

Off the Cliff and Back? Credit Conditions and International Trade during the Global Financial Crisis*

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Comments are Welcome.

Abstract

We examine the collapse of international trade flows during the 2008-2009 global financial crisis using detailed data on the evolution of monthly U.S. imports over the November 2006 - April 2009 period. We show that credit constraints and the reduction in the availability of external capital were an important channel through which the crisis affected trade volumes. We identify the effects of credit tightening by exploiting the variation in the cost of capital across countries and over time, as well as the variation in financial dependence across sectors. We find that countries with higher interbank interest rates and thus tighter credit markets export less in every period and are hit harder by the crisis. These effects are especially pronounced in sectors that require extensive external financing, have few collateralizable assets, and can access limited trade credit. Exports of financially vulnerable industries are thus more sensitive to the cost of external capital than exports of less dependent industries, and this sensitivity rises during the financial crisis. Our findings imply that the crisis would have reduced trade flows by 26% more if governments had not acted to lower interest rates, and by 30% less if policy interventions had had a more immediate effect on the cost of capital. These results provide new evidence on the causal effect of credit constraints on trade, and highlight the large real effects of financial market disturbances, the substantial cost of crisis contagion across countries, and the potential welfare gains of policy intervention.

Keywords: international trade, financial crisis, credit constraints, trade credit.

JEL Classification: F10, F14, F42, G01, G20, G28.

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1 Introduction and Motivation

The 2008-2009 global financial crisis has had far-reaching economic repercussions. After a sharp and sudden collapse in international trade in the last quarter of 2008, world trade flows are projected to decline by up to 12% in 2009. This greatly exceeds the anticipated loss of 6% in industrial output and 2.5% in income per capita.¹ The contraction in exports and imports has been particularly acute for small open economies, some of which have seen monthly trade volumes in the first few months of 2009 fall by up to 30% year-on-year. This has contributed to the spread of the crisis to countries with originally unscathed financial markets, as suggested by anecdotal evidence that many manufacturing plants have scaled down production and employment in response to limited export opportunities.²

Two aspects of the financial crisis are believed to have triggered this large decline in international trade: the slowdown in global demand and the reduction in the availability of external finance. There has been limited direct evidence, however, on either of these mechanisms. Understanding the factors that led to the collapse in trade flows and its slow recovery will shed light on its potential long-term consequences and uneven impact across countries and sectors. It will also facilitate the design of optimal policy interventions that can mitigate or even neutralize the real effects of future financial crises.

This paper is one of the first to establish and quantify the effect that credit tightening had on international trade during the 2008-2009 global crisis. We examine the evolution of monthly U.S. imports over the November 2006 - April 2009 period, and compare trade patterns before and during the crisis.³ We identify the effects of credit tightening by exploiting the variation in the cost of external capital across countries and over time, as well as the variation in financial dependence across sectors. We find that countries with higher interbank interest rates and thus tighter credit availability export less in every period and are hit harder by the crisis. These effects are especially pronounced in sectors that require extensive external financing, have few collateralizable assets, and can access limited trade credit. In other words, exports of financially dependent industries are more sensitive to the cost of external capital than exports of less dependent industries, and this sensitivity rises during the financial crisis. These results are robust to controlling for countries' overall development (GDP per capita) and factor endowments as a source of comparative advantage.

We also show that the exports of countries with stronger financial institutions were more resilient to the crisis, especially in sectors with high external finance dependence, few tangible assets and limited access to trade credit. These results are robust to using either a direct institutional measure (accounting

¹IMF projections.

²See for example Schwartz (2009a,b) in *The New York Times*.

³Based on the developments in global financial markets described in Section 2, we date the beginning of the crisis to the month when it started to unfold in earnest, September 2008. We discuss the robustness of our results to alternative ways of dating the crisis period later below.

standards) or an outcome-based proxy (private credit as a share of GDP) for countries' ability to efficiently allocate resources and sustain financial contracts. This suggests that both long-term institutional features of the financial system as well as short term fluctuations in the cost of capital can become a source of comparative advantage, particularly during a financial crisis.

Our findings imply that credit constraints contributed significantly to the overall decline in trade flows during the financial crisis. In particular, a 1% rise in interbank rates is associated with 16% lower trade volumes on average. Using our reduced-form estimates, we also infer how U.S. imports would have evolved under two alternative scenarios: (1) governments around the world did not actively intervene in financial markets, and interbank interest rates remained at their peak levels from September 2008; and (2) all countries implemented dramatic policy interventions immediately after September 2008, and interbank interest rates instantaneously dropped to their low levels of April 2009. We find that the 2008-2009 financial crisis would have reduced U.S. imports by 25.6% more and 30% less under these hypothetical scenarios, respectively. Moreover, there would have been large and systematic differences in the response of exports across sectors at different levels of financial vulnerability. These results highlight the large impact of financial market disturbances on the real economy, the substantial cost of crisis contagion across countries, and the scope for policy intervention.

The result that countries with lower interbank interest rates systematically export more to the United States is a reflection of the credit constraints that firms face when engaging in international trade. Access to external capital is important for both domestic production and exporting because firms often have to incur substantial up-front costs. Some of these costs are fixed, such as product development and investment in capital equipment, while others are variable, such as intermediate input purchases, advance payments to salaried workers, and land or equipment rental fees. Exporting is associated with additional, market-specific costs that can exacerbate firms' liquidity constraints. Sunk and fixed trade costs include learning about the profitability of potential export markets; making market-specific investments in capacity, product customization and regulatory compliance; and setting up and maintaining foreign distribution networks. Some variable trade costs such as shipping, freight insurance, and applicable trade duties may also have to be incurred before export revenues are realized. To overcome these liquidity constraints, firms routinely rely on bank financing or trade credit extended by their trade partners (buyers and suppliers). When firms are located in countries with access to cheaper bank credit, they are thus able to produce and export more.

While credit availability is important in all industries, for technological reasons some sectors are more dependent on the financial system. First, production and exporting in some industries are associated with larger up-front costs and thus require more external finance (Rajan and Zingales (1998)). Second, industries which employ more tangible assets such as plant, property and equipment enjoy easier access

to outside capital because firms can pledge more collateral (Braun (2003), Claessens and Laeven (2003)). Finally, in some sectors firms receive more trade credit which gives them an alternative to and reduces their dependence on bank financing (Fisman and Love (2003)). This is consistent with anecdotal evidence that most of the firms reporting the biggest losses in output and employment since September 2008 have been in computers and electronics (Sprint, Nokia, Texas Instruments, Philips, Microsoft, Sony, Ericsson), chemical manufacturing and pharmaceuticals (Pfizer), and transportation and machinery (Caterpillar, Harley Davidson), i.e. sectors with high dependence on external finance, low intensity of tangible assets, and limited access to trade credit (see Appendix Table 2). Our finding that exports in financially vulnerable sectors are particularly sensitive to high interbank interest rates thus provides further evidence that credit constraints play an important role for international trade.

We offer three potential interpretations for the result that countries with higher interbank rates experienced larger reductions in exports, particularly in financially vulnerable sectors. First, demand for countries' exports plummeted during the crisis as American households reduced consumption spending and American producers scaled down output and purchases of imported intermediate inputs.⁴ When firms need external finance for fixed up-front costs but anticipate lower export revenues, firms will find it more difficult to incentivize investors and raise the necessary bank credit. Moreover, the fall in demand is likely to pose a bigger problem in countries with already high interest rates on loans, and especially so in sectors that require more external finance but have limited tangible assets and access to trade credit.

Our second interpretation recognizes the fact that exporting firms may be able to access bank financing and trade credit in their destination market, as well as in their home country. As the crisis unfolded, the availability of bank loans and trade financing in the U.S. sharply declined. It is thus possible that U.S. imports fell partly because of the direct impact of credit tightening in the U.S. on the ability of firms in other countries to finance their exports. The differential effect of the crisis across countries and sectors can in turn be attributed to the multiplicative effects of tighter credit at home, tighter credit in the export market, and sectors' varying degree of financial dependence.⁵

Finally, given the unusual severity and rapid deepening of the 2008-2009 crisis, it is possible that economies transitioned to a new steady-state which heightened the importance of credit conditions as a source of comparative advantage.

While we are unable to distinguish between these three alternative interpretations, we emphasize that all three underscore the importance of credit constraints and financial intermediation in international trade.

⁴See Freund (2009) for historical evidence on the response of trade flows to GDP during global downturns.

⁵These two interpretations echo results in Borchert and Mattoo (2009), who find that trade in services has been more resilient to the 2008-2009 financial crisis than trade in manufactured goods. They suggest that this difference can be attributed to demand for services being relatively less cyclical, and to services production and trade being less dependent on external finance.

