, finding them consistent with the predictions of our model. In particular, they find that firms with larger short-term foreign debt were more likely to exit unless they were exporters.[9]

3. Empirical Methodology

The first hypothesis that we will test with our dataset is that exporters are more likely to borrow in foreign currency due to the benefits that they experience through cost and revenue channels compared to other firms. We specify our test using a random effects Probit model as

$$Prob(DFL_{it} = 1) = F\left(\alpha_i + \delta X_{it} + \varphi Z_{it} + d_t + v_j\right) \quad (8)$$

where DFL_{it} is access to foreign currency loans for firm i at time t, X_{it} captures export status and Z_{it} is a matrix of firm characteristics used as controls. Export status of the firm is measured by the continuous export share measure (*Expshare*), or the dummy variables *Dex* (= 1 for exporters, 0 otherwise) or *Dex50* (= 1 for majority exporters, 0 otherwise). Finding $\delta > 0$ would offer support to our supposition that exporters have a higher probability of obtaining foreign currency loans. The Probit estimator assumes that F is a Normal distribution, and unobserved characteristics of the firm are dealt with using random effects.

We control for a number of other influences on the probability of accessing foreign currency loans, including beginning of period leverage (*Lev*), liquidity (*Liquid*), and cost of sales (*Costs*), firm size and age. We control for whether a firm belonged to a chaebol. Borensztein and Lee (2003) note that the large Korean conglomerates (chaebols) have historically had preferential access to credit prior to the Asian crisis, but credit was reallocated to other more efficient firms in the post crisis period. All models include time (d_t) and two-digit industry dummies (v_j).

Next, we test the prediction of our model on the impact of the crisis on firm performance. Overall, we expect that conditional on survival, firms that borrow in foreign currency have better

[9] The sample in Kim et al. (2015) includes firms from different economic sectors observed over the period 1994-1999. Using additional information, unavailable to us, regarding firms that submitted a notification of closing business to the court system, they are able to identify liquidated and surviving firms.

sales performance in the post-crisis period. Moreover, given that exporters are likely to be high-productivity firms, our model predicts that export participation before the crisis implies better post-crisis performance. This is because exporters become more competitive after the currency collapse.

We test this prediction using the following model:

$$S_{it} = \alpha_i + \beta X_i + \gamma P_t + \delta X_i P_t + \theta FB_{it} + \eta W_{it} + \varepsilon_{it} \quad (9)$$

where S_{it} denotes sales of firm i at time t, X_i denotes the export status prior to the crisis, P_t is a dummy taking the value 1 post crisis and the interaction term $X_i P_t$ measures the impact of the crisis on exporters versus non-exporters. FB_{it} is an essential variable for our model, denoting the foreign currency borrowing ratio. W_{it} is a matrix of observable characteristics affecting firm performance similar to those included in the Probit equation (8). Different intercepts α_i control for unobservable firm specific effects and ε_{it} is the error term.

The export status has no subscript *t* because what matters for the predictions of the model is the initial status of the firm regarding exports, and this does not alter with time. We expect $\beta > 0$, i.e. firms that export before the crisis have on average higher sales over the entire period. Given that exporters benefit from the devaluation we expect that $\delta > 0$, i.e. exporters will do better than non-exporters after the crisis. Moreover, we expect foreign currency borrowing to be positively correlated with firm performance, that is $\theta > 0$.

The source of the shock in our analysis is the East-Asian crisis in 1997-1998. Korean banks were overexposed to large domestic borrowers at a time when a similar situation in Thailand had prompted a devaluation of the Thai Baht in July 1997. Nationalization of Kia Motors led to two downgrades of Republic of Korea sovereign debt by Moody's in November and December 1997, which would have raised the cost of external finance for Korean firms. This was therefore a well-defined funding shock for firms similar to the type of exogenous shock used by Khwaja and Mian (2008) to explore lending in Pakistan and by Schnabl (2012) in Peru. According to our model, the shock would be more severe for low productivity firms. Therefore, conditional on survival the performance of those firms that have borrowed in foreign currency, that is high-productivity firms (especially exporters), should be stronger. Therefore the sign and significance of δ is the key observation in this equation. Export status will have a significant influence on the difference in sales between pre-crisis and post-crisis periods.

Correlation between the unobserved firm specific effects α_i and the regressors in equation (9) would lead to biased estimates. For this reason, we estimate equation (9) in differenced form:

$$S_{it+1} - S_{it} = \gamma + \delta X_i + \theta(FB_{it+1} - FB_{it}) + \eta(W_{it+1} - W_{it}) + u_{it} \qquad (10)$$

where the estimated parameters are the same as in equation (9) and the difference-in-differences estimate δ captures the exporters' advantage following the crisis.[10] We take t =1996 (immediately before the crisis) and $t+1$ =1999 (immediately after the crisis). Using reasoning similar to Claessens et al. (2012) we compare sales following the devaluation of the currency with sales before the crisis allowing for export status and other characteristics in the *pre-crisis period*, which are exogenous. Thus the influence of *ex ante* characteristics on *ex post* performance can be properly evaluated. Since exporter status is one of the key characteristics we infer that exporter status prior to the crisis helps a firm to sustain sales growth after the crisis by comparison with non-exporters.

4. Data and Descriptive Statistics

We test the predictions of our model using a dataset drawn from the KIS-Value database containing firms' financial statement data maintained by the Korea Information Service (KIS). We focus on firms in the manufacturing sector and formulate a panel dataset from Korean listed and unlisted firms for the period from 1990 to 2006. Table 1 presents the structure of our unbalanced panel. Firms are allowed to enter, to exit the sample, and to stop reporting for a number of years during the sample period.[11] Panel A reports the number of firms observed each year. Column 3 reports the number of firms entering the sample each year, while column 4 gives the number of exiting firms. These figures refer to firms' first and last appearance in the sample. As shown in Panel B, firms can contribute from 1 up to 16 annual observations to the sample. The median firms have at least 5 annual observations. Information about the number of firms listed on the Korean stock exchange for each sample year is presented in Panel C.

[10] To control for firm fixed effects we estimate the model in first-differences, which is equivalent to taking deviations from the mean (the fixed effects estimator) when there are only two time periods.

[11] Firms above the nominal asset threshold of 7bn won are required to report annual financial statements; firms below the threshold may voluntarily report if they wish to.

Table 1. Sample Summary Statistics
Panel A. Structure of the Panel Data

Year	Freq.	Percent	Entry	Exit
1991	856	3.07	-	11
1992	872	3.13	134	9
1993	888	3.19	95	15
1994	931	3.34	86	15
1995	1,006	3.61	132	25
1996	1,028	3.69	133	17
1997	2,071	7.43	830	513
1998	1,235	4.43	201	69
1999	1,594	5.72	305	74
2000	2,023	7.26	436	121
2001	2,311	8.30	425	166
2002	2,638	9.47	420	321
2003	2,761	9.91	348	352
2004	2,718	9.76	228	322
2005	2,627	9.43	145	517
2006	2,301	8.26	74	-
Total	27,860	100.00	3,992	2,547

Panel B. Distribution of Time Observations (T_i) Per Firm

Distribution of T_i :	min	5%	25%	50%	75%	95%	max
	1	1	2	5	8	15	16

Note: The sample allows for gaps in the panel, i.e. the time series observations for any firm with incomplete information (less than 16 years) do not have to be in consecutive

The KIS database distinguishes between sales from exported and non-exported goods at the level of the individual firm. We use an enhanced version of this dataset that includes details about the currency denomination of firm loans. First, we investigate whether firms' access to foreign currency denominated loans *DFL* (1/0) is influenced by the export status of firms. We construct several indicators of the export status of firms: a continuous measure as the export share in total sales (*Expshare*), a dummy *Dex* (1/0) indicating whether a firm has engaged in any exporting activity in the current year, or not. Then we consider different groups of firms according to their export share. For instance, the dummy *Dex50* distinguishes majority exporters (1/0), i.e. a firm exports more than 50% of goods sold.

