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Abstract

This paper studies the role of the credit crunch in the severe contraction of economic activity during the 2008-09 global financial crisis, using firm-level data from six emerging Asian economies. After controlling for the effect of falling demand, we find that sales declined by less for firms with better pre-crisis financial conditions. Amid the decline in external financing opportunities, some firms relied more on trade credit from suppliers during the crisis, which allowed them to post relatively better sales. Export-intensive firms resorted less to trade credit as an alternative source of finance, which contributed to their larger declines in sales.

JEL classification: F14, F23, G32

Keywords: trade credit, 2008-09 financial crisis, emerging Asia, international trade.

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1 Introduction

The 2008-09 global financial crisis had dramatic effects on the economic activity in both advanced and emerging market economies (EMEs). The contraction in EMEs was surprisingly large given that the crisis originated in the advanced economies. There are two main known channels through which the crisis could have spilled over to EMEs: the reduction in demand for these countries' exports (the trade channel) and the deterioration in financing conditions (the financial channel).

For the set of EMEs that we study in this paper (China, India, Indonesia, Malaysia, Taiwan, and Thailand), the data suggest that both channels were at play during the crisis, a pattern discernible in both the aggregate and firm-level data. As shown in Figure 1, the downturn of activity in EMEs coincided with a worsening of financial conditions there. At the aggregate level (the top panels), the decline in real activity (real GDP, industrial production, exports) coincided with a marked slowdown in private credit growth. Similarly, at the firm level (the bottom panels), the decline in sales for both domestic and export-oriented firms coincided with a drop in their external financing. Notably, the decline in exports was sharper than that of total output.

[LOCATE FIGURE 1 ABOUT HERE]

Motivated by these observations, our study explores the effect of financial frictions in general, and trade credit in particular, on economic activity in our sample of EMEs during the global financial crisis. Our focus on trade credit as an alternative source of financing during the recent crisis is guided by the findings of existing studies, which document the role of trade credit in mitigating financing constraints during past EME crises (see for example Love et al., 2007).[1]

More specifically, we use firm-level data from the six emerging market countries mentioned above to explore: (1) Whether financial constraints, in the form of reduced access to external financing through bank loans and bond issuance, adversely affected firm-level sales during the crisis, after

[1] Love et al. (2007) find that during the Mexican devaluation in 1994-95 and the Asian crisis in 1997, trade credit facilitated the redistribution of credit from financially viable firms to the less viable ones.

controlling for the deterioration in global demand. (2) Whether the ability of firms to partially replace external finance with trade credit from suppliers enhanced their relative performance during the crisis. (3) Whether the relative inability of export-intensive firms to use trade credit as an alternative source of finance contributed to the larger decline in sales experienced by these firms. As in some of the previous studies, we define trade credit as the financing that firms receive from their upstream suppliers in the form of delayed payments for the transfer of goods and services.[2]

To disentangle the effect of financial constraints from the demand-driven reduction in sales during the crisis, we use two types of explanatory variables in our regression analysis. First, we use firms' pre-crisis degree of financial vulnerability and reliance on various sources of financing, including trade credit, to explain their sales performance during the crisis. Second, we construct firm-specific measures of global demand, a novel approach that allows us to document the effect of financial frictions on sales while controlling for the variation in demand.

Our results can be summarized as follows: (1) Financial conditions contributed to the decline in sales for all firms, but sales declined by less for firms with better financial conditions prior to the crisis, such as those with more liquid assets and less exposure to external finance. Moreover, after controlling for pre-crisis financial characteristics and demand conditions during the crisis, the export-intensive firms recorded larger declines in sales than their domestically-oriented counterparts. (2) Trade credit declined by less for the financially-vulnerable firms, especially firms with more exposure to short-term debt before the crisis, suggesting that some firms relied more on trade credit to cope with the dire financial conditions during the crisis. In addition, firms that were able to replace external finance with trade credit during the crisis – predominantly the domestic-oriented firms – experienced smaller declines in sales than firms that did not. (3) Exporters with comparable financial vulnerabilities had limited access to trade credit as an alternative source of

[2]Compared with "trade credit," the literature uses "trade finance" to refer to a broader range of short-term financing related to the international trade activities of firms, such as working capital loans, letters of credit and trade insurance provided by firms, banks or government agencies (see U.S. Department of Commerce, 2007).

financing, which contributed to the larger decline in their sales relative to non-exporters. These results highlight the interaction between financial constraints and the real sector in propagating the effects of the global financial crisis. In addition, the finding that trade credit was more scarce for exporters than for non-exporters points indirectly to the presence of financial frictions among the factors that contributed to the disproportionately large decline in exports during the crisis.[3]

Our results are not driven by differences in demand for domestic and export-oriented firms, or by differences in the firms' pre-crisis levels of inventories. We control for the effect of demand on firm-level sales by constructing an index of global demand from firm-level data on export reliance, sector-level data on exports by destination, and real GDP growth across destinations as a proxy for the change in demand. We also control for the role of firms' inventories in offsetting the impact of financial constraints on sales, since firms may draw on inventories when their production is restrained by financial constraints.

1.1 Literature Review

Our study adds to the existing evidence – which is somewhat mixed – on the effect of trade credit and financial constraints more generally on economic activity.

For trade credit and trade financing, Chor and Manova (2012) use firm level data to show that the decline in U.S. imports during the 2008-09 global crisis was larger for countries of origin and sectors with adverse credit conditions, including limited reliance on trade credit. Similarly, Amiti and Weinstein (2011) document that trade financing from banks played a key role in the transmission of financial shocks to the Japanese exporting firms during the crisis that affected the country in the 1990s. However, using disaggregated U.S. imports and exports data, Levchenko et

[3]The extent to which our results document the effect of financial frictions on international trade is restricted by data availability, since our dependent variable is the quarterly change in firm-level sales rather than in exports. However, we include the firms' reliance on exports (available at the annual frequency only) in the set of explanatory variables.

al. (2010, 2011) find no evidence that trade credit played a role in the collapse of trade during the 2008-09 crisis.

Other studies explore the role of broadly-defined financial constraints on economic activity, including on international trade. Manova et al. (2009) use firm-level data for Chinese exporters from 2005 to show that multinational affiliates and joint ventures had better export performance than private domestic firms, especially in sectors with greater reliance on external finance and fewer hard assets to be used as collateral.[4] Kolasa et al. (2010) use Polish firm-level data to show that foreign-owned firms proved more resilient during the 2008-09 crisis, which they argue was due to intra-group lending mechanisms supporting the credit-constrained affiliates. Along the same line, Rappoport et al. (2011) use matched customs and firm-level bank credit data from Peru to document the adverse effect of credit shortages on trade during the recent crisis. However, Bricongne et al. (2012) find that financial constraints played little role in explaining the decline in French exports.

Compared with the papers mentioned above, we study the role of trade credit received from suppliers (rather than trade finance received from banks or foreign affiliates) measured at the firm level (rather than at the sector level) as an alternative source of external financing during the 2008-09 crisis. In addition to trade credit, we also examine the relationship between firms' financial vulnerability prior to the crisis and their sales performance during the crisis, while also taking into account firms' reliance on exports and exposure to global demand. Due to our focus on firms from emerging Asia, the 2008-09 global financial crisis – which originated in advanced economies – can be viewed as an exogenous event in our analysis.

Our finding that financially-vulnerable firms (those with higher exposure to short-term debt before the crisis) substituted toward trade credit during the crisis is consistent with the literature

[4]For another study, see also Kalemli-Ozcan, Kamil and Villegas-Sanchez (2010).

on bank and trade credit channels. In an early study, Meltzer (1960) concludes that when liquidity conditions were tight, "firms with relatively large cash balances increased the average length of time for which [trade] credit was extended. And this extension of trade credit appears to have favored those firms against whom credit rationing is said to discriminate." More recently, Kohler et al. (2000) use a panel of publicly-traded firms from the United Kingdom and find that, during recessions, firms with direct access to capital markets extended more trade credit and received less in return, thus making credit available to other firms that rely more on bank credit. In line with Meltzer (1960), they argue that there is a "trade credit channel" that offsets the traditional bank credit channel in the monetary economics literature.[5]

The rest of the paper is organized as follows. Section 2 describes the data, Section 3 describes the empirical specifications, and Section 4 discusses the findings and robustness analyses. Section 5 concludes.