Our results add to a growing literature on the role of financial frictions in international trade. A number of theoretical and empirical papers have shown that, in the presence of credit constraints, countries with more developed financial institutions have a comparative advantage in financially vulnerable sectors.⁶ While this literature exploits the same cross-sector variation as us, it typically uses country-level measures of financial development (such as private credit as a share of GDP, accounting standards and creditor rights protection) that exhibit no or very limited time-series variation. By contrast, we explore the substantial variation in interbank interest rates across countries and over time using high-frequency data. We also focus on export patterns before and during a financial crises instead of on cross-country variation in steady-state.⁷

Our work is closest to that of Iacovone and Zavacka (2009), who explore the effect of 23 banking crises on exports during the 1980-2000 period. They find that exports in sectors more dependent on external finance and sectors with fewer tangible assets are hurt more during a banking crisis, but this effect is mitigated in countries with stronger levels of financial development. Our results also speak to the analysis in Amiti and Weinstein (2009), who exploit matched firm-bank data from Japan to show that banks transmitted financial shocks to exporters during the 1990s financial crisis. In comparison, we exploit high-frequency data on the cost of external finance in addition to measures of long-term financial development, and a global financial crisis instead of a banking crisis limited to one country or region. We also analyze the short-term response of trade flows at a monthly instead of annual frequency, and examine counterfactual scenarios.

Our work is also related to Kroszner, Laeven and Klingebiel (2007), who show that banking crises reduce output growth relatively more in financially vulnerable sectors. In contrast to our results, they find that this effect is actually stronger instead of weaker in countries with well-developed financial markets. They suggest that financially dependent sectors are more affected by crises in financially developed countries precisely because they had benefited most from and grown faster because of easier access to credit in such countries.

Finally, our results complement the evidence in Campello, Graham and Harvey (2009), who establish that the 2008-2009 financial crisis has had a more severe impact on planned R&D, employment and capital spending in credit-constrained firms using survey data for 1,050 CFOs in the U.S., Europe and Asia. Our findings illustrate the consequences of such exacerbated credit conditions on firms' export participation decisions.

⁶See Kletzer and Bardhan (1987), Beck, (2002), Matsuyama (2005), Becker and Greenberg (2007), Chaney (2005), Manova (2008a) and Ju and Wei (2008) for theoretical models of credit constraints in trade; Beck (2002, 2003), Becker and Greenberg (2007), Svaleryd and Vlachos (2005), Hur et al. (2006) and Manova (2008a,b) for country-level empirical evidence; and Greenaway et al. (2007), Muuls (2008) and Manova et al. (2009) for firm-level evidence.

⁷More recently, there is a growing body of empirical work based on micro-level data which shows that more credit-constrained firms do indeed have a lower propensity for undertaking exporting activities; see Amiti and Weinstein (2009) and Minetti and Zhu (2009).

The remainder of the paper is organized as follows. The next section provides a broad overview of the decline in trade flows and the rise in the cost of external finance during the crisis period. Section 3 describes the data on U.S. imports, sector measures of financial vulnerability, and country measures of credit availability. Section 4 examines the detrimental effect of the crisis on international trade, while Section 5 interprets the magnitudes of these effects via two hypothetical scenarios. The last section concludes.

2 A Preview of the Data: The Crisis-related Decline in US Imports

Our primary goal is to track how trade flows reacted to the unfolding global credit crisis. For this reason, we examine trade data at a monthly basis for the U.S., obtained from the U.S. Census Bureau website. We offer first an overview of the main trends in this data for the 2007-2009 period.

Figure 1 illustrates how aggregate U.S. trade flows unraveled as the credit crisis unfolded. Trade volumes were in fact recording modest trend growth all the way until mid-2008, but this was followed by a most severe contraction, both in terms of its magnitude and speed. U.S. trade flows witnessed a particularly sharp month-on-month decline between October and November 2008, the timing of which coincided with the height of the global credit crunch.⁸ While nervousness over the subprime portfolios of financial institutions had steadily been building up since the end of 2007, two events in September 2008 – the collapse of Lehman Brothers, and the government bailout of AIG – brought credit activity to a virtual standstill. The U.S. stock market collapsed severely in mid-October 2008 when, for several days, the prospect of a financial sector meltdown in the United States felt like an imminent possibility.

Indeed, the data on interbank lending rates (Figure 2) points to this prime rate of borrowing reaching a peak in mid-2008 in many major economies, before finally falling in November 2008 in response to the broad range of aggressive and extraordinary monetary policy moves being deployed to ease the liquidity situation. Beneath this broad trend, there are nevertheless important differences in the time paths observed in the interbank rates across countries. In countries such as Germany and Bulgaria, the cost of borrowing was in fact on a steady upward trend, until this was abruptly reversed in October and November 2008. In contrast, interbank rates had been declining from a much earlier date in Canada and Singapore, reflecting the earlier interventions made by central bankers in these countries to attempt to ease the liquidity situation. In China, the spike in the cost of credit came in the latter half of 2007, well before the height of the crisis in the U.S. and Europe. One last interesting case is Japan: Though interbank rates also crept up as the financial crisis unwound, and fell back again as monetary easing commenced in the last quarter of 2008, interbank rates were always very low, and never climbed above

⁸See however Eaton et al. (2009) who find that trade flows normalized by industry sales displayed a much less severe decline than trade flows or trade divided by GDP.

the 1% level. It is precisely this variation across countries in the cost of credit in the midst of the deteriorating global situation that we will exploit, in order to uncover and estimate the importance of credit conditions for international trade during the financial crisis.

There are several notable observations regarding the decline in U.S. trade flows. First, the fall in U.S. imports was more precipitous than that in U.S. exports. On a month-on-month basis, U.S. imports contracted 21.3% between October and November 2008, while U.S. exports fell 14.3%, indicating a particularly sharp decline in American consumer sentiment and import demand relative to other countries.⁹

Second, trade in manufactures (NAICS code first digit = 3) mirrored closely this aggregate decline. U.S. imports in the manufacturing sector were 19.2% lower in November 2008 compared with the previous month, while the corresponding fall for aggregate U.S. exports was 14.7%.¹⁰

Third, the contraction in U.S. manufactures was a very broad-based one. Focusing on U.S. imports, no 3-digit industry was spared from the contraction, with the only difference across industries being one of severity. The worst-hit industry was by far Petroleum and Coal Products manufacturing (NAICS code 324) where imports more than halved during this month (Table 1). On the other end of the spectrum, food manufacturing (311) and furniture manufacturing (337) saw the most moderate declines, but these still registered a more than 5% fall.

In what follows, we shall seek to understand the role of credit constraints in influencing the cross-country and cross-industry pattern of this sudden drop in U.S. imports.

3 Description of the Data

Our primary objective is to trace the consequences of the deterioration in credit conditions during the global financial crisis on international trade flows. This exercise requires trade flow data at a monthly frequency, in order to track the rapid unfolding of the crisis particularly during the latter half of 2008. Such data are not available for a large sample of countries, and we therefore focus on just one country, the United States, for which monthly trade data are regularly updated and made available by the U.S. Census Bureau. Since our interest is in understanding how cross-country differences in the severity of the credit crunch affected trade performance, we focus on U.S. import flows from its top 100 trading partners. We use monthly data starting from November 2006; this pre-dates the start of the crisis, in particular the latter months of 2007 when the critical state of the subprime loan market became ever more apparent. While our sample currently ends in April 2009, it is our intention to extend this as more data become available.

For our key explanatory variable, we use the interbank lending or offer rate as a measure of the

⁹This contrast is even more stark when the corresponding figures are calculated in year-on-year terms for November 2008: U.S. imports fell 18.3%, while U.S. exports dropped a more moderate 8.4%.

¹⁰On a year-on-year basis, the fall in US manufactured imports was 17.4%, while that for exports was 9.0%.

tightness of prevailing credit conditions in each country. These interbank lending rates are the interest rates that commercial banks are willing to charge each other for short-term loans of a pre-set duration (such as overnight, one month, or three months). Such interbank rates thus serve the vital role of helping to clear the market for loanable funds on a regular daily basis. More generally, they are also seen as an indicator of the overall cost of credit prevailing in the economy, especially since many other lending rates often take their cue from these interbank rates. It is not uncommon, for example, for interest rates on loans such as housing mortgages to be pegged against an interbank rate plus a few percentage points. (Since the default risk on interbank loans is considered to be low during periods of normal economic activity, interbank rates are typically among the most favorable interest rates that might be quoted at any given time.)

There are nevertheless some practical issues involved in obtaining a measure of the interbank rate. At any given time, multiple interbank rates are typically quoted. Individual banks may offer slightly different rates, and the exact terms of each credit contract may vary depending on the perceived credit-worthiness of the borrowing institution. That said, these rates have historically exhibited a very high correlation across lending and borrowing banks in a country, particularly in developed economies where the banking industry is competitive. In some countries, banking associations may even quote a reference interest rate that reflects prevailing conditions in the interbank lending market that then serves as a benchmark for the cost of borrowing in that economy. For example, the British Bankers' Association (BBA) reports the London Interbank Offer Rate (LIBOR) during each business day.

Reflecting this reality, the Thomson Reuters Datastream database which we use often contains more than one interbank rate series for a given country, even for loans of the same duration. When more than one series were reported in Datastream, we opted first to use series that were quoted by the country's central bank. If this was not available, we turned next to sources which were banking associations or related regulatory bodies, such as the British Bankers' Association (BBA), European Banking Federation (EBF), or Financial Markets Association (FMA).¹¹ In the absence of such sources, we then chose finally to use an interbank rate that was quoted by a major commercial bank in the country.

For our baseline results, we focus on the one-month (or thirty-day) interbank rate, reflecting the order of magnitude of the typical time frame needed to complete an international trade shipment. We average the interbank rate quoted across business days to obtain a monthly measure of the cost of credit in each country. As we show below, our results are robust to using three-month (or ninety-day) rates instead.¹²

One limitation of using interbank interest rates as a proxy for credit conditions is that such data are

¹¹For BBA series, we chose to use the daily interest rate series, rather than the "5pm" quotes. There are typically only minuscule differences between the two interbank rates.