Panel C. Firms' Listed Status

Year	Not listed	Listed	Total
1991	547	309	856
1992	559	313	872
1993	568	320	888
1994	606	325	931
1995	676	330	1,006
1996	706	322	1,028
1997	1,742	329	2,071
1998	933	302	1,235
1999	1,297	297	1,594
2000	1,725	298	2,023
2001	2,033	278	2,311
2002	2,350	288	2,638
2003	2,468	293	2,761
2004	2,436	282	2,718
2005	2,340	287	2,627
2006	2,024	277	2,301
Total	23,010	4,850	27,860

For firm-specific controls we measure beginning of period leverage as the total debt to total assets ratio (*Lev*), the liquid assets of the firm to total assets (*Liquid*), costs of sales over total sales (*Costs*), the log of the real total assets (*Size*), and the years since incorporation of the firm (*Age*). Age is not included in our model explicitly, but we consider firms that are older to be established, and to have had time to reach sufficient scale. These variables are likely to determine access to finance and the extent to which a firm can expand its sales. After removing the 1% tails of the accounting variables to exclude outliers, our final dataset includes 27,860 observations for 4,848 firms.

We allow for the fact that some large politically connected conglomerates were able to obtain domestic finance through state owned banks or their financial affiliates. We compile a list of the largest 30 chaebols from the Korea Fair Trade Commission 2007 definition of business groups. There are 116 firms and 931 firm-year observations for these 30 largest chaebols. While we allow for 30 of these groups, in practice the top 5 or 10 groups are the most powerful, accounting for a large share of manufacturing output and GDP. Even though chaebols had preferential access to credit prior to the crisis, it is not immediately clear whether they are likely to be advantaged or disadvantaged by their status as large politically connected conglomerates. Many of them, such as Hyundai, Kia Motors, Daewoo, LG, SK, Samsung, etc., were international companies with large

export sales, but equally they were also heavily dependent on state industrial banks, other domestic banks and their own financial services subsidiaries prior to the crisis. This may have ensured that they were not credit constrained, but because they were relatively inefficient, it may not have resulted in substantial advantages in terms of sales growth. Borensztein and Lee (2003) document that these firms experienced faster sales growth pre-crisis, and a smaller decline in sales in the crisis period itself than other firms. Arguably, chaebols could have different sensitivities to the Korean business cycle due to their size, conglomerate structure and their financial connections. We define a dummy (Chaebol = 1/0) for these conglomerates.

Table 2 reports in Panel A the descriptive statistics of the balance sheet variables we use in our analysis. We observe by comparison of the mean values in pre- and post-crisis periods that the Asian crisis reduced the average size (*Size*), leverage (*Lev*), foreign currency borrowing (*DFL*) and raised cost of sales (*Costs*) and liquidity (*Liquid*) for firms in our sample. Export participation diminished post-crisis. The probability values for the t-test statistics reported in the last column suggest that these differences are statistically significant. That costs of sales are significantly higher in the post-crisis period is consistent with our first prediction that a currency depreciation increases costs if firms have to import some of their inputs. Costs of sales (*Costs*) include operating costs and also the costs of raw materials, which will be influenced by any change in the exchange rate, therefore this variable does vary between different sample periods.

Panel B provides additional information about firms' borrowing in foreign denominated currency and various export engagement measures disaggregated at two-digit industry level. While there is a positive correlation between export status and foreign currency borrowing, the numbers reveal that firms across all industries borrow in foreign currency. To control for any differences across industries, all our regressions will include two-digit industry dummies.

Table 3 reports correlation coefficients for the whole sample and also separately pre-, during- and after the crisis. The pairwise correlations between access to foreign currency loans and firm size, age, and being part of a chaebol are slightly stronger in the pre- relative to the post-crisis period, but the opposite is true for exporter status.

Table 2: Summary Statistics

Panel A: Descriptive Statistics – Balance Sheet Characteristics

	Whole sample		Pre-crisis		1997-1998		Post-crisis		Pre v.
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Post
DFL	0.486	0.500	0.667	0.471	0.613	0.487	0.410	0.492	0.000
Lev	0.639	0.196	0.718	0.171	0.712	0.186	0.602	0.195	0.000
Costs	0.814	0.108	0.800	0.112	0.804	0.108	0.819	0.107	0.000
Liquid	0.362	0.150	0.347	0.134	0.361	0.147	0.366	0.155	0.000
Size	17.156	1.269	17.630	1.225	17.230	1.259	17.003	1.248	0.000
Age	16.479	11.527	18.664	11.096	17.201	10.993	15.710	11.651	0.000
Chaebol	0.632	0.482	0.834	0.372	0.598	0.490	0.579	0.494	0.000
Expshare	0.183	0.387	0.215	0.411	0.182	0.386	0.174	0.379	0.000
Dex	0.214	0.291	0.262	0.293	0.212	0.293	0.200	0.288	0.000
Dex50	0.486	0.500	0.667	0.471	0.613	0.487	0.410	0.492	0.000
Observations	27860		5581		3306		18973		

Note: The table presents means and standard deviations. *DFL* is a dummy equal to 1 if the firm has foreign currency denominated loans, 0 otherwise. *Lev* is the total debt to total asset ratio, *Costs* represents costs of sales over total sales, *Liquid* is the ratio of liquid assets of the firm to total assets at the beginning of the year. *Size* is measured as the log of the real total assets, *Age* is the number of years since firm incorporation. *Expshare* is the ratio of exports/total sales. *Dex* is a dummy equal 1 if a firm has engaged in any exporting activity in the current year, 0 otherwise. *Dex50* takes value 1 if the firm exports more than 50% of goods sold, 0 otherwise. The last column reports the probability value for the test of mean differences in the pre- and post-crisis.