2 Data Description

Our empirical analysis uses annual and quarterly data for almost 6,000 publicly-traded manufacturing firms from six emerging Asian countries – China, India, Indonesia, Malaysia, Taiwan and Thailand – obtained from the Worldscope database. The choice of the six emerging market countries is driven by data availability. Given our interest in export status as one of the determinants of firm performance in EMEs, we work with the countries where a reasonable number of firms report both exports and sales for the pre-crisis years. Thus, about one quarter of the firms in our sample with sales data for 2007 also report exports for the same year (about 1,600 firms).[6]

[5] In Kohler, Britton and Yates (2000), an important assumption behind the idea of the offsetting trade credit channel is that the adverse financial shock must cause the external finance premium to rise by more for bank-dependent firms than for firms with access to capital markets that provide trade credit. While a tightening of liquidity conditions may worsen firms' access to bank credit, those firms that can directly fund themselves in capital markets may step in to fill the financing gap, thus reducing the effect of the credit tightening on the economy.

[6] A similar fraction of firms reported exports on average between 2005 and 2007.

The firm-level data display contours similar to those of the aggregate data (Figure 1). First, aggregate activity measured by real GDP or industrial production contracted significantly between 2008:Q3 and 2009:Q1 (top-left panel). The median firm-level output, measured by sales, displays a similar pattern (bottom-left panel). Second, global trade fell sharply during the global financial crisis: The top-middle panel shows the significant decline in exports between 2008:Q3 and 2009:Q1 for the countries in our sample. At the firm level, we measure exports as the median sales of export-intensive firms whose exports represent more than 50 percent of total sales (bottom-middle panel). The aggregate and firm-level exports data display similar contours, with significant declines at the height of the global financial crisis. Third, another notable feature of the crisis was the significant deterioration in credit provision and an attendant run-up in the cost of capital. This feature is captured in the panels to the right by the growth of credit extended to the private sector at the aggregate level (top), and by the median external financing at the firm level (which is available at the annual frequency only, bottom panel).

The similarity in the patterns of aggregate and firm-level data provides reassurance for the use of micro data to understand the linkages between financial conditions, trade, and economic activity during the global financial crisis. The richness of the micro data allows us to conduct the analysis while controlling for other factors that otherwise would have confounded estimation.

[LOCATE TABLE 1 ABOUT HERE]

Using these micro data, our cross-sectional data set is constructed as follows. (See the summary statistics in Table 1.) The dependent variable is the contraction in firm-level activity during the crisis, measured by the percent decline in quarterly sales from peak (2008:Q3) to trough (2009:Q1). Among the explanatory variables, the exports-to-sales ratio is constructed using data available at the annual frequency for 2007 (the pre-crisis year). For the baseline results, we treat firms reporting sales but not exports as non-exporters, and assign them an exports-to-sales ratio equal to zero. This

approach is supported by the property that export-reporting firms in our sample have larger sales and larger total assets on average than firms with missing exports, a pattern which is consistent with previous studies documenting that exporting firms are larger than their domestically-oriented counterparts (Bernard et al., 2007).[7] In the robustness analysis, we relax this assumption by exploring two additional methods to construct the export status of these firms, and obtain similar results.

Also in the set of explanatory variables, the pre-crisis measures of financial vulnerability consist of working capital (the difference between current assets and current liabilities, as an indicator of liquidity) and short-term debt, each normalized by total assets. There are also standard measures of external and internal financing prior to the crisis, computed as total external finance and retained earnings normalized by total assets. In addition, the firms' pre-crisis reliance on trade credit from suppliers is measured as the amount of accounts payable normalized by the cost of goods sold, following Love et al. (2007) and Levchenko et al. (2010).[8]

In addition to firm-level data, we use annual data on exports by destination detailed at the two-digit sector level (provided by Comtrade) and quarterly real GDP data to construct a measure of global demand conditions during the crisis, as described in the next section.

One advantage of the Worldscope data is the availability of firm-level sales at the quarterly frequency, even if the data on exports, working capital, short-term debt, external finance and retained earnings are available at the annual frequency only. Thus, the data allow us to study the link between firms' sales performance during the crisis measured quarterly (as the percent change in sales between the peak and trough quarters) and a set of firm characteristics measured with annual data from the pre-crisis period. Given that the downturn and subsequent recovery of

[7] After controlling for country and industry effects, the export-reporting firms in our sample had on average $177 million larger sales, and $128 million larger total assets than firms not reporting exports for 2007. These differences are statistically significant at the 1 percent level.

[8] We multiply the ratio between accounts payable and the cost of goods sold by 360, and interpret the product as the number of days for which trade credit is received, as in Love et al. (2007).

economic activity in EMEs occurred over just a few quarters, the use of annual data to measure the peak-to-trough decline in sales would have understated the effect of the crisis on sales and the corresponding variation across firms.

Firms covered by the Worldscope database report their financial indicators according to each country's fiscal year (FY), which coincides with the calendar year for all countries in our sample except for India and Thailand. To match the firm-level data with the period marked by the crisis, the fiscal years are converted into calendar years by re-aligning the quarterly data for India (where FY 2009 started in April 2008) and Thailand (where FY 2009 started in October 2008).[9] For the same reason, for India and Thailand, the annual data reported for FY 2009 is assigned to calendar year 2008.

Out of the initial 6,000 firms, our econometric analysis is confined to the sub-sample of firms for which data are simultaneously available for the dependent and explanatory variables. The sample size is further reduced by the removal of outliers; we replace observations in both the top and bottom percentiles for external finance (which can be either positive or negative) with missing values, and those in the bottom percentiles for retained earnings and working capital. For the exports-to-sales ratio, short-term debt, and accounts payable (which have a lower zero bound), we replace the outliers with missing values for observations in the top percentiles only.

3 Empirical Methodology

To study the cross-sectional behavior of firm-level sales and trade credit received during the crisis, this paper uses three alternative econometric specifications, described by Models 1-3 below.

[9] For India, the first quarter of FY2009 became the second quarter of calendar year 2008. For Thailand, the first quarter of FY2009 became the fourth quarter of calendar year 2008.

3.1 Model 1: Determinants of Firm Performance

The first model studies the determinants of firm performance during the crisis, which is expressed as the peak-to-trough percent change in firm sales between 2008:Q3 and 2009:Q1, and constitutes the dependent variable in the regression. The set of explanatory variables consists of firm-specific characteristics, including financial vulnerability, reliance on different sources of financing, and export status all measured in 2007 (the pre-crisis year), as well as the change in the firm-specific global demand conditions during the crisis. The econometric specification is as follows:

$$\%\Delta\text{Sales}_i = \alpha + \beta_1 \text{FinVuln}_{2007,i} + \beta_2 \text{FinSource}_{2007,i} + \beta_3 \text{Exp/Sales}_{2007,i} + \beta_4 \%\Delta\text{Demand}_{isc} +$$

$$+ \sum_c \delta_c \text{Country}_{ci} + \sum_s \delta_s \text{Industry}_{si} + \sum_v \delta_v \text{Size}_{vi} + \varepsilon_i, \quad (1)$$

where the explanatory variables are:

1. Indicators reflecting the degree of financial vulnerability across firms at the onset of the crisis ($\text{FinVuln}_{2007,i}$). These are working capital as a measure of financial liquidity, and the stock of short-term debt normalized by total assets.

2. Measures of firms' reliance on external and internal sources of finance prior to the crisis ($\text{FinSource}_{2007,i}$). These include the total external finance and retained earnings, each normalized by total assets, and the amount of trade credit received from suppliers, measured as the stock of accounts payable normalized by the cost of goods sold in 2007.

3. Firms' export status ($\text{Exp/Sales}_{2007,i}$), measured as the exports-to-sales ratio in 2007.

4. A firm-specific measure for the change in global demand conditions during the crisis ($\%\Delta\text{Demand}_{isc}$), constructed as described in Section 3.1.1 below.