¹²The correlation in the monthly average of the one-month and three-month rates is very high for the countries in our sample, in excess of 0.99.

systematically available for a sample of 29 countries only at a monthly frequency. This sample covers primarily developed countries, although some emerging economies (Romania and Hungary) and trade-dependent economies (Singapore and Malaysia) are also represented. We thus believe that our sample captures a broad spectrum of countries in terms of their overall level of financial development, severity and timing of the credit crunch, which allows us to isolate the effects of credit conditions on international trade flows during the crisis.

Appendix Table 1 presents some summary statistics for the evolution of interbank interest rates over the November 2006 - April 2009 period and their variation across countries in our sample. Interest rates spiked to highs in March 2008 (when Bear Stearns was bailed out) and once again in September 2008 (when Lehman Brothers collapsed and AIG failed). The substantial easing measures undertaken by monetary authorities around the world were very successful in lowering the cost of borrowing from a median in our sample of 4.66% (September 2008) to 1.01% (April 2009).

Note that during normal economic times, higher interbank lending rates may reflect either limited credit availability or high demand from borrowing institutions, and ultimately producers and consumers. During the financial crisis, however, we believe that high interbank rates signal tight credit supply. This is widely supported by anecdotal observations in the popular press, and is consistent with the evidence in Campello, Graham and Harvey (2009) that the 2008-2009 financial crisis prevented credit-constrained firms from pursuing attractive investment projects. Finally, our empirical analysis implicitly controls for demand conditions in the United States, which can be seen as a proxy for the amount of credit demanded by firms who export to the U.S..

In addition to the variation in credit conditions across countries, our identification strategy also exploits the variation in the sensitivity to tighter credit availability across sectors. We follow the prior literature in constructing three such variables based on data from Compustat, which covers all publicly-traded firms in North America. External finance dependence (*EXTFIN*) is measured as the fraction of total capital expenditure not financed by internal cash flows from operations, and reflects firms' requirement for outside capital. Asset tangibility (*TANG*) is constructed as the share of net plant, property and equipment in total book-value assets, and captures firms' ability to pledge collateral in securing credit. Finally, trade credit intensity (*TCREDIT*) is calculated as the share of accounts payable in total assets, and indicates firms' access to trade financing from buyers and suppliers. For each firm, we first take the average of these three variables over the 1996-2005 period. We then use the median value across firms in each NAICS 3-digit category as the industry measure of *EXTFIN*, *TANG* and *TCREDIT*. Appendix Table 2 lists these values for the 21 industries in our data.

These three variables are widely believed to capture technologically-determined characteristics of a sector which are exogenous from the perspective of an individual firm. This is corroborated by the much

greater variation in these measures across industries than among firms within a given sector. Note that the value of these sector characteristics may differ across countries, but we measure them with a proxy based on firm-level data for the United States. This choice is motivated by three considerations. First, similar data are not systematically available for a broad range of countries. Second, the United States has one of the most advanced financial systems, recent developments notwithstanding, and the behavior of U.S. firms thus likely reflects firms' optimal choice of asset structure and external financing. Finally, our identification strategy requires only that the relative rank ordering of sectors remain stable across countries, even if the precise magnitudes vary across countries.

The Data Appendix describes the construction of all other variables used in the empirical analysis.

4 Results

We establish the detrimental effect of the deterioration in credit conditions during the 2007-2009 financial crisis on trade flows in two steps. We first document that the crisis had a disproportionately large impact on the exports of countries with a higher cost of external capital. We then show that financially dependent sectors in such countries were particularly severely affected by the crisis.

4.1 Credit tightness across countries

We begin the analysis by examining the differential effect of the crisis on U.S. imports across exporting countries with varying levels of the cost of capital. In particular, we estimate the following specification:

$$\ln Y_{it} = \beta_1 IBRATE_{it} + \beta_2 D_{crisis} \times IBRATE_{it} + D_t + \epsilon_{it} \quad (1)$$

where Y_{it} and $IBRATE_{it}$ are the value of exports to the U.S. and the interbank interest rate of country i during month t , respectively. D_{crisis} is a binary variable equal to 1 in September 2008 and later, which we will refer to as the crisis period. This way of modeling the crisis period reflects the reality of the developments in the United States, and allows us to identify the effect of credit tightness on trade flows at the height and immediate aftermath of the turmoil in financial markets.

We include month fixed effects D_t , which subsume the main average effect of the crisis on U.S. bilateral imports. These fixed effects control for the time-series variation in aggregate import demand and trade credit supply in the United States. The coefficients of interest β_1 and β_2 are thus identified purely from the variation in the cost of credit across exporting countries in a given month. We report standard errors clustered by country.

Panel A of Table 2 shows that countries with higher interbank interest rates export systematically less to the United States (Column 1). This effect is highly statistically and economically significant, and implies that a 1% rise in the cost of bank financing is associated with 16% – 20% lower sales to the

United States. This result is consistent with evidence in the prior literature that tighter credit conditions constrain firms' export levels or prevent firms from exporting altogether.

Note that bank financing may be more expensive either because of elevated demand for loans or because of low credit supply. Our results strongly suggest that during the 2007-2009 period, the variation in interbank rates across countries reflects limited credit availability. Conversely, if countries that export more to the United States reported higher interest rates, it would be likely that firms in those countries face promising export opportunities, would like to expand by accessing more external finance, and thus bid up the market-clearing interest rate. In view of these results and our findings below, we will interpret high interbank interest rates as an indicator of tighter credit conditions in the rest of this section.

As Column 2 shows, the financial crisis decreased exports disproportionately more for countries with higher interest rates on bank loans, although this effect is not significant at the standard 10% level. Equivalently, tight credit conditions became particularly damaging to a country's exports during the crisis. These effects are more precisely estimated when cross-country differences in factor endowments and overall development are taken into account. To do so, in Column 3 and 4 we include countries' GDP per capita, endowments of physical (K/L) and human capital (H/L) relative to labor, and the interaction of these three terms with the crisis dummy. We also obtain estimates of the same magnitude and significance when we use the three-month interbank interest rate (Column 6). Our results become statistically significant, however, when we consider March 2008 instead of September 2008 as the beginning of the crisis period (Column 8) or lag the interbank interest rate by three months to reflect the fact that firms have to secure external financing far in advance of product delivery (Column 7).

The bottom panel in Table 2 confirms that our findings hold with greater economic and statistical significance when we examine countries' exports *by sector*. We exploit the detailed nature of the customs data, and study U.S. imports by 3-digit NAICS industry. This allows us to include industry-month fixed effects in the estimating equation:

$$\ln Y_{ikt} = \beta_1 IBRATE_{it} + \beta_2 D_{crisis} \times IBRATE_{it} + D_{kt} + \epsilon_{ikt} \quad (2)$$

The effects of credit tightness on trade flows in general and during the crisis, β_1 and β_2 , are now identified from the variation across countries within a given sector k and month t . This provides a stricter test of the credit constraints mechanism as it implicitly allows U.S. demand for imported goods to vary both across industries and over time.

We find that countries with lower interbank interest rates export more to the United States not only in aggregate, but also sector by sector, and that this advantage increases during the crisis. These results once again hold with greater statistical significance when we control for cross-country differences in factor endowments and GDP per capita. They also survive extending the crisis period to March 2008 and later,

using the three-month interbank rate, or lagging the one-month interest rate.

Column 9 in both panels presents results from a reduced sample of countries. We exclude Turkey which stands out with its particularly high interbank interest levels, and find coefficients of the same order of magnitude, but of lower statistical significance. We ascribe this finding to the limited sample of countries in our data (29), and more specifically to the low number of economies with underdeveloped financial markets and very costly external capital. Were our sample more representative, it would cover more countries with intermediate and high interest rates, Turkey would no longer stand out as an outlier, and the effects of credit conditions would be significant and potentially larger because they would be identified from a less skewed distribution of lending rates across countries.

How shall we interpret these results? Recall that the evolution of interbank interest rates varies substantially across countries, and is thus not collinear with the crisis dummy included in these regressions (Figure 2). Our results can therefore not be attributed to a non-linear effect of the cost of capital on export performance. We offer two potential rationalizations for the finding that countries with higher interbank rates experience larger reductions in exports during the financial crisis.

First, as the crisis unfolded, consumer demand for final imported goods plummeted as households lost significant portions of their real estate and financial assets, and faced unemployment or job insecurity. This decline was further deepened by the sharp contraction in the availability of consumer credit. The combination of lower consumer demand and tighter producer credit reinforced the fall in domestic production, which also reduced demand for imported intermediate inputs. While non-durable goods and services may have been more resilient during the crisis period, demand for imported manufactures collapsed.