Panel B: Summary Statistics by Industry

Industry	Stats	DFL	Expshare	Dex	Dex50	Obs.
Basic metals	Mean	0.595	0.646	0.117	0.176	2104
	SD	0.491	0.478	0.322	0.232	
Chemicals and Chemical Products	Mean	0.510	0.736	0.202	0.232	2884
	SD	0.500	0.441	0.402	0.279	
Coke, Refined Petroleum Products and	Mean	0.306	0.556	0.009	0.131	108
Nuclear Fuel	SD	0.463	0.499	0.096	0.163	
Computers and Office Machinery	Mean	0.405	0.669	0.275	0.282	338
	SD	0.492	0.471	0.447	0.333	
Electrical Machinery and Apparatuses	Mean	0.459	0.711	0.180	0.228	1582
n.e.c.	SD	0.498	0.453	0.384	0.284	
Electronic Components, Radio, TV and	Mean	0.511	0.660	0.363	0.341	3862
Communication Equipment	SD	0.500	0.474	0.481	0.367	
Fabricated Metal Products, Except	Mean	0.422	0.626	0.110	0.170	1551
Machinery and Furniture	SD	0.494	0.484	0.312	0.227	
Food Products and Beverages	Mean	0.592	0.580	0.046	0.079	1325
	SD	0.492	0.494	0.210	0.171	
Furniture; Manufacturing of Articles n.e.c	Mean	0.451	0.695	0.219	0.239	406
	SD	0.498	0.461	0.414	0.318	
Medical, Precision and Optical	Mean	0.321	0.576	0.199	0.211	680
Instruments, Watches and Clocks	SD	0.467	0.494	0.399	0.296	
Motor Vehicles, Trailers and Semitrailers	Mean	0.463	0.507	0.088	0.145	3480
	SD	0.499	0.500	0.284	0.215	
Other Machinery and Equipment	Mean	0.361	0.591	0.093	0.148	3470
	SD	0.480	0.492	0.291	0.222	
Other Non-metallic Mineral Products	Mean	0.458	0.415	0.021	0.056	1048
	SD	0.498	0.493	0.143	0.146	
Other Transport Equipment	Mean	0.479	0.793	0.360	0.338	353
	SD	0.500	0.406	0.481	0.333	
Pulp, Paper and Paper Products	Mean	0.736	0.679	0.032	0.121	757
	SD	0.441	0.467	0.175	0.159	
Rubber and Plastic Products	Mean	0.432	0.620	0.164	0.209	1514
	SD	0.496	0.486	0.371	0.269	
Sewn Wearing Apparel and Fur Articles	Mean	0.455	0.691	0.289	0.292	606
	SD	0.498	0.462	0.454	0.387	
Textiles, Except Sewn Wearing apparel	Mean	0.667	0.848	0.543	0.499	1053
	SD	0.472	0.359	0.498	0.338	
Wood and of Products of Wood and Cork,	Mean	0.694	0.550	0.126	0.162	111
Except Furniture	SD	0.463	0.500	0.333	0.313	
Publishing, Printing and Reproduction of	Mean	0.375	0.425	0.069	0.084	360
Recorded Media	SD	0.485	0.495	0.255	0.201	
Tanning and Dressing of Leather	Mean	0.709	0.896	0.720	0.652	268
Luggage and Footwear	SD	0.455	0.306	0.450	0.373	
Total	Mean	0.486	0.632	0.183	0.214	27860
	SD	0.500	0.482	0.387	0.291	

Note: The table presents mean values and standard deviations. *DFL* is a dummy equal to 1 if the firm has foreign currency denominated loans, 0 otherwise. *Expshare* is the ratio of exports/total sales. *Dex* is a dummy equal 1 if a firm has engaged in any exporting activity in the current year, 0 otherwise. *Dex50* takes value 1 if the firm exports more than 50% of goods sold, 0 otherwise. The last column reports the number of observations.

Table 3: Correlation Matrices

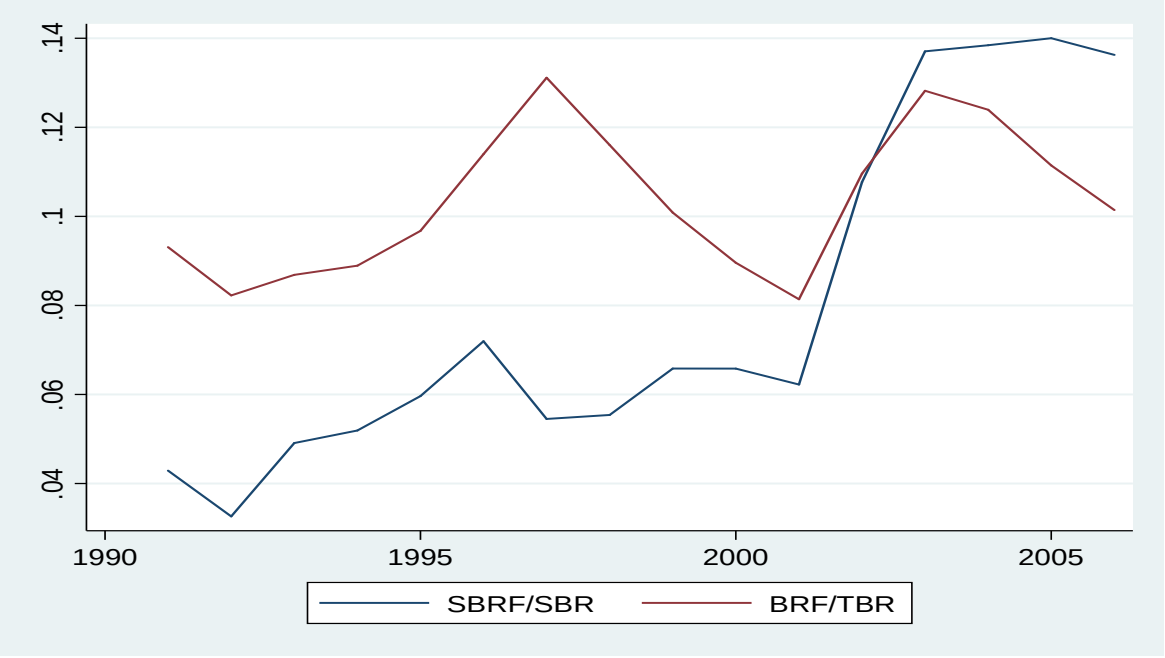
Whole sample	DFL	Lev	Costs	Liquid	Size	Age	Chaebol	Expshare
Lev	0.041*							
Costs	0.064*	0.111*						
Liquid	-0.151*	-0.141*	-0.119*					
Size	0.379*	-0.141*	0.010*	-0.133*				
Age	0.192*	-0.184*	0.003	-0.112*	0.562*			
Chaebol	0.101*	0.020*	-0.018*	-0.044*	0.302*	0.086*		
Expshare	0.167*	-0.090*	0.127*	-0.113*	0.188*	0.083*	0.023*	
Dex	0.185*	-0.088*	-0.012*	-0.078*	0.289*	0.189*	0.075*	0.563*
Before the crisis	DFL	Lev	Costs	Liquid	Size	Age	Chaebol	Expshare
Lev	-0.069*							
Costs	0.134*	0.053*						
Liquid	-0.140*	-0.137*	-0.246*					
Size	0.385*	-0.093*	-0.015*	-0.036*				
Age	0.180*	-0.169*	-0.051*	-0.018*	0.534*			
Chaebol	0.099*	0.040*	-0.001	-0.034*	0.319*	0.082*		
Expshare	0.149*	-0.120*	0.282*	-0.238*	-0.008	-0.020*	-0.018*	
Dex	0.151*	-0.068*	0.172*	-0.118*	0.099*	0.048*	0.048*	0.399*
During the crisis	DFL	Lev	Costs	Liquid	Size	Age	Chaebol	Expshare
Lev	0.012*							
Costs	0.127*	0.105*						
Liquid	-0.165*	-0.167*	-0.128*					
Size	0.375*	-0.130*	0.028*	-0.068*				
Age	0.203*	-0.191*	-0.010	-0.033*	0.567*			
Chaebol	0.073*	0.016*	-0.021*	-0.018*	0.266*	0.063*		
Expshare	0.139*	-0.077*	0.074*	-0.092*	0.141*	0.064*	0.022*	
Dex	0.137*	-0.129*	0.008	-0.037*	0.206*	0.153*	0.058*	0.595*
After the crisis	DFL	Lev	Costs	Liquid	Size	Age	Chaebol	Expshare
Lev	-0.006*							
Costs	0.061*	0.162*						
Liquid	-0.142*	-0.129*	-0.091*					
Size	0.341*	-0.229*	0.035*	-0.158*				
Age	0.169*	-0.232*	0.032*	-0.140*	0.560*			
Chaebol	0.089*	-0.011*	-0.017*	-0.049*	0.297*	0.083*		
Expshare	0.159*	-0.114*	0.098*	-0.080*	0.236*	0.104*	0.032*	
Dex	0.156*	-0.148*	-0.038*	-0.066*	0.306*	0.204*	0.070*	0.594*

Note: Significance at 5% confidence level indicated by *.