5. Dummy variables to isolate the country, industry, and firm size effects. Firms are assigned to 22 industry groups provided by the Worldscope database, after excluding non-manufacturing firms from the sample. Firms are also ranked in three size categories (top, mid, and bottom) based on their total assets in 2007.

6. In the robustness analysis, we include additional variables such as the initial level of sales in 2008:Q3 to control for convergence effects, two alternative measures of export status, as described in Section 4.2, and indices for domestic and external demand.

3.1.1 Demand Index

We construct the firm-specific index of global demand as a function of the firms' exports-to-sales ratio, the sector-specific exposure to demand from various foreign destinations, and the real GDP growth across destinations as a proxy for the change in demand during the crisis. Since the firm-level export data are not detailed by destination, we use the sector-level data on exports by destination detailed at the 2-digit level (provided by Comtrade SITC rev.3) for each country of origin to approximate the firms' exposure to foreign destinations.[10] For each sector and country of origin, we compute the shares of 31 export destinations for 2007. On average, the 31 destinations comprised more than 90 percent of our countries' exports. Thus, the sector-specific reliance on foreign markets is assigned to the corresponding firms according to their primary sector of activity, country of origin, and firm-specific degree of export reliance.

Using the method just described, the demand index ($\%\Delta\text{Demand}_{isc}$) for firm i in sector s and country of origin c is a weighted average of the change in domestic and external demand between 2008:Q3 and 2009:Q1, with the weights given by the firm-specific exports-to-sales ratio (Exp/Sales_i)

[10] For Taiwan, since Comtrade does not provide exports data, we compute the demand index using the sector-specific export shares by destination from Malaysia, a country in our sample whose exports structure is most similar to that of Taiwan. Our results are robust to the exclusion of Taiwan, suggesting that this assumption is not materially affecting our results.

in 2007:

$$\%\Delta\text{Demand}_{isc} = (1 - \text{Exp/Sales}_i) \times \%\Delta\text{GDP}_c + \text{Exp/Sales}_i \times \sum_d (w_{dsc} \times \%\Delta\text{GDP}_d)\,. \qquad (2)$$

In equation (2), the real GDP growth between 2008:Q3 and 2009:Q1 in country of origin c represents a proxy for the change in domestic demand conditions. Similarly, the average real GDP growth between 2008:Q3 and 2009:Q1 across the 31 foreign destinations is a proxy for the change external demand conditions, weighted by the shares w_{dsc} of each destination d in the exports of sector s from country of origin c in 2007.[11]

3.2 Model 2: Substitution Across Sources of Financing

In the second model, we explore the firms' ability to substitute across various sources of financing during 2008, the crisis year, as a strategy to relax their financial constraints. To this end, the set of explanatory variables includes the dynamic trade-off between the trade credit and the external financing that firms received during the crisis as a new dimension of firm heterogeneity, in addition to the pre-crisis financial indicators in Model 1.

Figure 2 illustrates the trade-off between external finance and new trade credit received in 2008 by the firms in our sample. On the horizontal axis, the amount of external finance (normalized by total assets) measures the flow of firm financing from outside sources in 2008, such as the issuance and/or retirement of stock and debt. Thus, negative values of external finance correspond to firms that repurchased equity or experienced declines in their outstanding debt during the crisis.[12] On the vertical axis, the difference in the stock of accounts payable between 2007 and 2008 normalized

[11] In the robustness analysis discussed in Section 4.2, the global demand index is split into its domestic and external demand components, namely $(1 - Exp/Sales_i) * \%\Delta GDP_c$ and $Exp/Sales_i * \sum_d w_{dsc} * \%\Delta GDP_d$ respectively, which enter separately in an alternative specification for Model 1.

[12] For Figures 1 and 2, the Worldscope firm-level data on external finance is available at the annual frequency only.

by the cost of goods sold shows the change in trade credit received from suppliers during the crisis. Positive values on the vertical axis correspond to firms that obtained more trade credit in 2008 relative to the previous year.

[LOCATE FIGURE 2 ABOUT HERE]

Based on Figure 2, firms are classified across the four quadrants defined by the zero lines, labeled as 1-4, starting with quadrant 1 in the North-West and moving clockwise towards quadrant 4 in the South-West. The classification of firms is as follows: (1) Firms in quadrant 1 posted an increase in trade credit received from suppliers but negative external financing, thus replacing external finance with trade credit during the crisis. (2) Firms in quadrant 2 experienced both an increase in trade credit and positive external financing, thus becoming less constrained along both dimensions. (3) Quadrant 3 includes firms with declines in trade credit but positive external financing, thus substituting trade credit with external finance in the crisis year. (4) Finally, quadrant 4 consists of firms with reduced access to both sources of finance in 2008.

In order to study the extent to which the substitution between external finance and trade credit affected sales during the crisis, we add a set of dummy variables ($\text{Quad}_{q,i}$, for $q = 1, 2, 3$) to the specification described by equation (1). The dummy variables reflect the firms' distribution across the first three quadrants:

$$\%\Delta Sales_i = \alpha + \beta_1 \text{FinVuln}_{2007,i} + \beta_2 \text{FinSource}_{2007,i} + \beta_3 \text{Exp/Sales}_{2007,i} + \beta_4 \%\Delta \text{Demand}_{isc} + \beta_5 \text{Prod}_i +$$

$$+ \beta_6 \text{TotalAssets}_i + \sum_{q=1,2,3} \theta_s \text{Quad}_{qi} + \sum_c \delta_c * \text{Country}_{ci} + \sum_s \delta_s \text{Industry}_{si} + \varepsilon_i \qquad (3)$$

We also include measures of firm productivity (Prod_i, including return on assets, gross profits normalized by total assets, and sales normalized by total assets) and firm size (TotalAssets_i, replacing the size dummy) measured prior to the crisis, in order to address a potential endogeneity issue

related to omitted variables.[13] Firms' productivity and size prior to the crisis are characteristics that may affect both their sales and their access to trade credit (or external financing) during the crisis. For instance, this would be the case if the less productive and smaller firms experienced a larger decline in both sales and trade credit received during the crisis.

On average, after controlling for financial characteristics, export status, demand, country, industry and size, we expect firms in quadrant 1 to outperform their counterparts in quadrant 4, since their improved access to trade credit should offset, at least partially, the reduced access to external finance. We also expect firms in quadrant 2 to outperform those in other quadrants. Finally, firms in quadrant 3 should fare better than those in quadrant 4.

In the robustness analyses, we include the initial level of sales in 2008:Q3 to control for convergence effects, and use two alternative measures of export status.

3.3 Model 3: Determinants of Trade Credit

The third model studies the characteristics of firms that received more trade credit from suppliers during the crisis. In particular, it explores whether the use of trade credit from suppliers as an alternative source of finance differed across exporters and non-exporters.

$$\Delta\left(\frac{\text{Payables}}{\text{CGS}}\right)_i = \alpha + \beta_1 \text{FinVuln}_{2007,i} + \beta_2 \text{FinSource}_{2007,i} + \beta_3 \text{Exp/Sales}_{2007,i} + \beta_4 \%\Delta\text{Demand}_{isc} + \\ + \sum_c \delta_c \text{Country}_{ci} + \sum_s \delta_s \text{Industry}_{si} + \sum_{l=2,3} \delta_l \text{Size}_{li} + \varepsilon_i \quad (4)$$

In the specification described by equation (4), we use quarterly data to construct the dependent variable as the peak-to-trough change in accounts payable normalized by the four-quarter sum of the cost of goods sold between 2008:Q3 and 2009:Q1. The explanatory variables consist of annual

[13] For the use of these measures as proxies for firm productivity, see Barber and Lyon (1996) and Glen and Singh (2004) for return on assets; Love and Zicchino (2006) for profits normalized by total assets; Han and Rousseau (2009) and Nahata (2008) for sales normalized by total assets.

indicators of financial vulnerability, dependence on various sources of finance other than trade credit, export reliance in 2007, exposure to demand conditions, and dummy variables for country, industry and size. In the robustness analysis, we include the initial level of trade credit to control for convergence effects, use two alternative measures export status, and construct an alternative measure of trade credit using accounts payable normalized by total assets (rather than the cost of goods sold), as in Fisman and Love (2003).