Note that we have implicitly controlled for the aggregate or sector-specific decline in U.S. demand with monthly or sector-month fixed effects. What can explain our results, however, is that the sudden drop in U.S. demand has posed a bigger challenge to exporters that face tighter credit conditions. When firms need external finance to cover their fixed up-front costs, they require sufficiently high export revenues to guarantee lenders a high enough expected return. A decline in anticipated export revenues thus makes it more difficult for firms to incentivize investors and raise the necessary funds. When the fall in demand and the cost of external capital are both high enough, some firms would not be able to finance their exports and would withdraw from the American market altogether. In the presence of firm heterogeneity in marginal production costs, however, relatively larger, more productive firms may survive even if they have to scale down export quantities. In other words, under credit constraints, both the number of firms from country i exporting to the U.S., as well as the value of individual firm exports would contract in response to a sharp decline in U.S. demand, and this contraction would be amplified in countries with high interbank rates.

This interpretation suggests that credit constraints can magnify the detrimental effects of a downturn in one economy on the output and exports of its trade partners.

An alternative explanation recognizes the fact that exporting firms may be able to access bank financing and trade credit not only in their home country, but also in their destination market. As the crisis deepened, the availability of bank loans in the U.S. sharply declined. While such data is difficult to obtain, the shortfall in trade financing has been estimated at between \$25-500 billion in the second half of 2008, a trend consistent with anecdotal evidence in the popular press (WTO 2008, Chauffour and Farole 2009). It is thus possible that U.S. imports fell not only because demand plunged, but also because potential exporters found it more difficult to obtain financing in the U.S..

Once again, these developments in the U.S. cannot by themselves explain the differential effect of the financial crisis on the exports of countries with varying costs of external capital, since the estimation includes monthly fixed effects. However, if firms selling to the United States use U.S. credit markets as a substitute for borrowing at home, then credit tightening in the U.S. would be particularly burdensome on exporting firms based in countries where external credit is limited and interbank rates high.

This interpretation raises the possibility that financial frictions in one country can amplify the effect of credit constraints in its trade partners. This is consistent with the theory and evidence in Manova (2008a) and Antràs, Desai and Foley (2009) that foreign portfolio flows and foreign direct investment can compensate for underdeveloped domestic financial markets.

While we cannot distinguish between these two alternative explanations, we emphasize that they both underscore the importance of credit constraints and financial intermediation in international trade. In other words, both interpretations support the idea that credit constraints matter for international trade and amplified the effect of the global crisis on trade flows.

4.2 Financial dependence across sectors

One potential concern with the results above is that the interbank interest rate may capture the effect of some other unobserved country characteristic which led to the differential effect of the crisis on trade flows. To address this concern and establish the role of credit constraints more convincingly, we next exploit the variation in financial dependence across sectors. We show that the financial crisis not only had a greater impact on countries with tighter credit conditions, but also exerted a disproportionately large effect on financially vulnerable industries in such countries.

We focus on three sector characteristics that reflect firms' sensitivity to the availability of bank credit and the cost of external capital: requirement for external finance (*EXTFIN*), endowment of tangible assets (*TANG*), and access to trade credit (*TCREDIT*). As argued in Section 3, these variables are widely believed to capture technologically-determined characteristics of a sector which are exogenous

from the perspective of an individual firm. Focusing on one proxy for financial dependence at a time, for example $EXTFIN$, we are interested in the following estimating equation:

$$\begin{aligned} \ln Y_{ikt} = & \alpha_0 + \alpha_1 D_{crisis} + \alpha_2 IBRATE_{it} + \alpha_3 EXTFIN_k + \alpha_4 IBRATE_{it} \times EXTFIN_k + \\ & + \alpha_5 D_{crisis} \times IBRATE_{it} + \alpha_6 D_{crisis} \times EXTFIN_k + \alpha_7 D_{crisis} \times IBRATE_{it} \times EXTFIN_k + \varepsilon_{ikt} \end{aligned} \quad (3)$$

This expression reflects the idea that the financial crisis has had a negative effect on the exports of all countries i and sectors k ($\alpha_1 < 0$, the main effect of the crisis dummy), that countries with higher interbank rates may export less in all sectors and time periods t ($\alpha_2 < 0$, the main effect of $IBRATE_{it}$), and that there may be systematic differences in export demand or supply across sectors (α_3 , the main effect of $EXTFIN$).

Of greater interest to us are the double and triple interaction terms. We allow the financial crisis to have a differential effect on exports across countries with varying degrees of credit tightness ($D_{crisis} \times IBRATE_{it}$) and sectors at different levels of financial dependence ($D_{crisis} \times EXTFIN_k$). We also accommodate the result in the prior literature that credit conditions constitute a source of comparative advantage, such that countries with higher interbank rates may generally export relatively more in financially dependent sectors ($IBRATE_{it} \times EXTFIN_k$). Finally, we include a triple interaction ($D_{crisis} \times IBRATE_{it} \times EXTFIN_k$) to test whether the negative effect of the crisis on exports is not only stronger in countries with worse credit conditions, but also concentrated on the most financially vulnerable sectors in those economies.

To isolate the effect of our main variables of interest, $IBRATE_{it} \times EXTFIN_k$ and $D_{crisis} \times IBRATE_{it} \times EXTFIN_k$, we include country-month, industry-month and country-industry fixed effects. These fixed effects subsume the role of all terms in (3) that vary only along two of the three dimensions (country, industry, month). Our estimating equation becomes:

$$\ln Y_{ikt} = \beta_1 IBRATE_{it} \times EXTFIN_k + \beta_2 D_{crisis} \times IBRATE_{it} \times EXTFIN_k + D_{it} + D_{kt} + D_{ik} + \epsilon_{ikt} \quad (4)$$

Note that the industry-month fixed effects in this specification D_{kt} capture sector-specific import demand conditions in the United States month by month, as well as the time variation in the availability of external financing and trade credit in the U.S.. The country-industry fixed effects D_{ik} control for the comparative advantage that countries with higher interbank rates have in financially dependent sectors *on average*, but it allows the sectoral composition of countries' exports to continuously respond to fluctuations in the countries's cost of capital over time. Finally, the country-month fixed effects D_{it} capture the effect of aggregate production and credit conditions in every country and time period, such

that the regression isolates the effects of the financial crisis on trade above and beyond those on domestic output.

The coefficient on $IBRATE_{it} \times EXTFIN_k$ in this regression is identified from the variation across sectors within a given country and month, as well as the variation across countries in a given sector and month. The triple interaction term essentially takes the difference between the crisis-driven change in exports of a country with tight credit markets in a financially dependent sector and in a financially less dependent sector, and compares that difference to the same difference for a country with lower interbank interest rates.

We present our results in Columns 1 and 2 of Table 3. For completeness, the top panel in this table shows estimates from regressions that condition on industry-month and country-month fixed effects, while the bottom panel shows results from the fully saturated model that also includes country-industry fixed effects. As anticipated, we find that countries with lower interbank interest rates tend to export relatively more in sectors with a greater requirement for external finance ($\beta_1 < 0$), although this effect is not always precisely estimated. Importantly, this advantage intensified during the crisis period ($\beta_2 < 0$).

We obtain similar results when we explore the variation in sectors' endowment of collateralizable assets in Columns 1 and 2 of Table 4. Since industries with high levels of asset tangibility are less sensitive to worsening credit conditions, the sign of the coefficients in this table are now reversed. Thus countries with high interbank interest rates have a comparative advantage in sectors intensive in tangible assets, and this advantage is significantly more pronounced during the financial crisis.

Finally, in Table 5 we explore the role of access to trade credit, and to what extent sectors that enjoy greater availability of trade financing are immune to contractions in the bank credit market. On the one hand, trade credit may provide firms with an alternative to bank loans. Since trade credit is typically extended by upstream suppliers or downstream buyers in the form of a guarantee rather than an actual flow of funds, firms' trade partners may be willing and able to offer trade financing irrespectively of the developments in the market for bank loans. This would suggest that sectors with greater availability of trade credit would be more resilient during the crisis and in the face of higher interbank interest rates. On the other hand, trade credit is typically backed by firms' banks and other financial institutions which guarantee that the respective party in a transaction will fulfill its financial obligations. It is therefore also possible that trade financing will contract during a period of high interest rates.

The results in Columns 1 and 2 of Table 5 indicate that countries with high interbank interest rates do in fact export relatively more in sectors with higher levels of trade credit. Moreover, the exports of countries with tighter bank credit markets were more resilient to the financial crisis in the sectors that could access more trade financing. Note that this result is not inconsistent with the anecdotal evidence of a collapse in trade financing during the crisis for two reasons. First, our measure of the availability of

trade credit is based on firms' use of trade financing in 1995-2005, i.e. before the crisis began. Secondly and more importantly, however, our identification is based on the technologically-determined variation in this measure across sectors, and there is no reason why the ranking of sectors should change when the level of total trade credit available (and trade credit available in each sector) drops.

In the rest of Tables 3, 4 and 5, we confirm that these results are not driven by omitted variable bias. In Columns 4 and 5, we control for countries' size (GDP) and overall level of development (GDP per capita), as well as their interactions with industry fixed effects and with both the crisis dummy and industry fixed effects. Similarly, Columns 3 and 5 account for factor endowment differences across countries as a source of comparative advantage. In particular, we include the interaction of a country's physical and human capital endowment (K/L and H/L respectively) with sectors' physical and human capital intensity (k/l and h/l), as well as triple interactions with the crisis dummy ($K/L_i \times k/l_k \times D_{crisis}$ and $H/L_i \times h/l_k \times D_{crisis}$). Our results are also robust to using an alternative start date for the crisis, March 2008 (Column 8), the 3-month interbank interest rate (Column 6) or lagging the interbank interest rate by 3 months to account for the possibility that firms need to borrow months in advance of the production and export delivery date (Column 7). The last two columns in each table demonstrate the stability of the point estimates to dropping outliers in terms of country interbank interest rates (Turkey) and sector financial dependence (NAICS code=325, pharmaceuticals).