Our model is silent about the maturity structure of debt. Nevertheless it can be argued that firms that have raised short-term foreign debt might have been more vulnerable to the currency

crisis.[12] Therefore, we take advantage of the detailed information on the maturity structure of debt to construct several ratios of the borrowing by individual firms in foreign currency to determine their impact on sales. We construct ratios of borrowing in foreign currency to total borrowing (BRF/TBR) and short term borrowing in foreign currency relative to total short term borrowing (SBRF/SBR). Short-term debt comprises the sum of bank overdrafts, short-term borrowings in foreign currency, short-term borrowings-notes and short-term other borrowings. Total borrowing is composed of short-term debt, the current portion of long-term liabilities and long-term borrowing including bonds. These data are important for the testing of our model since we argue that exporters are more likely to borrow in foreign currency. Moreover, conditional on survival, firms that have borrowed in foreign currency before the crisis should perform better after the crisis and among them exporters should be the best performers. Table 4 gives the descriptive statistics for these ratios, and the probability value for the test of difference between them. There is not much change in the mean values of total foreign borrowing between 1996 and 1999, but there seems to be a significant change in the maturity of foreign borrowing as the ratio of foreign currency in total short term borrowing (SBRF/SBR) rises over this period. Figure 1 shows the evolution of the two ratios over the sample period.

Figure 1. Foreign currency borrowing ratios



[12] For example, Kim et al. (2015) find that the net worth of firms that carried a lot of short-term foreign currency debt prior to the crisis dropped significantly during the crisis.

Table 4: Descriptive Statistics – Foreign Currency Borrowing Ratios

	BRF/TBR		difference	SBRF/SBR		difference
	1996	1999	p value	1996	1999	p value
Mean	0.109	0.109	0.987	0.061	0.093	0.000
SD	0.154	0.168		0.162	0.227	
Observations	1,040			943		

Note: The table presents means and standard deviations. BRF/TBR is the ratio of borrowing in foreign currency to total borrowing and SBRF/SBR is short term borrowing in foreign currency in relation to short term total borrowing.

5. Results

5.1 Access to Foreign Currency Borrowing

We begin with an analysis of foreign currency borrowing for production using a random effects Probit model described in the previous section and report the estimates in Table 5 Panel A. We have based the analysis of our model on the supposition that exporters, which are generally high-productivity firms, are more likely to obtain funding in foreign currency than non-exporters. To test this hypothesis, we explore whether export participation is a significant determinant of foreign currency borrowing (H1). Export participation itself is measured in three different ways: by the share of firm exports in its total sales (columns 1-4), by an indicator that the firm is an exporter (columns 5-8), and by whether exports comprise more than 50% of total sales (columns 9-12). Each regression is estimated for four different time periods: the full sample (1990-2006), the pre-crisis period (pre 1997), the crisis period (1997 and 1998) and the post-crisis period (after 1998). Time and industry dummies are included in all models.

The results in Table 5 are essentially the same across all three measures of export participation showing statistical significance throughout. To the extent that firms produce more goods to sell in their export markets, we expect them to borrow more in foreign currency. Therefore, we are not surprised to find that export status is a significant determinant of foreign currency borrowing. To demonstrate the economic effects, Panel B reports marginal effects (the effect on the probability of foreign currency borrowing from a unit increase in each variable) calculated at the means.[13] For all three export status measures, the largest marginal effects are

[13] There are other issues to consider in this relationship. For example, to address the potential endogeneity of our export measures we use their lagged values instead and find that these results perfectly resemble those reported in Table 4. Some authors have also paid attention to the causal relationship between foreign currency loans and exporting (e.g. Minetti and Zhu, 2011), who find access to finance is a significant determinant of a firm's decision to export. Our model is silent about the direction of causality but our empirical results indicate that exporters are more likely to access foreign currency loans than domestic firms.

obtained during the crisis period, when being an exporter raises the probability of foreign currency borrowing at the moment when there are the greatest advantages from doing so. Obviously, the marginal effects are largest for the continuous measure *Expshare*. For instance, a 1% rise in the share of exports to total sales raises the probability of foreign currency borrowing by 18% during the crisis, compared to a value of 15% prior to the crisis and 10% post crisis. Other measures based on dummy variables show lower marginal effects in the range 6.5 - 8.3% during the crisis because they only indicate the firm satisfies the criteria without indicating the extent of the export volume. The values pre- and post-crisis are also lower for these measures.

We turn now to the impact of the other firm characteristics included in our empirical model. Table 5 includes a measure of the size of the firm based on the logarithm of real assets, indicating that the firm has reached sufficient scale necessary to export and therefore to borrow in foreign currency. Size has a positive impact on the probability of obtaining foreign currency borrowing. Focusing on the results from the model using *Expshare*, a larger firm size raises the probability of foreign currency borrowing by 24.3% pre crisis, 21.9% in the crisis, and 18.5% post-crisis. The figures in probit models for *Dex* and *Dex50* are comparable. According to the trade export literature more productive firms are larger and produce more goods for both domestic and foreign markets.[14] Those firms are also more likely to borrow in foreign currency, which we confirm. Firm age generally has a positive but insignificant effect, probably due to correlation with firm size.

Firms with higher liquidity (*Liquid*) are less likely to borrow in foreign currency. Again referring to *Expshare* results, an additional unit of liquidity lowers the probability of foreign currency borrowing by 39% pre crisis, 51.3% in the crisis and 25.5% post crisis. Our model assumes firms have insufficient funds to self-finance their projects, which is why they must borrow in order to produce, a larger stock of liquid assets reduces the amount of external funds they need to borrow. Firms with greater leverage (*Lev*) are found to have a higher probability of borrowing in foreign currency. Leverage has a high economic impact, raising the probability of foreign currency borrowing by 19% in the post-crisis period for every percentage point increase.

[14] A large international trade literature, following the seminal work by Melitz (2003), makes a positive link between entry to export markets and firm size through sunk costs (Bernard et al., 2003; Bernard and Jensen, 2004; Campa, 2004; Helpman et al., 2004; Roberts and Tybout, 1997; Roberts et al., 1997; Tybout, 2003). Empirical support for this view is cited in Girma et al. (2004) and Greenaway et al. (2007) for firms from Germany, Italy, Latin America, Spain, the UK and the US. Aw and Hwang (1995) and Aw et al. (2000) draw the same conclusions from a sample of Taiwanese and South Korean firms.