4 Results

This section discusses the baseline results for Models 1-3 described above.

4.1 Baseline Results

4.1.1 Model 1: Determinants of Firm Performance

The first column of Table 2 shows the baseline results for Model 1. The results suggest that, in addition to the deterioration in global demand, the firm-specific financial conditions prior to the crisis affected sales performance. Thus, greater financial liquidity ex-ante enhanced sales performance, as evidenced by the positive and statistically significant coefficient for working capital.[14] The coefficient estimate shows that, for firms with working capital (normalized by total assets) one standard deviation above the mean, sales growth was 2.8 percentage points higher. In contrast, greater reliance on external finance ex-ante affected firms' sales negatively during the crisis. Firms with external finance (normalized by assets) one standard deviation above the mean suffered a 1.7 percentage points larger decline in sales.

The coefficient on the demand index is positive and statistically significant as we would expect. Those firms for which specific demand conditions deteriorated by one standard deviation (4.4

[14] The results are similar when the quick ratio (the sum of cash, cash equivalents and net receivables divided by current liabilities) is used instead of working capital as a measure of financial liquidity.

percentage points) more than the mean, sales growth was 6.8 percentage points lower.[15] It is notable, however, that even after controlling for the decline in global demand, the firm-specific indicators of financial liquidity and reliance on external finance prior to the crisis are statistically significant with the expected signs. The results suggest that, in addition to demand, financial conditions contributed to the decline in firm-level sales during the crisis.

Finally, export-oriented firms experienced a relatively more severe deterioration in sales than their domestic-oriented counterparts. Thus, sales for firms with one standard deviation more in exports as a fraction of sales before the crisis fell by 1.4 percentage points more during the crisis.

The results are preserved when we include the initial level of sales as an explanatory variable to control for convergence effects (see column 2 of Table 2).

[LOCATE TABLE 2 ABOUT HERE]

4.1.2 Model 2: Substitution across Sources of Finance

Although greater reliance on external finance prior to the crisis disrupted sales, the firms' ability to substitute external financing with trade credit during the crisis enhanced their sales performance. In Table 3, the first column shows the baseline results for Model 2, which includes the substitution quadrants along with controls for firm productivity and size.

The coefficient on quadrant 1 is positive and statistically significant, suggesting that firms that were able to obtain more trade credit from suppliers experienced a smaller decline in sales (by about 8 percentage points less) relative to firms in quadrant 4 (which experienced a reduction in both trade credit and external finance during the crisis). The coefficient on quadrant 3 is not statistically significant, i.e. firms with less trade credit but more external finance did not fare better than firms with less access to both sources of finance, a result which highlights the importance of

[15] The changes in sales and global demand are expressed in the same units for the same interval. For the former, it is the percent change in firm-level sales. For the latter, it is the percent change in the weighted average of domestic and foreign GDP, weighted by each firm's export reliance and sector-level export shares across 31 destinations.

the trade credit dimension in understanding the sales performance across firms. Thus, the ability to substitute away from external finance towards trade credit enhanced sales, but the reverse was not true, possibly owing to the more onerous nature of external finance at times of financial turmoil. Finally, as expected, firms in quadrant 2 (which obtained more trade credit and more external financing) experienced smaller declines in sales relative to the firms in quadrant 4 (by almost 11 percentage points less).

We do not believe that the results for the quadrants are driven by reverse causality. The peak-to-trough change in sales is measured over 2008:Q3-2009:Q1, whereas external financing and trade credit (i.e. the variables used to construct the quadrants) are measured over 2008. As such, the overlap between the change in sales and the financing variables used to construct the quadrants is only one quarter, namely 2008:Q4. Moreover, it seems implausible that the firms' lack of access to external financing was due exclusively to the anticipation of the decline in sales, but not related to the exogenous deterioration in global funding conditions emanating from the shock in advanced economies, following the collapse of Lehman Brothers in September 2008.

Interestingly, once we control for the substitution between external financing and trade credit in Model 2, the coefficient on the export-to-sales ratio becomes statistically insignificant (it was significant in Model 1). This is consistent with the notion that exporters and non-exporters differed in their ability to substitute external financing with trade credit. Indeed, in Figure 2, out of the firms in quadrants 1 and 2 (firms that received more trade credit during the crisis), only 6.1 percent were export-intensive (with exports representing at least half of total sales), compared with 9.2 percent for the firms in quadrants 3 and 4.[16]

The pre-crisis financial indicators are statistically significant and have the expected sign, in line with our previous results. Firms that were more financially liquid before the crisis performed

[16] Overall, 7.9 percent of the firms in Figure 2 had exports accounting for more than half of sales in 2007.

better during the crisis; firms with ex-ante working capital one standard deviation above the mean enjoyed 3.1 percentage points more in sales growth. Similarly, firms with greater reliance on trade credit from suppliers before the crisis fared better; firms with trade credit one standard deviation above the mean experienced 2.9 percentage points more in sales growth.

These results are preserved when we control for the initial level of sales, as shown in column 2 of Table 3. The pre-crisis financial variables and the substitution quadrants preserve their sign and statistical significance. In addition, the control variables for productivity (profits and sales normalized by assets) and size (total assets) are positive and statistically significant as expected.

[LOCATE TABLE 3 ABOUT HERE]

4.1.3 Model 3: Determinants of Trade Credit

Given that increased access to trade credit improved sales performance, the next set of results shed light on the characteristics of firms that were able to use more trade credit as an alternative source of finance during the crisis, based on the specification in Model 3. Table 4 (first column) shows the baseline results for the link between the change in trade credit and firm-specific indicators of financial vulnerability and export reliance measured prior to the crisis.

First, the more financially-vulnerable firms increased their use of trade credit during the crisis, as shown by the coefficient on short-term debt, which is positive and statistically significant. The finding indicates that some of the financially-vulnerable firms used more trade credit as an alternative form of finance, likely due to the fact that their short-term debt matured and became difficult to rollover during the crisis. Firms with short-term debt one standard deviation above the mean received trade credit for 3.6 additional days from suppliers at the height of the crisis. This result is economically significant, since for the average firm, trade credit from suppliers declined by about 4 days from the peak to the trough quarters of the crisis (see Table 1).

Second, the more export-oriented firms were less able to use trade credit as an alternative source of finance. The results show a negative and statistically-significant relation between the export share of sales in 2007 and the peak-to-trough change in trade credit during the crisis. Firms with exports-to-sales ratio one standard deviation above the mean received trade credit from suppliers for 1.2 less days. This result is consistent with the uneven distribution of export-oriented firms across the four quadrants in Figure 2, as discussed above. The finding suggests that export-intensive firms experienced less access to trade credit as an alternative source of finance, which likely contributed to the decline in their sales.

The negative link between the ex-ante export status and the use of trade credit during the crisis is preserved in the robustness analysis when the initial level of trade credit is added to control for convergence effects (column 2 of Table 4). It is also robust to alternative measures of export reliance (columns 3 and 4, also see Sections 4.2.1 and 4.2.2), and trade credit measured as accounts payable normalized by total assets rather than the cost of goods sold (column 5). In addition, the robustness analysis confirms that firms that were more vulnerable and less liquid ex-ante (i.e. were more reliant on external financing and had less working capital) used more trade credit from suppliers during the crisis (see columns 4 and 5).

[LOCATE TABLE 4 ABOUT HERE]

4.1.4 Discussion

Our main results indicate that financially-distressed firms received more trade credit during the crisis, which provided relief from the credit crunch and allowed them to maintain relatively better sales. However, exporters were less able to use trade credit as an alternative source of financing, consistent with our view that their more binding financial conditions contributed to the disproportionate decline in their sales during the crisis. These results raise two important questions.