While statistical significance varies somewhat across alternative specifications, the magnitude of the estimated effects (i.e. their economic significance) remains stable. Our results are more robust when we use sectors' asset tangibility and access to trade credit rather than their dependence on external finance.¹³

To summarize, countries with high interbank interest rates export relatively more in financially dependent sectors. Equally importantly, the financial crisis was most detrimental to the exports of financially vulnerable sectors in countries with particularly bad credit conditions.

These findings corroborate the two interpretations we offered of the results in the previous subsection. In particular, they are consistent with import demand and credit conditions worsening in the United States during the financial crisis, thereby magnifying the detrimental effect of tight credit markets on countries' export flows. Moreover, the simultaneous contraction in export revenues, financing at home, and financing in the destination market would naturally be most consequential for firms in sectors that require more external finance but have limited tangible assets and access to trade credit.

In addition to these two interpretations, our triple-interactions analysis here suggests yet another, third potential explanation. Given the unusual severity and rapid deepening of the 2008-2009 crisis, it is

¹³See Appendix Table 8 for results from a regression that includes the interaction of interbank interest rates and the crisis dummy with all three sector characteristics. While the sign and magnitudes of the estimated coefficients are similar to those in Tables 3, 4 and 5, they are less precisely estimated because they are identified from the variation in three sector characteristics across 29 industries only.

possible that many economies transitioned to a new steady-state in which production and exports were shifted further towards comparative advantage industries. In particular, the crisis may have heightened the importance of financial development and the availability of cheap external finance as a source of comparative advantage.

As before, we are unable to distinguish between these three alternative interpretations, but we emphasize that all three underscore the importance of credit constraints and financial intermediation in international trade.

We conclude this subsection with an empirical exercise that puts less structure on the development of international trade flows as the crisis unfolded. More specifically, we relax the assumption that there was a stepwise change in trade patterns after September 2008, and allow the effect of credit conditions on the composition of countries' exports to vary non-linearly over time. To this end, we employ a series of monthly dummies $D_{m=t}$ equal to 1 in month t instead of the crisis binary indicator, and interact each against the product of the one-month interbank rate in country i in month t and the external finance dependence characteristic of the industry k . We estimate the following specification:

$$\ln Y_{ikt} = \sum_{t=1}^M \beta_{1m} D_{t=m} \times IBRATE_{it} \times EXTFIN_k + D_{it} + D_{kt} + D_{ik} + \epsilon_{ikt} \quad (5)$$

where D_{it} , D_{kt} and D_{ik} control for country-month, industry-month and country-industry fixed effects as before. We drop the triple interaction corresponding to the dummy variable for the first month, $t = 1$, to avoid a collinearity problem with the country-industry fixed effects.

We plot the evolution of the β_{1m} coefficients in Figure 3A, to illustrate the importance of the credit channel of comparative advantage over time. Figures 3B and 3C present similar graphs for the triple interactions of the monthly dummies with countries' interbank interest rates and *TANG* or *TCREDIT*, respectively. In each figure, the dotted lines indicate the bounds of the 90% confidence intervals of each β_{1m} coefficient. Two linear regression trend lines for the β_{1m} 's are also plotted, for the pre-September 2008 and post September 2008 period. The point estimates from the regressions with *EXTFIN*, *TANG* and *TCREDIT* are also listed in Appendix Table 4.

Two patterns stand out in these figures. First, the coefficients on the interactions with *EXTFIN* are almost always negative, while those with *TANG* and *TCREDIT* are almost always positive. This reinforces our earlier conclusion that countries with higher interbank interest rates export systematically more in financially vulnerable sectors that require more external finance, have few collateralizable assets and enjoy less trade credit availability.

Secondly, all three figures clearly illustrate that the importance of credit conditions for (the composition of) countries exports increased dramatically as the crisis deepened. In other words, the magnitude of β_{1m} increased over time. There is a well pronounced structural break right around September 2008,

the month we used as the beginning date of the height of the crisis period in our earlier analysis. While all three graphs exhibit clear jumps in β_{1m} in September 2008, the results for *EXTFIN* suggest that credit conditions became progressively more important for the sectoral composition of countries' exports after September 2008, while the behavior of the coefficients for *TANG* and *TCREDIT* suggests the opposite. These findings indicate that the overall effect of credit tightness on countries' export flows is complex and depends on a range of industry characteristics.

4.3 Strength of financial institutions across countries

We view the interbank interest rate as an indicator of short-term conditions in credit markets, which for our purposes captures the availability of bank financing during the financial crisis. The cost of lending in an economy, however, depends not only on the amount of available external financing, but also on the strength of financial contractibility, i.e. the probability that financial contracts will be honored and creditors repaid. The ability of financial markets to efficiently allocate resources and the degree of financial contract enforceability in turn depend on the strength of financial institutions. To provide further complementary evidence of the role of credit constraints on trade flows during the financial crisis, this subsection explores whether countries with more advanced financial institutions were more resilient to the global downturn.

We use two different proxies for the strength of financial contractibility which capture long-term characteristics of countries' institutional set up. The first of these variables is private credit (*PC*), the amount of credit extended by banks and other financial institutions to the private sector as a share of GDP. We obtain the 1996-2005 average level of private credit for each country in our sample, based on annual data. While this is an outcome-based measure, it has been widely used in the finance and growth and finance and trade literatures as a measure of the ability of an economy to sustain financial contracts. We also consider the quality of accounting standards in a country (*ACCOUNT*), which is an index reflecting the detail and nature of the accounting information that companies are required to provide to authorities in a country. Both of these measures provide substantial cross-country variation, but do not vary within a country over time.

To explore the differential effect of the crisis across countries at different levels of financial development, we estimate the following two specifications:

$$\ln Y_{ikt} = \beta_1 PC_i \times EXTFIN_k + \beta_2 D_{crisis} \times PC_i \times EXTFIN_k + D_{it} + D_{kt} + \epsilon_{ikt} \quad (6)$$

$$\ln Y_{ikt} = \beta_2 D_{crisis} \times PC_i \times EXTFIN_k + D_{it} + D_{kt} + D_{ik} + \epsilon_{ikt} \quad (7)$$

The first of these estimating equations includes country-month and industry-month fixed effects, which

makes it possible to estimate the magnitude of the comparative advantage that financially developed countries have in financially dependent sectors (β_1), as well as how much more pronounced this advantage became during the financial crisis (β_2). We can evaluate only the latter of these effects when we also incorporate country-industry fixed effects in the second specification.

We present our results for private credit in Table 6, and those for accounting standards in Table 7. Consistent with the evidence in the prior literature, we find that financially developed countries consistently export more in sectors characterized by high external finance dependence (columns 1-3), few tangible assets (columns 4-6) and limited access to trade credit (columns 7-9). Moreover, the financial crisis intensified the magnitude of these effects, such that the exports of financially advanced economies were relatively more resilient to the crisis in financially vulnerable sectors. Once again, the economic significance of these effects is robust to the choice of country measure of financial development or sector characteristic of financial dependence, and remains unchanged when we control for factor endowments and overall development (GDP per capita) as a source of comparative advantage. The statistical significance of the estimated coefficients, however, varies across specifications.¹⁴

5 Interpreting the Magnitudes

Section 4 provides strong evidence that credit constraints are an important determinant of aggregate trade flows and the sectoral composition of countries' exports, and that credit conditions were particularly consequential during the financial crisis. These results reflect the importance of the supply of credit in the short term, as proxied by the interbank interest rate, as well as the significance of long-term financial institutions and the strength of financial contractibility.

In this section, we interpret the magnitude of the contribution of credit constraints to the overall decline in trade flows during the financial crisis. To do so, we use estimates from our empirical analysis to infer how U.S. imports would have evolved under two alternative scenarios. First, we evaluate the hypothetical effect of the financial crisis if governments around the world had not actively intervened in financial markets, and interbank interest rates had remained at their peak levels from September 2008. This provides an upper bound for the most damage that the global crisis could have inflicted on trade flows specifically through the credit constraints channel. We then consider the opposite extreme, and assume that all countries implemented dramatic policy interventions immediately after September 2008, and that interbank interest rates instantaneously dropped to their lowest levels, i.e. those at the end of our sample in April 2009. This exercise provides a lower bound for the effects of the financial crisis on trade flows and an estimate of the potential welfare gains from more timely and targeted policy

¹⁴See Appendix Table 8 for results from a regression that includes the interaction of private credit (accounting standards) and the crisis dummy with all three sector characteristics.

interventions.

5.1 Case 1: no policy intervention

We examine first the counterfactual evolution of trade flows under the hypothetical scenario of no government intervention in credit markets. In particular, we assume that the interbank interest rate in each country remained fixed at its peak September 2008 level through the end of our sample period, April 2008.