Table 5: Access to Foreign Currency Borrowing

Panel A: Random Effects Probit Estimates of Foreign Currency Borrowing

Variables	(1) 90-06	(2) Pre 97	(3) 97-98	(4) Post 98	(5) 90-06	(6) Pre 97	(7) 97-98	(8) Post 98	(9) 90-06	(10) Pre 97	(11) 97-98	(12) Post 98
Lev	0.615***	-0.179	0.600	0.746***	0.617***	-0.242	0.617	0.740***	0.605***	-0.214	0.516	0.730***
	(0.084)	(0.303)	(0.444)	(0.111)	(0.084)	(0.303)	(0.447)	(0.111)	(0.084)	(0.304)	(0.442)	(0.111)
Costs	-0.081	0.852*	1.372*	0.106	-0.028	1.098**	1.638**	0.159	-0.042	1.059**	1.586**	0.138
	(0.165)	(0.516)	(0.744)	(0.212)	(0.165)	(0.510)	(0.744)	(0.212)	(0.165)	(0.513)	(0.740)	(0.212)
Liquid	-0.810***	-1.873***	-2.787***	-0.978***	-0.811***	-1.953***	-2.809***	-0.976***	-0.821***	-1.951***	-2.852***	-0.985***
	(0.098)	(0.347)	(0.508)	(0.128)	(0.098)	(0.347)	(0.509)	(0.128)	(0.098)	(0.347)	(0.508)	(0.128)
Size	0.712***	1.169***	1.192***	0.707***	0.717***	1.163***	1.194***	0.716***	0.723***	1.176***	1.218***	0.722***
	(0.021)	(0.073)	(0.106)	(0.028)	(0.021)	(0.073)	(0.108)	(0.028)	(0.021)	(0.073)	(0.108)	(0.027)
Age	0.059*	-0.135	0.096	0.055	0.058*	-0.131	0.095	0.052	0.062*	-0.127	0.091	0.057
	(0.034)	(0.109)	(0.134)	(0.042)	(0.034)	(0.109)	(0.134)	(0.042)	(0.034)	(0.109)	(0.134)	(0.042)
Expshare	0.337***	0.718***	0.984***	0.396***								
	(0.063)	(0.205)	(0.279)	(0.084)								
Dex					0.118***	0.313**	0.449***	0.118**				
					(0.034)	(0.122)	(0.152)	(0.046)				
Dex50									0.073*	0.273**	0.348*	0.112**
									(0.041)	(0.131)	(0.189)	(0.055)
Observations	27,860	5,581	3,306	18,973	27,860	5,581	3,306	18,973	27,860	5,581	3,306	18,973
No of firms	4,848	1,436	2,288	4,174	4,848	1,436	2,288	4,174	4,848	1,436	2,288	4,174

Note: The table presents coefficients and standard deviations in parenthesis. The dependent variable is DFL = 1 if the firm has foreign currency denominated loans, 0 otherwise. *Lev* is the total debt to total asset ratio, *Costs* represents costs of sales over total sales, *Liquid* is the ratio of liquid assets of the firm to total assets at the beginning of the year. *Size* is measured as the log of the real total assets, *Age* is the number of years since firm incorporation. *Expshare* is the ratio of exports/total sales. *Dex* is a dummy equal 1 if a firm has engaged in any exporting activity in the current year, 0 otherwise. *Dex50* takes value 1 if the firm exports more than 50% of goods sold, 0 otherwise. Time and industry dummies are included in all regressions. ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.

Panel B: Marginal Effects

Variables	(1) 90-06	(2) Pre 97	(3) 97-98	(4) Post 98	(5) 90-06	(6) Pre 97	(7) 97-98	(8) Post 98	(9) 90-06	(10) Pre 97	(11) 97-98	(12) Post 98
Lev	0.158	-0.037	0.111	0.195	0.159	-0.050	0.113	0.194	0.157	-0.045	0.096	0.191
Costs	-0.021	0.177	0.253	0.028	-0.007	0.228	0.301	0.042	-0.011	0.221	0.294	0.036
Liquid	-0.209	-0.390	-0.513	-0.255	-0.210	-0.406	-0.516	-0.256	-0.212	-0.408	-0.530	-0.258
Size	0.184	0.243	0.219	0.185	0.185	0.242	0.219	0.188	0.187	0.246	0.226	0.189
Age	0.015	-0.028	0.018	0.014	0.015	-0.027	0.018	0.014	0.016	-0.027	0.017	0.015
Expshare	0.087	0.150	0.181	0.103								
Dex					0.031	0.065	0.083	0.031				
Dex50									0.019	0.057	0.065	0.029

Note: Marginal effects calculated at the mean.

Costs of sales (*Costs*) reflects the effect of currency depreciation on firms' total costs (operating costs and the costs of raw materials) inducing firms to reduce production levels and lower the demand for borrowing in the post-crisis period. At the same time, it may be that higher unit costs are a proxy of higher quality which is correlated with what we call productivity, in which case higher unit costs should be positively correlated with the ability to obtain loans in foreign currency. We find positive coefficients prior- and during the crisis period, indicating that this channel is less important as a determinant of foreign currency borrowing after the crisis.

Table 6 differs from Table 5 in that it adds the *Chaebol* dummy (1/0), indicating the status of those firms that were among the 30 largest conglomerates. While all other results remain the same, chaebols do not seem to have a higher probability of obtaining foreign currency loans than other firms due to their size, name recognition, and their exporter status. Importantly, export status continues to exert a positive influence on access to foreign currency borrowing.

Our tabulated results are obtained with the random effects probit estimator which controls for the panel structure of our data and assumes that the firm fixed effects are not correlated with the regressors. Due to the non-linearity of the probit estimator we cannot estimate a panel probit and cluster standard errors at the firm level. Alternatively, we use the simple probit estimator and cluster standard errors. These results (available upon request) are qualitatively similar to those presented in Tables 5 and 6. For additional robustness checks, we consider the continuous foreign currency share BRF/TBR (borrowing in foreign currency relative to total borrowing) as the dependent variable. Table 7 reports the random effects Tobit coefficients when exporter status is measured by the share of export sales to total sales. These estimates confirm the positive relation between exporter status and foreign currency borrowing.

Table 6: Probit Estimates of Foreign Currency Borrowing – Controlling for Chaebol