First, why would financially-distressed firms be able to use more trade credit from suppliers as an alternative form of financing? The trade credit literature argues that suppliers have a monitoring advantage over banks. In the course of business, suppliers obtain information about the borrower which other lenders can only obtain at a cost (see Schwartz and Whitcomb, 1978 and 1979, or Emery, 1987). As such they are able to extend credit to firms that otherwise could not secure bank loans. Moreover, suppliers have an advantage over banks in enforcing debt repayments. They can credibly threaten to cut off future supply of inputs, and also have industry knowledge that allows them to liquidate the collateral in case of default. This is consistent with findings by Demirguc-Kunt and Maksimovic (2001) that trade credit is relatively more prevalent in countries with worse legal institutions.

Second, why would exporters have less access to trade credit during the crisis? Studies find that exporting firms are generally less financially vulnerable than domestically-oriented ones (see Minetti and Zhu, 2011, or Muuls, 2008), whereas trade credit is a source of financing used mostly by the more financially-vulnerable firms, as shown in the previous paragraph. The results support our view that, since exporters did not have a need to develop the trade credit channel in normal times, they generally could not use it as an alternative source of financing at the height of the crisis.

4.2 Additional Robustness Analysis

The baseline results described above are subject to some caveats, which are addressed in the next set of analyses.

4.2.1 Exports-to-sales ratio computed from logit model

The analysis so far assumed that firms reporting sales but not exports for 2007 were non-exporters, and thus assigned a value of zero to their exports-to-sales ratio, as discussed in Section 2. There

is a possibility that some exporters may fail to report exports data, in which case assigning zero values to their exports-to-sales ratio could be problematic.

To ensure that our results are not driven by this assumption, we re-estimate Models 1, 2 and 3 with an alternative measure of export reliance, using the following approach. First, we estimate a logit model for the sub-sample based on firms that reported either positive or zero exports for 2007. The dependent variable is the exporting status (exporter vs. non-exporter), and the predictor variable is the log of the sales-to-total assets ratio in 2007 as a proxy for firm productivity, along with dummy variables to control for industry and country of origin.[17] This approach follows the well-established empirical result from previous studies that exporting firms are larger and more productive than their domestically-oriented counterparts (Bernard et al., 2007). The results indicate a positive and statistically significant slope coefficient for the log of the sales-to-total assets ratio, suggesting that the probability of the firm being an exporter increases with firm productivity. Second, using the logit estimate, we compute the probability of exporting as a function of productivity for all the firms in our sample, including for firms that did not report exports but reported sales and total assets for 2007.[18] Third, the resulting export probabilities are used as a proxy for export status in Models 1, 2 and 3. In addition, the global demand index is re-computed using the new proxy for the exports-to-sales ratio.

The results, presented in the third column for each of Tables 2, 3 and 4, are largely similar to the baseline results for each model, confirming that the assumption of zero exports for the missing observations does not materially affect our baseline results. In Table 2 (column 3), the coefficient for working capital is still positive and statistically significant, while those of external finance and export intensity are negative and statistically significant. In Table 3 (column 3), the coefficients

[17] See Han and Rousseau (2009) and Nahata (2008) for the use of sales normalized by total assets as an indicator of firm productivity.

[18] Using the logit estimates, we compute the probability that a firm is an exporter as follows: $prob(i = \text{exporter}) = \exp(X_i\beta)/[1 + \exp(X_i\beta)]$.

on quadrants 1 and 2 are still positive and statistically significant. In Table 4 (column 3), the coefficient on export status is negative and statistically significant.

Constructing the export status for non-reporting firms from the logit model has the advantage that it generates variation in the exports-to-sales ratio using a reasonable economic assumption (i.e. export status depends on firm productivity). One possible limitation of this approach arises from the inability to determine the properties of the second-stage estimator, which depend on the extent to which the sub-sample of firms reporting exports (used in the logit, first-stage estimation) is representative of the entire sample of firms used in the second-stage regression. However, we do not believe that this limitation drives our results. To be sure, we perform an additional robustness check by imputing the firm-level export status from sector-level averages as described below.

4.2.2 Exports-to-sales ratio from sector averages

On a country-by-country basis, we assign the average exports-to-sales ratio computed at the 3-digit sector level to the firms in that sector that have missing export observations for 2007. We use sector-level average ratios to impute exports at the firm level for each country if at least three firms in that sector and country reported exports. However, we keep the original exports-to-sales ratio for firms that report either zero or positive exports.

The results for the determinants of sales performance, presented in the fourth column of Tables 2 and 3, are similar to the baseline results for each model. Similarly, in the fourth column of Table 4, the negative link between export status and trade credit during the crisis is consistent with the baseline results from the first column.

4.2.3 Domestic vs. External Demand

In order to assess the impact of domestic vs. external demand conditions separately on sales performance during the crisis, the global demand index in equation (2) is split into its domestic and external demand components, namely $(1-Exp/Sales_i)\times\%\Delta GDP_c$ and $Exp/Sales_i\times\sum w_{dsc}\times\%\Delta GDP_d$, respectively. The two components are included separately in the estimation of Model 1.[19] The results, reported in column 5 of Table 2, show positive and statistically significant links between firm sales and each of the domestic and external components of demand. In addition, column 6 shows the results for the measures of domestic and external demand interacted with country dummy variables. To save space, only the country interactions with statistically significant coefficients are reported.[20] For domestic demand, the interacted terms are positive and statistically significant for Malaysia and Thailand, economies which suffered large real GDP contractions during the crisis.[21] Notably, for external demand, the interacted terms are positive and statistically significant for China, Malaysia, and Thailand, suggesting that sales of firms in these countries were more sensitive to the deterioration in external demand.

4.2.4 Inventories

One potentially important variable missing from the headline analysis is the level of firms' inventories. Inventories play an important role in meeting demand when production is disrupted. During the financial crisis, firms with production constrained by the dire financial conditions could have drawn on inventories to fulfill some or all of the demand for their products. In this case, financial conditions would have a smaller effect on sales.

We re-estimate Models 1 and 2 for the determinants of sales performance while controlling for

[19] The export-to-sales ratio is excluded due to its perfect correlation with the domestic demand component within each country.

[20] The complete set of results for the interacted variables are available upon request.

[21] In contrast, China, India and Indonesia are among the few EMEs that did not contract during the 2008-09 crisis.

the inventories-to-sales ratio measured in 2007. Indeed, the results in Table 5 show positive and statistically significant coefficients on the inventories-to-sales ratio (columns 1 and 3), indicating that firms with higher levels of inventories relative to sales prior to the crisis experienced a relatively smaller decline in sales during the crisis. In addition, the specifications in columns (2) and (4) interact the inventories-to-sales ratio with the financial variables already discussed. The coefficients on the interacted terms with short-term debt and external finance are statistically significant and have the expected signs. Thus, the sales of firms with higher pre-crisis levels of inventories relative to sales were less constrained by their vulnerability position or reliance on external finance. These results point to an important role of inventories in alleviating, but not eliminating, the effect of financial constraints on performance, as our benchmark results indicate.

[LOCATE TABLE 5 ABOUT HERE]

5 Conclusions

We explore the extent to which financial conditions contributed to the decline in firms' sales at the height of the 2008-09 global financial crisis using micro data from six emerging market economies in Asia. Even after controlling for demand, we find that financial conditions adversely affected sales during the crisis, and that the use of trade credit played an important role in the relative performance of firms. In particular, when financing conditions deteriorated, the more financially-vulnerable firms turned to trade credit from suppliers as a supplement to other forms of financing. In addition, firms that were able to replace external finance with trade credit had better sales. In contrast to domestic-oriented firms, export-intensive firms with comparable financial vulnerability relied less on trade credit as an alternative source of financing, and experienced sharper declines in sales.

Our findings have implications for the design of policy to cushion the effect of future financial

crises. Policy makers and firms would be well-advised to explore the development of trade credit as an additional source of financing, which might not be as desirable in normal times, but could prove useful during crises when credit markets become impaired.