To infer the additional decline in trade flows that would have resulted from these continued tight credit conditions, we use our estimates from equation (2). This is the regression of countries' exports to the United States by sector on the exporting country' interbank interest rate and its interaction with the crisis dummy, controlling for industry-month fixed effects. We proceed in two steps. We first use our point estimates and the actual interbank rates to obtain the predicted U.S. imports from each country and sector. We then construct the hypothetical predicted trade flows under the counterfactual evolution of interest rates. We find that the United States would have imported 25.6% less from the average country and sector in every month between October 2008 and April 2009, were interbank rates to remain at their elevated September-2008 levels.¹⁵ This would have constituted a substantial reduction in the volume of trade, as it would have more than doubled the actual drop in trade flows of 24.1% between September 2008 and April 2009 observed for our sample of countries. As another benchmark, consider that the overall decline in world trade is projected to reach 12% in all of 2009.

Our results further suggest that trade flows would be affected systematically more in financially vulnerable sectors, were interbank rates to remain at their peak levels. To quantify the magnitude of these distributional effects, we use our estimates from specification (4), which examines how the effect of the financial crisis varies both across countries with different credit conditions and across sectors at different levels of financial dependence. Using the estimates from Table 3, if all countries' interbank interest rates were kept at their September 2008 levels through the end of April 2009, U.S. imports would have declined 9% faster in the most external-finance dependent sector (chemical manufacturing) relative to the least dependent sector (leather and allied manufactured products). Similarly, trade would have dropped by 17% more in the industry with the lowest share of tangible assets (computer and electronics manufacturing) relative to the industry with the hardest assets (petroleum and coal products). Finally, countries would have exported 22% less on average in the sector with least availability of trade credit (textiles) relative to the sector with the greatest access to buyer and supplier credit (transportation equipment).¹⁶

¹⁵Comparative statics based on Column 2 in the bottom panel of Table 2. Note that the predicted effects of continued credit tightness would be about twice as large if we used the results in Column 5, which controls for cross-country differences in factor endowments and overall development.

¹⁶Comparative statics based on Column 2 in the bottom panels of Tables 3, 4 and 5.

These estimates give an estimate of the real costs of credit constraints during the financial crisis. At the same time, they also offer encouraging evidence that policy interventions in financial markets were quite effective in alleviating the real consequences of the crisis.

5.2 Case 2: immediate response to policy interventions

We next consider the alternative scenario, under which policy interventions were more extreme and the interbank rate in each country dropped to its low April 2009 level immediately after September 2008. An equivalent interpretation of this hypothetical case is that government interventions were the same, but financial markets and interbank rates responded instantaneously, with no lag.

To gauge how much higher trade flows would have been under this counterfactual case, we once again use our point estimates from the regressions with double and triple interactions as described in the previous subsection. We now use these point estimates to compare predicted trade flows under actual interbank rates to those under the assumption of permanently low interest rates after September 2008.

We find that U.S. imports from the average exporting country would have been 30% higher in each month between October 2008 and April 2009, had policy interventions had an instantaneous effect on credit conditions. Trade flows in financially vulnerable sectors would have benefited disproportionately more from the increased availability of cheap external credit. The difference between the most and least external capital dependence would have been 8.4%, while the difference between industries with the lowest and highest endowment of tangible assets (access to trade credit) would have been 12% (13.7%).

These results suggest that the effect of the financial crisis on trade flows would have been substantially more mild in the absence of credit constraints or under more timely improvements in credit conditions. The large estimated gains from lower interbank interest rates also emphasize the scope for welfare-enhancing policy interventions. Finally, our findings justify governments' actual efforts to relax the extreme credit tightening triggered by the crisis.

6 Conclusion

This paper is one of the first to establish and quantify the effect that credit tightening had on international trade during the 2008-2009 global crisis using data on monthly U.S. imports over the November 2006 - April 2009 period. We find that countries with higher interbank interest rates and thus tighter credit availability export less in every period and are hit harder by the crisis. These effects are especially pronounced in sectors that require extensive external financing, have few collateralizable assets, and can access limited trade credit. In other words, exports of financially dependent industries are more sensitive to the cost of external capital than exports of less dependent industries, and this sensitivity rises during the financial crisis. We also show that the exports of countries with stronger financial institutions were

more resilient to the crisis, especially in sectors with high external finance dependence, few tangible assets and limited access to trade credit.

Our findings imply that credit constraints played an important role in the transmission of the effects of the financial crisis to international trade flows. They also indicate that policy interventions significantly relaxed credit conditions, thereby dampening the detrimental impact of the crisis on global trade. Our reduced-form estimates suggest that the 2008-2009 financial crisis would have reduced U.S. imports by 25.6% more if interest rates had remained at their peak September 2008 level through April 2009. At the same time, were the effects of government policies more immediate, trade flows would have been 30% higher than they actually were.

These results provide further evidence of the causal effect of credit constraints on trade, and highlight the large impact of financial market disturbances on the real economy, the substantial cost of crisis contagion across countries, and the scope for policy intervention. Ultimately, they also shed light on the design of optimal policy interventions that can mitigate or even neutralize the real effects of future financial crises.

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8 Data Appendix

A. Trade flows

US trade flows: From the US Census Bureau Foreign Trade Statistics, which reports monthly US trade flows at the 3-digit or 6-digit NAICS level. For US imports, we use the “imports” series rather than the “Cimports” series. The two series differ in their treatment of imports destined for US foreign trade zones (FTZs) or bonded warehouses. The “Cimports” series records the value of these goods as they are imported from or withdrawn from the FTZs or bonded warehouses, whereas the “imports” series record this value at their time of arrival in the FTZs or bonded warehouses (see Feenstra et al. 2002). The correlation between the two import concepts is in any case very high: 0.9917.

B. Industry characteristics

External capital dependence (*EXTFIN*): Constructed following the methodology in Rajan and Zingales (1998). Data from Compustat is used, which covers all publicly-traded firms in North America. A firm’s dependence on external capital is the fraction of total capital expenditures over the period 1996-2005 not financed by internal cash flow. The median value across firms in each NAICS 3-digit category is used as the industry measure of *EXTFIN*.

Asset tangibility (*TANG*): Constructed following Braun (2003), using the same Compustat data as for *EXTFIN*. For each firm, asset tangibility is computed as the total value of a firm’s net plant, property and equipment divided by the total value of its assets for the period 1996-2005. The median value across firms in each NAICS 3-digit category is used as the industry measure of *TANG*.

Trade credit (*TCRED*): Constructed following Fisman and Love (2003), using the same Compustat data as for *EXTFIN*. For each firm, access to trade credit in a given year is computed as the change in accounts payable divided by the change in the firm’s total assets. This flow measure of access to trade credit is summed over the period 1996-2005 to get a firm measure for this decade. The median value across firms in each NAICS 3-digit category is used as the industry measure of *TCRED*.

Factor intensities ($\log(k/l), \log(h/l)$): From the NBER-CES database. These are constructed first for SIC 4-digit industries: (i) Physical capital intensity as the log of the ratio of real capital stock to total employment; and (ii) Skill intensity as the log of the ratio of non-production workers to total employment. These are calculated using 1996 data, the most recent year available in the NBER-CES dataset. We map SIC 4-digit to NAICS 3-digit industries using the Feenstra et al. (2002) US import database (1989-2006). In that database, import flows at a detailed HS-10 digit level are reported, with accompanying SIC and NAICS industry codes, from which concordance weights were constructed. The factor intensity of each NAICS 3-digit industry is calculated as the concordance-weighted average of the factor intensities of its constituent SIC 4-digit industries.