Variables	(1) 90-06	(2) Pre 97	(3) 97-98	(4) Post 98	(5) 90-06	(6) Pre 97	(7) 97-98	(8) Post 98	(9) 90-06	(10) Pre 97	(11) 97-98	(12) Post 98
Lev	0.619***	-0.177	0.602	0.750***	0.620***	-0.236	0.621	0.745***	0.609***	-0.210	0.518	0.735***
	(0.084)	(0.303)	(0.444)	(0.111)	(0.084)	(0.304)	(0.447)	(0.111)	(0.084)	(0.305)	(0.442)	(0.111)
Costs	-0.076	0.855*	1.377*	0.111	-0.022	1.102**	1.645**	0.164	-0.037	1.062**	1.591**	0.144
	(0.165)	(0.517)	(0.744)	(0.213)	(0.165)	(0.510)	(0.745)	(0.212)	(0.165)	(0.514)	(0.741)	(0.212)
Liquid	-0.812***	-1.873***	-2.787***	-0.981***	-0.813***	-1.952***	-2.808***	-0.978***	-0.822***	-1.951***	-2.852***	-0.988***
	(0.098)	(0.347)	(0.508)	(0.128)	(0.098)	(0.347)	(0.509)	(0.128)	(0.098)	(0.347)	(0.508)	(0.128)
Size	0.718***	1.172***	1.195***	0.716***	0.724***	1.169***	1.199***	0.725***	0.730***	1.179***	1.222***	0.731***
	(0.022)	(0.075)	(0.108)	(0.028)	(0.022)	(0.075)	(0.110)	(0.029)	(0.022)	(0.075)	(0.109)	(0.028)
Age	0.055*	-0.137	0.093	0.051	0.055	-0.135	0.091	0.047	0.058*	-0.129	0.088	0.052
	(0.034)	(0.109)	(0.135)	(0.042)	(0.034)	(0.110)	(0.135)	(0.042)	(0.034)	(0.110)	(0.135)	(0.042)
Chaebol	-0.208	-0.047	-0.084	-0.252	-0.224	-0.116	-0.131	-0.270	-0.215	-0.072	-0.099	-0.263
	(0.159)	(0.329)	(0.491)	(0.201)	(0.159)	(0.329)	(0.493)	(0.201)	(0.159)	(0.330)	(0.490)	(0.201)
Expshare	0.336***	0.717***	0.983***	0.394***								
	(0.063)	(0.205)	(0.279)	(0.084)								
Dex					0.119***	0.314**	0.449***	0.117**				
					(0.034)	(0.122)	(0.152)	(0.046)				
Dex50									0.072*	0.271**	0.346*	0.110**
									(0.041)	(0.131)	(0.189)	(0.055)
Obs	27,860	5,581	3,306	18,973	27,860	5,581	3,306	18,973	27,860	5,581	3,306	18,973
No of firms	4,848	1,436	2,288	4,174	4,848	1,436	2,288	4,174	4,848	1,436	2,288	4,174

Note: The table presents coefficients and standard deviations in parenthesis. Chaebol is 1 if the firm is part of a chaebol, 0 otherwise. See also notes to Table 4.

Panel B: Short Term Foreign Currency Ratio SBRF/SBR

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
ΔSBRF/SBR	0.252***	0.251***	0.248***	0.242***	0.240***	0.238***
	(0.084)	(0.085)	(0.084)	(0.084)	(0.085)	(0.085)
ΔCosts	-0.444	-0.500*	-0.477*	-0.429	-0.488*	-0.461*
	(0.282)	(0.278)	(0.280)	(0.278)	(0.274)	(0.277)
ΔLev	-0.188*	-0.195**	-0.185*	-0.178*	-0.185*	-0.174*
	(0.099)	(0.099)	(0.099)	(0.097)	(0.097)	(0.097)
Age_1996	-0.008***	-0.008***	-0.008***	-0.007***	-0.007***	-0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Size_1996	-0.017	-0.016	-0.016	-0.038**	-0.036**	-0.037**
	(0.012)	(0.012)	(0.012)	(0.015)	(0.015)	(0.015)
Chaebol_1996				0.213***	0.211***	0.215***
				(0.068)	(0.068)	(0.068)
Expshare_1996	0.148**			0.149**		
	(0.058)			(0.058)		
Dex_1996		0.024			0.018	
		(0.048)			(0.047)	
Dex50_1996			0.070*			0.072*
			(0.037)			(0.037)
Observations	943	943	943	943	943	943
R-squared	0.171	0.163	0.167	0.182	0.174	0.178

Note: The table presents coefficients and robust standard errors in parenthesis. The dependent variable is the change in firm real sales (ln) in 1999 relative to 1996. The financial ratio used in Panel B is the short term foreign currency borrowing relative to total short term borrowing (SBRF/STBR). *Costs* represents costs of sales over total sales. *Lev* is the total debt to total asset ratio, *Age* is the number of years since firm incorporation. *Size* is measured as the log of the real total assets. *Expshare* is the ratio of exports/total sales. *Dex* is a dummy equal 1 if a firm has engaged in any exporting activity in the current year, 0 otherwise. *Dex50* takes value 1 if the firm exports more than 50% of goods sold, 0 otherwise. Chaebol is 1 if the firm is part of a chaebol, 0 otherwise. Δ denotes the first difference indicator and underscore _1996 denotes that the variable is measured in 1996. Time and industry dummies are included in all regressions. ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.

5.2 Sales Performance

Our next set of results refers to the impact of the crisis on total sales for firms that are foreign currency borrowers and exporters compared to those that are not (H2). Table 8 reports results for differences in log sales for 1999 compared to 1996, explained by the characteristics that we discussed previously: leverage, costs, size and age. We report the results for alternative export status indicators and allow foreign debt ratios to affect sales growth. The ratios we use are borrowing in foreign currency in relation to total borrowing (BRF/TBR) and short term borrowing

in foreign currency to short term total borrowing (SBRF/SBR). The results are reported in Panels A and B of Table 8.

Table 7: Tobit Estimates of Foreign Currency Borrowing

VARIABLES	(1) 90-06	(2) Pre 97	(3) 97-98	(4) Post 98	(5) 90-06	(6) Pre 97	(7) 97-98	(8) Post 98
Lev	-0.050***	-0.148***	-0.101***	-0.008	-0.049***	-0.148***	-0.101***	-0.007
	(0.014)	(0.020)	(0.031)	(0.021)	(0.014)	(0.020)	(0.031)	(0.021)
Costs	-0.045	0.048	0.190***	-0.009	-0.043	0.048	0.191***	-0.008
	(0.028)	(0.035)	(0.052)	(0.041)	(0.028)	(0.036)	(0.052)	(0.041)
Liquid	-0.084***	-0.043*	-0.185***	-0.114***	-0.085***	-0.043*	-0.185***	-0.115***
	(0.017)	(0.023)	(0.034)	(0.025)	(0.017)	(0.023)	(0.034)	(0.025)
Size	0.098***	0.050***	0.059***	0.116***	0.099***	0.050***	0.060***	0.118***
	(0.003)	(0.004)	(0.005)	(0.005)	(0.004)	(0.004)	(0.006)	(0.005)
Age	-0.011*	-0.017**	-0.023**	-0.018**	-0.012**	-0.017**	-0.024**	-0.019**
	(0.006)	(0.008)	(0.010)	(0.009)	(0.006)	(0.008)	(0.010)	(0.009)
Chaebol					-0.048*	-0.003	-0.013	-0.061
					(0.028)	(0.021)	(0.031)	(0.039)
Expshare	0.048***	0.061***	0.050***	0.067***	0.047***	0.061***	0.050***	0.067***
	(0.011)	(0.014)	(0.019)	(0.016)	(0.011)	(0.014)	(0.019)	(0.016)
Observations	27,860	5,581	3,306	18,973	27,860	5,581	3,306	18,973
No of firms	4,848	1,436	2,288	4,174	4,848	1,436	2,288	4,174
No. left-censored	14,321	1,856	1,279	11,186	14,321	1,856	1,279	11,186

Note: The table presents random effects Tobit coefficients and standard deviations in parenthesis. The dependent variable is borrowing in foreign currency relative to total borrowing (BRF/TBR). *Lev* is the total debt to total asset ratio, *Costs* represents costs of sales over total sales, *Liquid* is the ratio of liquid assets of the firm to total assets at the beginning of the year. *Size* is measured as the log of the real total assets, *Age* is the number of years since firm incorporation. *Expshare* is the ratio of exports/total sales. *Dex* is a dummy equal 1 if a firm has engaged in any exporting activity in the current year, 0 otherwise. *Dex50* takes value 1 if the firm exports more than 50% of goods sold, 0 otherwise. Chaebol is 1 if the firm is part of a chaebol, 0 otherwise. Time and industry dummies are included in all regressions. ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.