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Table 1. Summary statistics

Variable	Frequency	No. obs.	Mean	St. dev.	Min.	Max.	Unit
Dependent variables							
%Δ Sales $_{2008:Q3\text{-}2009:Q1}$	Quarterly	4,590	-19.09	40.41	-100.00	261.15	%
Change in Acc. Payable/CGS $_{2008:Q3\text{-}2009:Q1}$	Quarterly	2,077	-4.03	30.73	-210.82	239.46	days
Change in Acc. Payable/Tot. Assets $_{2008:Q3\text{-}2009:Q1}$	Quarterly	1,597	-2.45	6.26	-49.62	29.01	%-point
Explanatory variables							
Working Capital/Assets $_{2007}$	Annual	5,897	0.19	0.27	-1.24	1.00	-
Short-term debt/Assets $_{2007}$	Annual	5,815	0.15	0.14	0.00	0.82	-
External Finance/Assets $_{2007}$	Annual	5,825	0.06	0.13	-0.24	0.66	-
Retained Earnings/Assets $_{2007}$	Annual	4,096	0.01	0.36	-3.50	0.90	-
Acc. Payable/CGS $_{2007}$	Annual	5,679	65.84	49.41	0.00	359.73	days
Export status and demand index							
Exports/Sales $_{2007}$	Annual	5,940	0.08	0.21	0.00	1.00	-
Exports/Sales $_{2007,}$ logit	Annual	5,844	0.88	0.13	0.07	1.00	-
Exports/Sales $_{2007,}$ 3-digit sector	Annual	4,351	0.35	0.28	0.00	0.99	-
%Δ Demand	Annual	5,562	-1.16	4.37	-6.80	3.30	%
%Δ Demand, logit	Annual	5,472	-3.41	1.16	-7.56	2.04	%
%Δ Demand, 3-digit sector	Annual	4,031	-1.13	3.22	-6.71	3.30	%
Firm productivity, size and inventories							
Return on Assets $_{2007}$	Annual	5,658	6.81	8.65	-33.21	42.83	%
Gross Profits/Total Assets $_{2007}$	Annual	5,648	0.34	0.59	-1.91	3.99	-
Sales/Total Assets $_{2007}$	Annual	5,956	0.92	0.68	0.00	10.32	-
Total Assets $_{2007}$	Annual	5,968	383.25	1,448.17	0.00	43,609.22	US$ mil
Inventories/Sales $_{2007}$	Annual	5,801	0.26	0.37	0.00	3.55	-
Convergence variables (initial levels)							
Sales $_{2008:Q3}$	Quarterly	4,798	61.87	133.03	-2.45	1310.87	US$ mil
Acc. Payable/CGS $_{2008:Q3}$	Quarterly	1,642	56.82	47.29	0.09	346.99	days
Acc. Payable $_{2008:Q3}$/Total Assets $_{2007}$	Quarterly	1,703	11.69	10.87	0.01	77.58	%

Data sources: Worldscope (for firm-level data), Haver Analytics (for macro data used in the demand index) and authors' calculations. See Section 2 for details.

Table 2. Determinants of firm sales, Model 1

Dependent variable: % Change in Sales, 2008:Q3-2009:Q1

	(1)	(2)	(3)	(4)	(5)	(6)
Assumptions:	Baseline	Robustness, control for initial sales	Robustness, exp. status from productivity	Robustness, exp. status from sector averages	Robustness, dom. vs. ext. demand	Robustness, dom. vs. ext. demand
Working Capital/Assets $_{2007}$	10.24**	9.845**	10.99**	17.55***	9.845**	9.887**
	(4.708)	(4.756)	(4.728)	(5.631)	(4.756)	(4.776)
Short-term debt/Assets $_{2007}$	-3.629	-4.377	-1.910	-7.583	-4.379	-4.612
	(7.372)	(7.475)	(7.373)	(8.613)	(7.475)	(7.518)
External Finance/Assets $_{2007}$	-13.22**	-12.98**	-14.65***	-0.577	-12.95**	-13.12**
	(5.223)	(5.238)	(5.318)	(7.370)	(5.238)	(5.257)
Retained Earnings/Assets $_{2007}$	-0.889	-0.768	-0.0510	-1.399	-0.763	-0.897
	(3.715)	(3.723)	(3.637)	(4.271)	(3.722)	(3.802)
Acc. Payable/CGS $_{2007}$	0.0144	0.0118	0.00473	0.0163	0.0118	0.0115
	(0.0199)	(0.0201)	(0.0194)	(0.0257)	(0.0201)	(0.0202)
Exports/Sales $_{2007}$	-6.491**	-5.851**	-91.07***	-13.59***		
	(2.532)	(2.617)	(31.04)	(4.085)		
%Δ Demand	1.548**	1.466**	1.317	3.574***		
	(0.666)	(0.678)	(1.047)	(0.964)		
%Δ Domestic demand					1.295**	
					(0.629)	
%Δ Domestic demand × Malaysia						17.40**
						(8.312)
%Δ Domestic demand × Thailand						34.82***
						(3.004)
%Δ External demand					2.739**	
					(1.083)	
%Δ External demand × China						18.46**
						(8.806)
%Δ External demand × Malaysia						31.39**
						(15.26)
%Δ External demand × Thailand						83.37***
						(7.528)
Sales $_{2008\text{-}Q3}$		-0.00683*	-0.00331	-0.00274	-0.00682*	-0.00679*
		(0.00394)	(0.00416)	(0.00449)	(0.00394)	(0.00395)
Constant	-30.11***	-30.32***	52.29*	-31.88***	-31.45***	-55.65***
	(8.580)	(8.637)	(30.56)	(6.922)	(8.482)	(18.39)
Observations	3,063	3,020	3,024	1,757	3,020	3,020
R-squared	0.107	0.106	0.113	0.152	0.106	0.108
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Firm size dummies	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Heteroskedasticity-robust standard errors are reported in parentheses. To preserve space, only the country interactions with statistically significant coefficients are reported in column 6. The demand index for firm i in sector s, country c is: $\%\Delta Demand_{isc} = (1 - Exp/Sales_{2007,i}) \times \%\Delta GDP_c + Exp/Sales_{2007,i} \times \Sigma_d (Weight^d_{sc} \times \%\Delta GDP^d)$, where: (1) $Exp/Sales_{2007,i}$ is the exports/sales ratio obtained as follows: (a) In columns 1, 2, 5 and 6, it is equal to the exports/sales ratio for firms that report either zero or positive exports, and zero for firms that report no exports for 2007. (b) In column 3, it is the probability that firms were exporters in 2007, computed from a logit estimation of export status as a function of productivity (sales/total assets) for the sub-sample of firms that report either zero or positive exports for 2007. (c) In column 4, it is equal to the 3-digit sector average ratio for firms that do not report exports for 2007, and to the firm-specific ratio for firms that report either zero or positive exports for 2007. (2) $\%\Delta GDP_c$ is real GDP growth for firms' country of origin c between 2008:Q3 and 2009:Q1, as a proxy for the change in domestic demand. (3) $Weight^d_{sc}$ is the share of destination d in the exports of sector s from country c; for Taiwan, since Comtrade does not provide trade data, we use Malaysia's export shares by destination. (4) $\%\Delta GDP^d$ is the real GDP growth for the destination country d between 2008:Q3 and 2009:Q1, as a proxy for the change in external demand.