C. Country characteristics

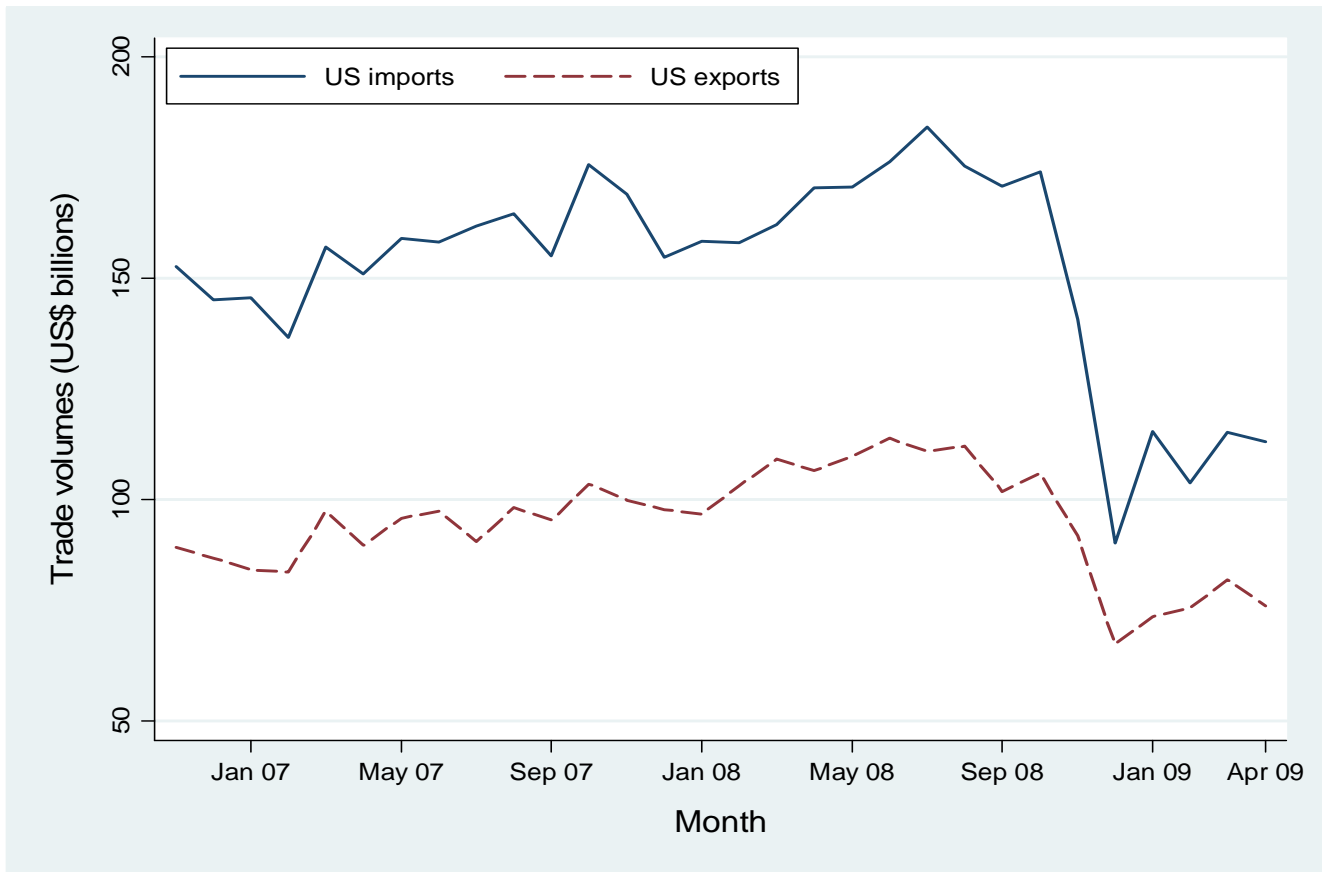
Factor abundance ($\log(K/L), \log(H/L)$): Based on Caselli (2005) and the Penn World Tables, Version 6.2 (Heston et al. 2006). Physical capital stock is calculated using the perpetual inventory method, namely: $K_t = I_t + \delta K_{t-1}$, where I_t is investment and $\delta = 0.06$ is the assumed depreciation rate. The investment flow and labor force data are from the latest version of the Penn World Tables. Human capital per worker is taken from Caselli (2005). Following Hall and Jones (1999), H/L is calculated as a

Mincerian return-weighted average years of schooling, namely $H/L = \exp(\phi(s))$, where s is the average years of schooling in the population over 25 years of age, and $\phi(\cdot)$ is a piece-wise linear function with a slope of 0.13 for $s < 4$, 0.10 for $4 < s < 8$, and 0.07 for $s > 8$.

Private credit: From Beck et al. (2009). Equal to the amount of credit extended by banks and other non-bank financial intermediaries to the private sector divided by GDP, averaged over 1996-2005.

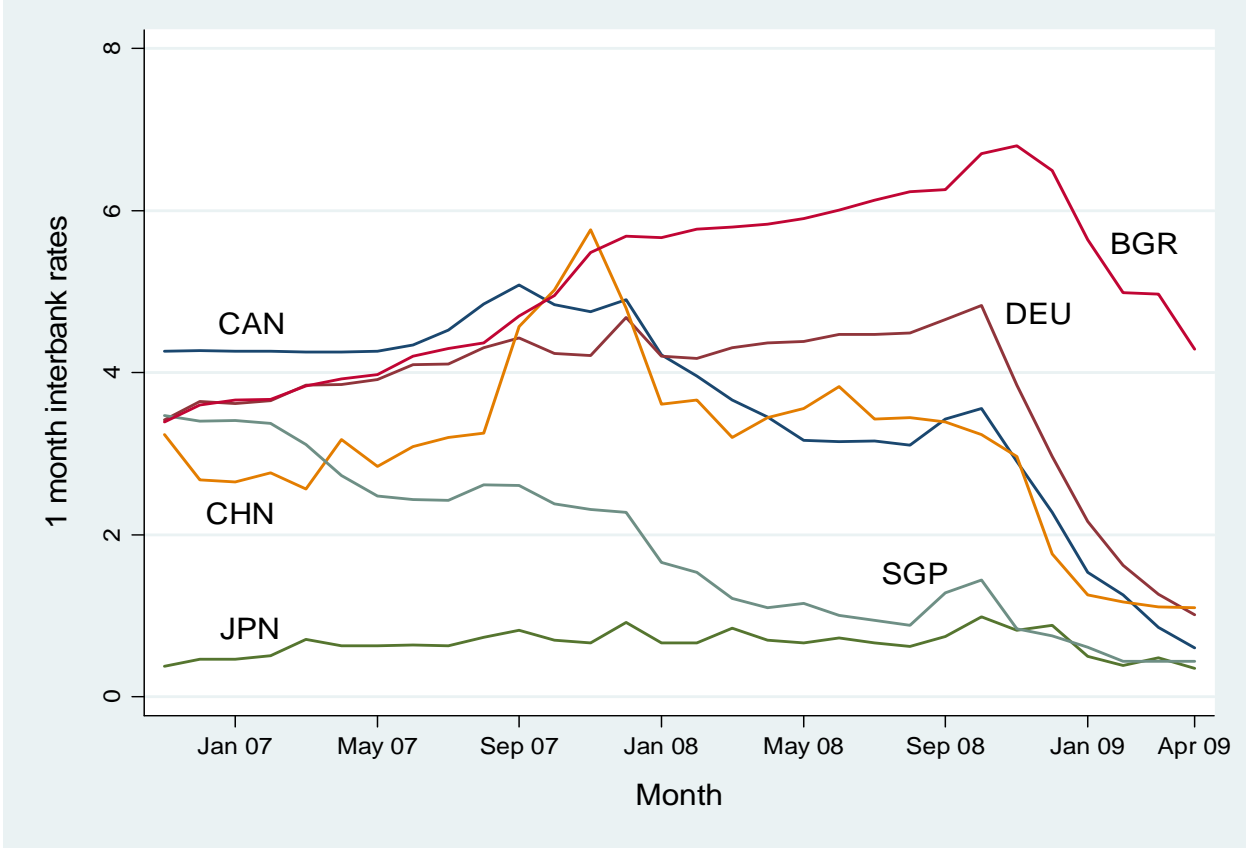
GDP: Both GDP and GDP per capita are from the World Development Indicators (WDI), in PPP units.

Figure 1
The Decline in US Trade Volumes during the Global Financial Crisis



Source: US Census Bureau.

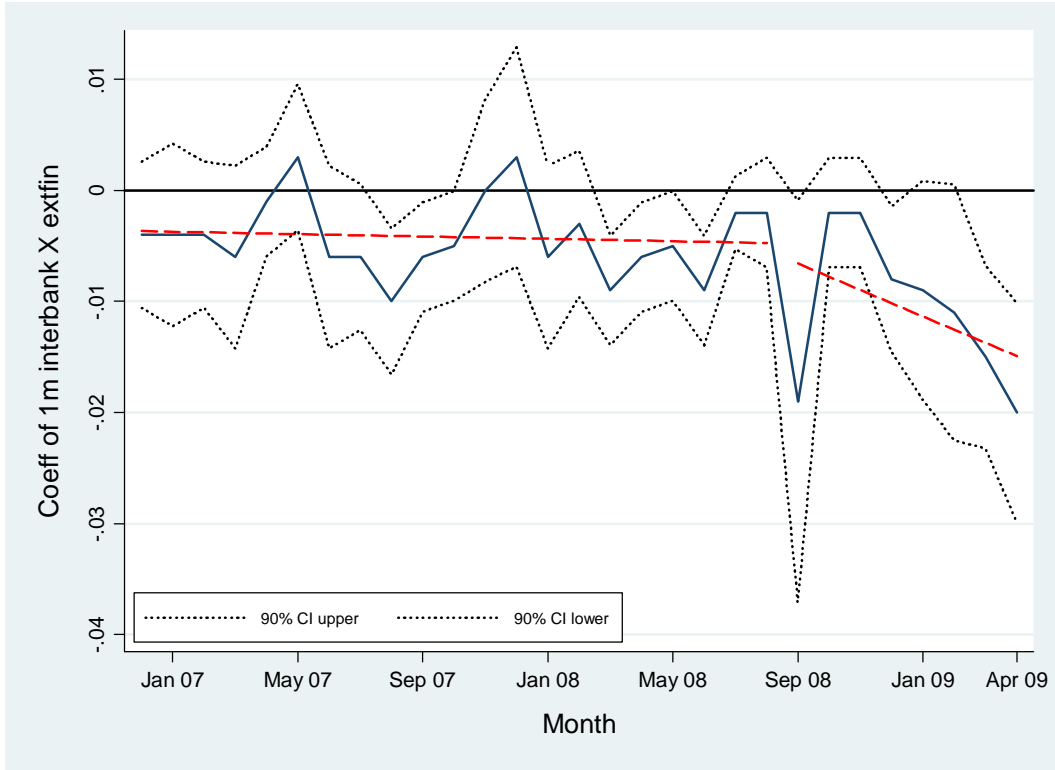
Figure 2
Interbank Rates during the Global Financial Crisis