Our theoretical model indicates that differences in the control variables between 1996 and 1999 should influence the difference in sales between 1996 and 1999 for similar reasons to those given above. A key influence on sales is expected to be the export status in 1996. This is the variable that tells us what impact the export status made to the difference in sales between the two periods. Unobserved (fixed) effects are removed by differencing. Time and industry controls are included in all specifications. We also control for chaebol status in 1996 as a potential influence on sales.

Table 8: Firm Performance and Foreign Currency Borrowing Ratios

Panel A: Foreign Currency Borrowing Ratio BRF/TBR

VARIABLES	(1) F3	(2) F3	(3) F3	(4) F3	(5) F3	(6) F3
ΔBRF/TBR	0.195**	0.195**	0.196**	0.179**	0.180**	0.180**
	(0.089)	(0.089)	(0.089)	(0.089)	(0.090)	(0.089)
ΔCosts	-0.506**	-0.559**	-0.533**	-0.500**	-0.556**	-0.527**
	(0.258)	(0.254)	(0.256)	(0.254)	(0.251)	(0.253)
ΔLev	-0.219**	-0.230***	-0.217**	-0.203**	-0.214**	-0.201**
	(0.089)	(0.089)	(0.089)	(0.087)	(0.087)	(0.087)
Age_1996	-0.008***	-0.008***	-0.008***	-0.007***	-0.007***	-0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Size_1996	-0.013	-0.011	-0.012	-0.032**	-0.029**	-0.031**
	(0.011)	(0.011)	(0.011)	(0.013)	(0.013)	(0.013)
Chaebol_1996				0.199***	0.195***	0.201***
				(0.062)	(0.062)	(0.062)
Expshare_1996	0.141***			0.144***		
	(0.053)			(0.054)		
Dex_1996		0.018			0.013	
		(0.047)			(0.047)	
Dex50_1996			0.071**			0.075**
			(0.034)			(0.034)
Observations	1,040	1,040	1,040	1,040	1,040	1,040
R-squared	0.171	0.164	0.168	0.181	0.173	0.177

Note: The table presents coefficients and robust standard errors in parenthesis. The dependent variable is the change in firm real sales (ln) in 1999 relative to 1996. The financial ratio used in Panel A is the foreign currency borrowing relative to total borrowing (BRF/TBR). *Costs* represents costs of sales over total sales, *Lev* is the total debt to total asset ratio. *Age* is the number of years since firm incorporation. *Size* is measured as the log of the real total assets. *Expshare* is the ratio of exports/total sales. *Dex* is a dummy equal 1 if a firm has engaged in any exporting activity in the current year, 0 otherwise. *Dex50* takes value 1 if the firm exports more than 50% of goods sold, 0 otherwise. Chaebol is 1 if the firm is part of a chaebol, 0 otherwise. Δ denotes the first difference indicator and underscore _1996 denotes that the variable is measured in 1996. Time and industry dummies are included in all regressions. ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.

We find two consistent results. First, export status has a positive and significant effect on the difference in sales between 1996 and 1999. The positive and strongly significant coefficient, δ in equation (10), shows that export status had a very important influence on firms' sales, since exporters had higher sales than non-exporters after controlling for all other effects. This is the most important finding in our results, which strongly supports the hypothesis in our model that exporters have higher sales following a crisis. According to our theoretical model, this is not just because these firms are exporters, but because the firms are high productivity firms that signal their type by borrowing in foreign currency, exporting some of their output, and obtaining higher sales as a

result. Our result differs from the Claessens et al. (2012) finding – that firms more exposed to trade experience a decline in sales – because their analysis refers to a global crisis which adversely affected firms' export markets, while ours discusses a regional crisis that did not affect the global demand for exports.

Second, the foreign debt ratio – defined in two different ways to reflect foreign currency borrowing to total borrowing (Panel A) and foreign borrowing as a proportion of short term borrowing (Panel B) – has a positive effect on sales. This is consistent with the finding of Castagnino et al. (2013) who analyze exporter performance in Argentina; they find that once firms become exporters, access to foreign finance enables firms to increase export volume, export greater numbers of products and reach more export destinations.[1] Firms that obtained positive differences in their ratios of foreign currency borrowing in our data (ΔBRF/TBR and ΔSBRF/SBR in Panels A, and B) had greater differences in sales between 1999 and 1996. Our earlier results in Tables 5 and 6 showed that exporters were more likely to obtain foreign currency loans than non-exporters, so again this demonstrates the benefit of being an exporter.

Other factors had an influence on the difference in sales. Higher leverage lowers firms' sales performance (possibly because these firms are less inclined to borrow). Higher costs of sales significantly affect firm performance consistent with the idea that costs of production are likely to increase following currency depreciation. Older and larger firms have smaller differences in sales. This is likely to reflect the fact that small / young firms grow faster than larger and older, more established firms. It is not a prediction of our model, but it is consistent with findings in the wider literature on determinants of growth in sales. The inclusion of a variable for the top 30 chaebols suggests that firms that belonged to the large conglomerates before the crisis had better sales performance at the outset of the crisis.

5.2.1 Dealing with the potential endogeneity of foreign currency borrowing

In this section we examine the concern that the current ratio of foreign currency borrowing in equations (9) and (10) is potentially endogenous undermining our difference-in-differences estimates reported in Tables 7 and 8. In a separate exercise, to make sure that independent variables are really predetermined, we relate their second lagged value with firm sales performance. For

[1] Bernini et al. (2015) explore the relationship between export quality and leverage.

example, we relate sales growth in 1997-1998 with covariates measured in 1996.[2] As our model makes specific predictions regarding the impact of the crisis on exporters, foreign currency borrowing, and costs of production following a depreciation, we include the interactions of these variables with the dichotomous variable *Crisis,* which takes value 1 for the years 1997-1998, 0 otherwise. Formally, we estimate the model below, where all variables are as previously defined.

$$S_{it} - S_{it-1} = \alpha_i + \beta_1 X_{it-2} + \beta_2 FB_{it-2} + \beta_3 Costs_{it-2} + \beta_{1c} X_{it-2} Crisis_{97-98,t} + \beta_{2c} FB_{it-2} Crisis_{97-98,t} + \beta_{3c} Costs_{it-2} Crisis_{97-98,t} + \boldsymbol{\beta}_4 W_{it-2} + d_t + e_{it}$$

Table 9 presents the fixed effects estimates for the two ratios of foreign currency borrowing (BRF/TBR and SBRF/SBR) and different indicators of the export status of the firm in Panel A. Time dummies are included in all regressions and standard errors are clustered at the firm level. The estimates reported in Panel B include also controls for industry specific effects and chaebol status. They are obtained with the Hausman-Taylor estimator, which allows for correlation between the regressors and the firm fixed effects $\alpha_{i,}$ just like the fixed effects estimator. Additionally, this estimator allows inclusion of time-invariant industry controls, which would be differenced out in a fixed effects estimation.

Across the two panels, we focus on the interacted variables and observe that exporters have better sales performance than other firms during the crisis. Similarly, borrowing in foreign currency correlates positively with sales growth during the crisis. The cost channel, however, is very weakly supported by our results. Panel B of Table 9 provides even stronger evidence that exporters and firms which borrow in foreign currency have better sales performance during the financial crisis when we control for industry specific effects and chaebol status.