Table 3. Determinants of firm sales, Model 2

Dependent variable: % Change in Sales, 2008:Q3-2009:Q1

	(1)	(2)	(3)	(4)
Assumptions:	Baseline	Robustness, control for initial sales	Robustness, exp. status from firm productivity	Robustness, exp. status from sector averages
Working Capital/Assets $_{2007}$	11.38**	10.98**	11.63**	12.27*
	(4.661)	(4.728)	(4.702)	(6.736)
Short-term debt/Assets $_{2007}$	-7.530	-7.604	-6.929	-13.28
	(6.829)	(6.944)	(6.844)	(9.236)
External Finance/Assets $_{2007}$	-6.725	-6.223	-7.655	2.974
	(5.931)	(5.977)	(6.023)	(7.907)
Retained Earnings/Assets $_{2007}$	4.185	4.304	4.153	6.536*
	(2.837)	(2.866)	(2.747)	(3.572)
Acc. Payable/CGS $_{2007}$	0.0592***	0.0578***	0.0564***	0.0513**
	(0.0198)	(0.0198)	(0.0194)	(0.0250)
Exports/Sales $_{2007}$	-3.355	-2.796	-97.24***	-15.12***
	(2.570)	(2.686)	(35.02)	(4.243)
%Δ Demand	1.919***	1.921**	1.286	3.503***
	(0.739)	(0.750)	(1.060)	(1.037)
I_Quad1	8.385***	8.226***	8.457***	7.434***
	(1.853)	(1.865)	(1.853)	(2.538)
I_Quad2	10.61***	10.43***	10.06***	9.705***
	(2.286)	(2.309)	(2.293)	(3.161)
I_Quad3	0.326	0.442	0.0666	-0.126
	(1.472)	(1.496)	(1.476)	(1.823)
Return on Assets $_{2007}$	-0.135	-0.126	-0.0897	-0.184
	(0.0987)	(0.0997)	(0.0990)	(0.127)
Gross Profits/Total Assets $_{2007}$	4.554***	4.700***	4.634***	4.647**
	(1.684)	(1.710)	(1.693)	(2.173)
Sales/Total Assets $_{2007}$	1.555	2.591**	5.844***	2.298
	(1.124)	(1.291)	(1.473)	(1.406)
Total Assets $_{2007}$	7.75e-05	0.00284*	0.00782***	0.00139
	(0.000328)	(0.00157)	(0.00244)	(0.00191)
Sales $_{2008\text{-}Q3}$		-0.0129**	-0.0249***	-0.00249
		(0.00601)	(0.00767)	(0.00689)
Constant	-35.59***	-36.50***	45.61	-35.81***
	(9.836)	(9.891)	(34.30)	(7.887)
Observations	2,501	2,462	2,464	1,481
R-squared	0.152	0.151	0.164	0.191
Country dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: See the notes to Table 2, including for the construction of $Exp/Sales_{2007,i}$ and $\%\Delta Demand_{isc}$.

Table 4. Determinants of trade credit, Model 3

Dependent variable: Change in Acc. Payable normalized by the Cost of Goods Sold (columns 1-4) and by Total Assets (column 5) in the interval 2008:Q3-2009:Q1

	(1)	(2)	(3)	(4)	(5)
Assumptions:	Baseline	Robustness, control for initial acc. payable	Robustness, exp. status from firm productivity	Robustness, exp. status from sector averages	Robustness, Acc. Payable norm. by assets
Working Capital/Assets $_{2007}$	6.641	-3.098	-1.118	-9.116	-1.671**
	(8.054)	(7.896)	(8.009)	(6.841)	(0.739)
Short-term debt/Assets $_{2007}$	25.94***	10.16	12.66	18.52	-1.857
	(9.300)	(9.454)	(9.481)	(11.90)	(1.363)
External Finance/Assets $_{2007}$	13.81	10.53	7.909	29.09***	0.566
	(9.883)	(10.38)	(10.60)	(10.95)	(1.159)
Retained Earnings/Assets $_{2007}$	-0.491	-4.619	-4.213	-0.437	0.00617
	(6.927)	(6.526)	(6.270)	(4.228)	(0.613)
Exports/Sales $_{2007}$	-5.777*	-5.195*	-61.27*	-6.360*	-1.142**
	(3.270)	(3.139)	(36.79)	(3.596)	(0.555)
%Δ Demand	0.124	0.788	2.184	1.927**	0.0724
	(0.884)	(0.883)	(1.400)	(0.976)	(0.130)
Acc. Payable/CGS $_{2008:Q3}$		-0.233***	-0.237***	-0.160***	
		(0.0397)	(0.0398)	(0.0480)	
Acc. Payable $_{2008:Q3}$/Total Assets $_{2007}$					-0.325***
					(0.0224)
Constant	6.382	16.06	75.40**	11.16	0.473
	(11.26)	(12.61)	(36.00)	(9.311)	(1.822)
Observations	1,246	1,187	1,161	744	1,254
R-squared	0.054	0.148	0.157	0.142	0.468
Country dummies	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes
Firm size dummies	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: See notes to Table 2, including for the construction of $Exp/Sales_{2007,i}$ and $\%\Delta Demand_{isc}$.

Table 5. Determinants of firm sales, robustness to inventories

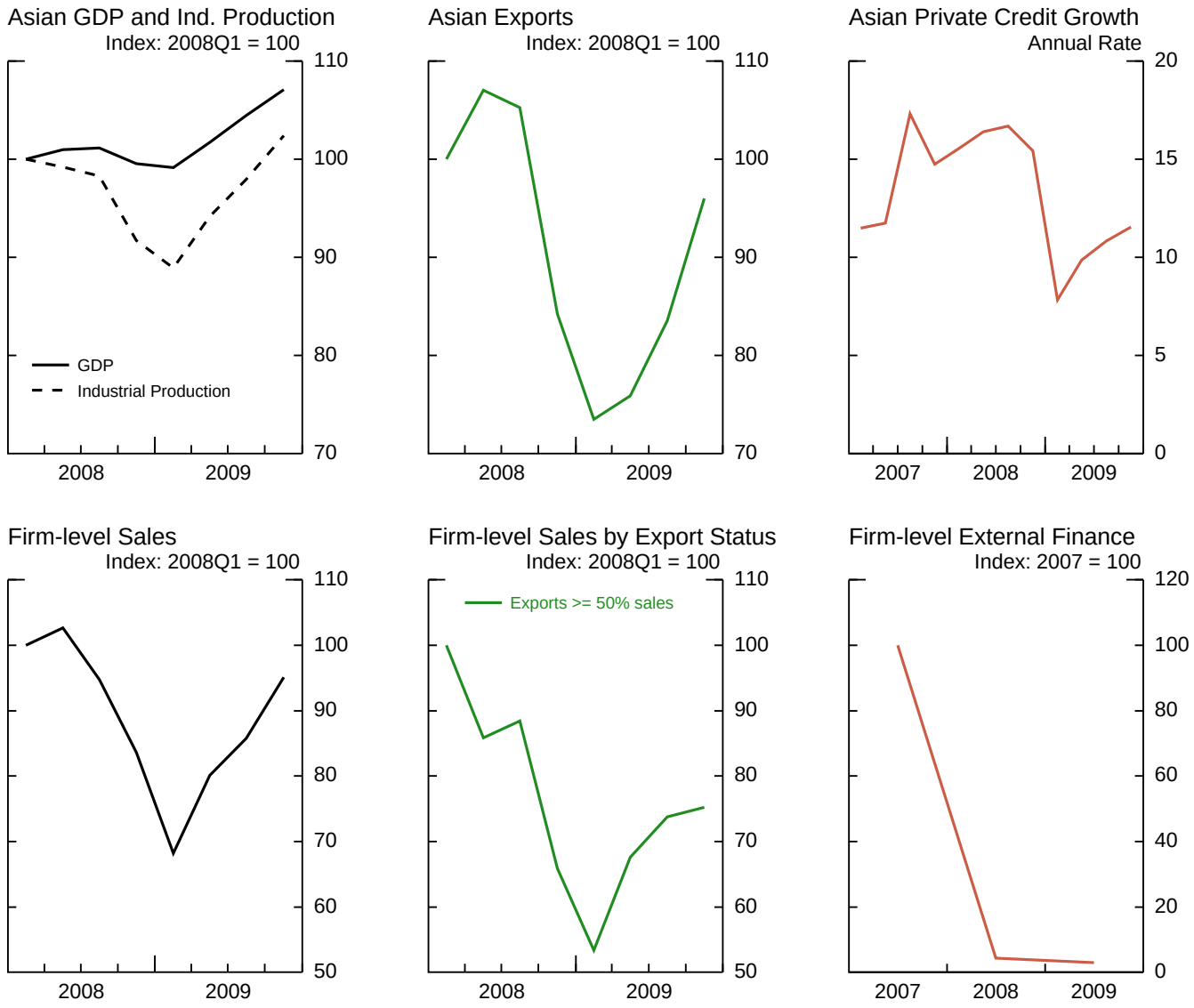
Dependent variable: % Change in Sales, 2008:Q3-2009:Q1