[2] We thank a referee for suggesting this exercise. Kim et al. (2015) use a similar specification and opt for estimating two cross-sectional equations, one for the crisis and one for the pre-crisis period. We exploit the large panel dimension of our data and estimate with firm fixed effects.

Table 9: Firm Performance – panel regressions
Panel A: Panel Fixed Effects Estimates

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
BRF/TBR	0.000	0.001	0.001			
	(0.016)	(0.016)	(0.016)			
BRF/TBR*Crisis	0.070	0.119***	0.067			
	(0.043)	(0.045)	(0.043)			
SBRF/SBR				-0.048***	-0.047***	-0.047***
				(0.014)	(0.014)	(0.014)
SBRF/SBR*Crisis				0.136***	0.142***	0.124***
				(0.035)	(0.035)	(0.034)
Costs	0.203***	0.201***	0.200***	0.215***	0.213***	0.211***
	(0.054)	(0.054)	(0.054)	(0.056)	(0.056)	(0.056)
Costs*Crisis	-0.113*	0.085	-0.031	-0.103	0.108	-0.016
	(0.066)	(0.068)	(0.065)	(0.066)	(0.067)	(0.065)
Expshare	-0.041**			-0.040**		
	(0.019)			(0.020)		
Expshare*Crisis	0.280***			0.281***		
	(0.024)			(0.024)		
Dex		-0.015*			-0.015*	
		(0.009)			(0.009)	
Dex*Crisis		0.021			0.025	
		(0.019)			(0.019)	
Dex50			-0.020*			-0.016
			(0.010)			(0.010)
Dex50*Crisis			0.190***			0.189***
			(0.017)			(0.016)
Lev	-0.081***	-0.081***	-0.083***	-0.081***	-0.082***	-0.083***
	(0.023)	(0.024)	(0.023)	(0.024)	(0.025)	(0.024)
Size	-0.146***	-0.151***	-0.147***	-0.145***	-0.149***	-0.145***
	(0.009)	(0.010)	(0.009)	(0.010)	(0.010)	(0.010)
Age	-0.015	-0.007	-0.016	-0.014	-0.006	-0.015
	(0.027)	(0.027)	(0.027)	(0.028)	(0.028)	(0.028)
Observations	17,257	17,257	17,257	16,265	16,265	16,265
R-squared	0.133	0.124	0.133	0.136	0.127	0.136
Number of firms	3,454	3,454	3,454	3,343	3,343	3,343

Note: The table presents estimated coefficients and robust standard errors in parenthesis. The dependent variable is firm real sales growth. All endogenous variables are lagged twice, i.e. for sales growth 1997-1998 the controls are measured in 1996. Crisis =1 for the years 1997-1998, 0 otherwise. Time dummies are included in all regressions. ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.

Panel B: Hausman-Taylor Estimates

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
BRF/TBR	0.000	0.001	0.001			
	(0.014)	(0.014)	(0.014)			
BRF/TBR*Crisis	0.070*	0.119***	0.067*			
	(0.039)	(0.039)	(0.039)			
SBRF/SBR				-0.048***	-0.046***	-0.047***
				(0.012)	(0.012)	(0.012)
SBRF/SBR*Crisis				0.135***	0.141***	0.124***
				(0.032)	(0.033)	(0.033)
Costs	0.204***	0.203***	0.201***	0.216***	0.214***	0.212***
	(0.039)	(0.039)	(0.039)	(0.040)	(0.040)	(0.040)
Costs*Crisis	-0.113*	0.085	-0.031	-0.102*	0.109*	-0.016
	(0.059)	(0.057)	(0.057)	(0.058)	(0.056)	(0.057)
Expshare	-0.039***			-0.039**		
	(0.015)			(0.015)		
Expshare*Crisis	0.279***			0.281***		
	(0.022)			(0.022)		
Dex		-0.014*			-0.014*	
		(0.008)			(0.008)	
Dex*Crisis		0.021			0.025	
		(0.019)			(0.019)	
Dex50			-0.019**			-0.016*
			(0.008)			(0.008)
Dex50*Crisis			0.190***			0.189***
			(0.015)			(0.015)
Lev	-0.083***	-0.082***	-0.084***	-0.083***	-0.084***	-0.085***
	(0.018)	(0.018)	(0.018)	(0.019)	(0.019)	(0.019)
Size	-0.146***	-0.151***	-0.147***	-0.144***	-0.149***	-0.145***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Age	0.006	0.013	0.005	0.010	0.017	0.009
	(0.022)	(0.022)	(0.022)	(0.022)	(0.023)	(0.022)
Chaebol	2.530***	2.596***	2.531***	2.284***	2.347***	2.279***
	(0.812)	(0.823)	(0.809)	(0.789)	(0.800)	(0.783)
Observations	17,257	17,257	17,257	16,265	16,265	16,265
Number of firms	3,454	3,454	3,454	3,343	3,343	3,343

Note: The table presents coefficients and standard errors obtained with the Hausman-Taylor estimator, which allows (i) some of the covariates to be correlated with the unobserved firm specific effects and (ii) inclusion of time-invariant industry specific effects and chaebol status. The dependent variable is firm real sales growth. All endogenous variables are lagged twice, i.e. for sales growth 1997-1998 the controls are measured in 1996. Crisis =1 for the years 1997-1998, 0 otherwise. Time and industry dummies are included in all regressions. ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.

6. Discussion and Conclusions

It is well documented that before the East Asian 1997 crisis both the banking and corporate sectors of many Asian economies had become fragile through the accumulation of short-term debt that was denominated in foreign currencies. In subsequent years lessons were learned, mismatch was contained, and governments built up reserves to avoid the risk of a currency crisis. But in recent years growth in foreign currency borrowing has re-emerged in Asia. While many firms that issued debt or took out loans in international currencies are to some degree naturally hedged by their earnings in the same currency concerns have increased about the consequences of the large borrowings in international currency, particularly when exchange rates might be more volatile.

Our paper explores the relationship between foreign currency borrowing, exporting and performance. It develops a simple signaling model of foreign currency borrowing that yields predictions about firm survival and performance during a currency crisis. By looking at this question it shifts the focus from foreign currency borrowing per se, to the characteristics of the firms that typically borrow in foreign currency and their chances of survival. Our model predicts that those lower productivity firms that borrowed in foreign currency and sell into the domestic market are least likely to survive a collapse of the currency. The empirical study by Kim et al. (2015) offers strong support for this prediction. Our model also predicts that conditional on survival the high productivity firms, which are the best performers, are most likely to have borrowed in foreign currency. These firms are also likely to be exporters, who benefit after a crisis from the fact that their foreign sales become more competitive after a crisis.

Kim *et al.* (2015) suggest that "in assessing the risk of exchange rate exposure, it is important to know precisely who is carrying that risk. In the case of Korea, small, nonexporting firms found themselves bearing the brunt of the economic adjustment" (p. 223). We concur and add that among those firms the most vulnerable were those that borrowed in foreign currency.

The literature has recognized many contributing factors to the East-Asian crisis including the surge of capital across international borders, the expansion of domestic credit, the maturity mismatch on the balance sheets of banks and the currency mismatch on the balance sheets of both firms and banks. In 2002, China, Japan and South Korea launched the Asian Bond Market Initiative (ABMI) to strengthen the resilience of the region's financial system by encouraging the

development of local currency bond markets.[3] Our study offers support for the initiative and, moreover, identifies the types of firms that are more likely to benefit from it.

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[3] See https://www.jbic.go.jp/en/efforts/result-abmi.

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