	(1)	(2)	(3)	(4)
Models:	Model 1	Model 1	Model 2	Model 2
Working capital/Assets $_{2007}$	6.787	8.301	6.746	7.689
	(4.932)	(5.337)	(4.908)	(5.559)
Short-term debt/Assets $_{2007}$	-9.177	-21.47**	-15.44**	-20.69**
	(7.561)	(8.532)	(7.121)	(8.483)
External Finance/Assets $_{2007}$	-13.70***	-26.29***	-6.703	-20.69***
	(5.207)	(6.330)	(5.912)	(7.227)
Retained Earnings/Assets $_{2007}$	-0.229	0.442	4.167	7.067*
	(3.717)	(4.708)	(2.887)	(4.198)
Acc. Payable/CGS $_{2007}$	-0.000992	-0.00532	0.0460**	0.0429*
	(0.0201)	(0.0210)	(0.0200)	(0.0230)
Exports/Sales $_{2007}$	-5.699**	-5.885**	-3.439	-3.798
	(2.611)	(2.618)	(2.736)	(2.776)
%Δ Demand	1.541**	1.648**	1.802**	1.875**
	(0.675)	(0.679)	(0.753)	(0.772)
I_Quad1			8.494***	8.710***
			(1.871)	(1.862)
I_Quad2			10.39***	10.27***
			(2.297)	(2.293)
I_Quad3			0.303	0.460
			(1.485)	(1.485)
Return on Assets $_{2007}$			-0.128	-0.137
			(0.0998)	(0.102)
Gross Profits/Total Assets $_{2007}$			5.558***	5.270**
			(2.121)	(2.114)
Sales/Total Assets $_{2007}$			3.082**	2.968**
			(1.239)	(1.225)
Inventories/Sales$_{2007}$	5.462*		6.310*	
	(3.188)		(3.412)	
Inv/Sales$_{2007}$ × Working capital/Assets$_{2007}$		-10.58		-1.861
		(10.15)		(9.587)
Inv/Sales$_{2007}$ × Short-term debt/Assets$_{2007}$		40.04*		19.83
		(23.33)		(16.72)
Inv/Sales$_{2007}$ × Ext. Finance/Assets$_{2007}$		47.16***		47.43***
		(16.15)		(16.43)
Inv/Sales$_{2007}$ × Ret. Earnings/Assets$_{2007}$		-1.267		-12.81
		(11.79)		(11.95)
Inv/Sales$_{2007}$ × Acc. Payable/CGS$_{2007}$		-0.000323		0.00660
		(0.0311)		(0.0306)
Sales $_{2008\text{-}Q3}$	-0.00479	-0.00468	-0.00593	-0.00635
	(0.00395)	(0.00394)	(0.00433)	(0.00432)
Constant	-29.10***	-26.31***	-37.61***	-35.50***
	(8.698)	(8.475)	(10.45)	(10.25)
Observations	3,000	3,000	2,449	2,449
R-squared	0.109	0.117	0.155	0.160
Country dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Firm size dummies	Yes	Yes	Yes	Yes

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Notes: Columns (1) and (3) add the inventory/sales ratio for 2007 as an explanatory variable to Models 1 and 2, respectively. Columns (2) and (4) add interactions of the inventory/sales ratio with each of the financial variables on rows 1-5. *Exp/Sales$_{2007,i}$* is constructed as in columns 1, 2, 5 and 6 of Table 2. See the additional notes to Table 2.

Figure 1. Aggregate vs. firm-level data

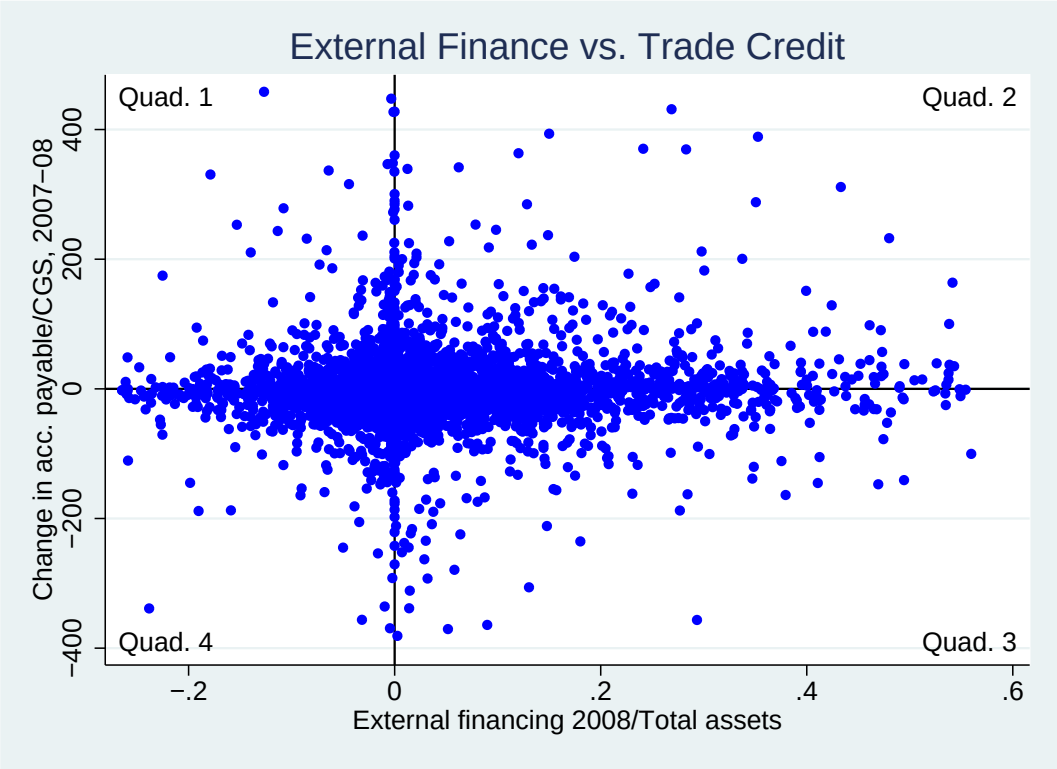


Data sources: Haver Analytics (aggregate data) and Worldscope (firm-level data).

Notes: For the aggregate data (top panels), we use real GDP (in local currencies, seasonally-adjusted) and industrial production (IP); private credit growth (computed as the q/q annualized growth rate of outstanding private credit in local currencies, non seasonally-adjusted); and exports (in nominal US$, seasonally-adjusted) for six emerging Asian economies (China, India, Indonesia, Malaysia, Thailand and Taiwan). We normalize the GDP, IP and exports series relative to 2008:Q1, and take non-weighted averages of the resulting indices for the six countries. For private credit, we use: (1) China: Uses of credit funds of Financial Institutions, 100 Mil. Yuan, NSA; (2) India: Domestic Credit: Commercial Sector, NSA, Millions Rupees; (3) Indonesia: Commercial Bank Credit, NSA Bil. Rupiahs; (4) Malaysia: Banking Sector: Claims on Private Enterprises, NSA, Mil. Ringgit; (5) Taiwan: Loans/Investments of Major Financial Institutions: Claims on Private Sector, NSA, 100 Mil. NT$; (6) Thailand: Depository Corporations Survey: Claims on Other Sectors, NSA, Mil. Baht.

For the firm-level data (bottom panels), we report medians computed across the full sample of firms from the six emerging Asian countries (China, India, Indonesia, Malaysia, Thailand and Taiwan), and report the values relative to 2008:Q1. For firm-level external finance (bottom-right panel), the data is available at the annual frequency only.

Figure 2. External financing and trade credit during the 2008-09 crisis



Data source: Worldscope firm-level data. The sample includes firms from China, India, Indonesia, Malaysia, Taiwan and Thailand.

Note: On the horizontal axis, the amount of external finance (available at the annual frequency only) normalized by total assets measures the flow of firm financing from outside sources in 2008, such as the issuance and/or retirement of stock and debt. Negative values of external finance correspond to firms that repurchased equity or experienced declines in their outstanding debt during the crisis. On the vertical axis, the difference in the stock of accounts payable between 2007 and 2008 normalized by the cost of goods sold shows the change in trade credit received from suppliers during the crisis. Positive values correspond to firms that obtained more trade credit in 2008 relative to the previous year.