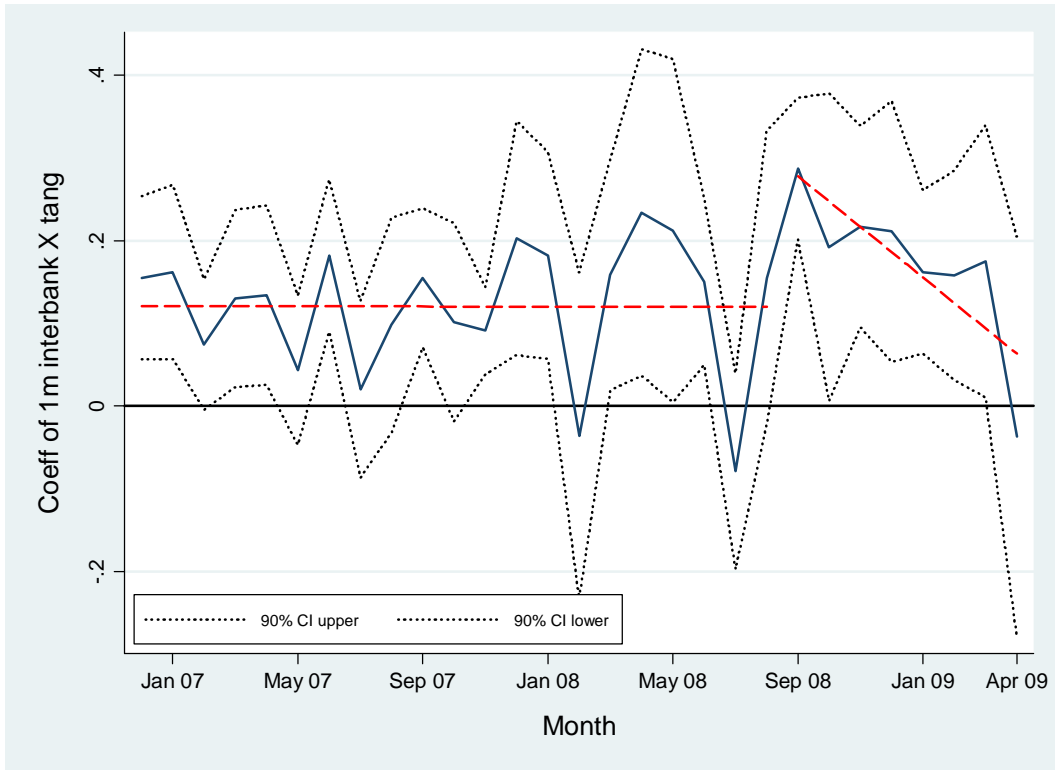
Source: Thomson Datastream.

Figure 3
The Importance of Credit Channels of Comparative Advantage over Time

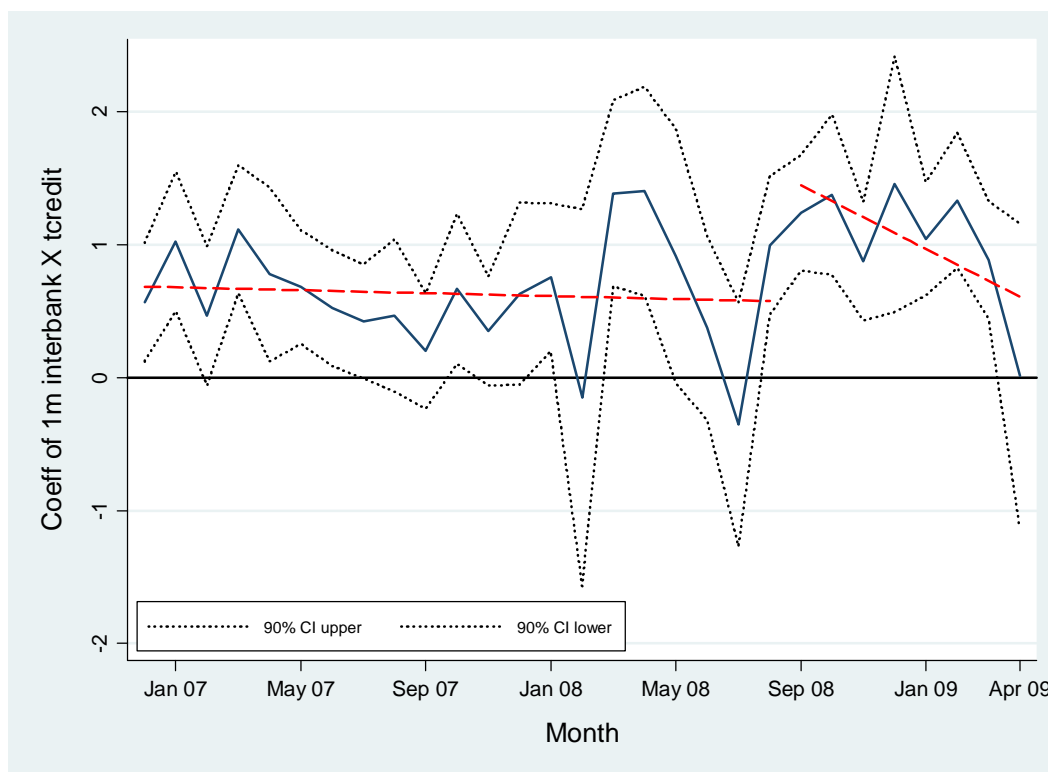
A: Interbank rate X EXTFIN



B: Interbank rate X TANG



C: Interbank rate X TCRED



Notes: Panel A plots the coefficients β_i obtained from the following regression specification: $\text{LogTrade}_{ikt} = \sum_m \beta_m * D_{t=m} * \text{Interbank}_{it} * \text{EXTFIN}_k + D_{it} + D_{kt} + D_{ik} + \varepsilon_{ikt}$. Here, i , k , and t index the exporting country, industry, and month respectively, while D_{it} , D_{kt} , and D_{ik} are exporter-month, industry-month, and exporter-industry fixed effects respectively. $D_{t=m}$ is a dummy variable equal to 1 if the month in question is m . We use a full set of these dummy variables for each month in our sample, and interact each against the product of the one-month interbank rate in country i in month t and the external finance dependence characteristic of the industry k . (We drop the dummy variable for the first month, $t=1$, to avoid a collinearity problem with the country-industry fixed effects.) The evolution of the β_m coefficients is plotted, to illustrate the importance credit channel of comparative advantage over time. Panel B and C do likewise, with *EXTFIN* replaced by *TANG* and *TCRED* respectively. In each panel, the dotted lines indicate the bounds of the 90% confidence intervals of each β_m coefficient. Two linear regression trend lines for the β_m 's are plotted, one for pre-September 2008 and a second line for September 2008 and after. A horizontal line at 0 is included.

Table 1
The Month-on-Month Fall in US Manufacturing Imports (Oct-Nov 2008)

A: Industries (NAICS 3-digit) with sharpest declines in imports (top 5)

324:	Petroleum and Coal Products Manufacturing	-53.0%
315:	Apparel Manufacturing	-34.1%
316:	Leather and Allied Product Manufacturing	-23.2%
331:	Primary Metal Manufacturing	-22.6%
325:	Chemical Manufacturing	-22.5%

B: Industries (NAICS 3-digit) with smallest declines in imports (bottom 5)

336:	Transportation Equipment Manufacturin	-12.1%
322:	Paper Manufacturing	-11.9%
326:	Plastics and Rubber Products Manufacturing	-10.1%
311:	Food Manufacturing	-7.5%
337:	Furniture and Related Product Manufacturing	-6.3%

Table 2
Country Credit Conditions and Trade Volumes

<u>Crisis = 1: Sep 09 and after</u>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
						3m rate	Lag rate	Mar 09	Less TUR
	Dependent variable: Log (Total exports to the US)								
IBrate	-0.203** [0.082]	-0.199** [0.092]	-0.208* [0.103]	-0.130*** [0.040]	-0.095 [0.111]	-0.097 [0.111]	-0.079 [0.110]	-0.075 [0.112]	-0.229* [0.126]
Crisis X IBrate		-0.012 [0.044]	-0.034 [0.035]	-0.005 [0.018]	-0.046 [0.029]	-0.047 [0.028]	-0.063* [0.032]	-0.067* [0.036]	0.027 [0.059]
Log(K/L), Log(H/L)?	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Log(GDP), Log(GDPpc)?	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	869	869	809	839	809	809	809	809	779
R-squared	0.17	0.17	0.21	0.65	0.63	0.63	0.62	0.63	0.65
	Dependent variable: Log (Industry exports to the US)								
IBrate	-0.169** [0.080]	-0.159* [0.085]	-0.183* [0.094]	-0.092*** [0.032]	-0.036 [0.061]	-0.036 [0.061]	-0.025 [0.060]	-0.018 [0.061]	-0.070 [0.104]
Crisis X IBrate		-0.030 [0.035]	-0.055 [0.035]	-0.024 [0.020]	-0.065* [0.035]	-0.064* [0.036]	-0.064* [0.037]	-0.074* [0.039]	-0.068 [0.082]
Log(K/L), Log(H/L)?	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Log(GDP), Log(GDPpc)?	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Ind-Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18040	18040	16825	17410	16825	16825	16825	16200	16200
R-squared	0.29	0.29	0.33	0.57	0.57	0.57	0.57	0.57	0.58

Notes: Standard errors are clustered by country, with *, **, and *** denoting significance at the 10%, 5%, and 1% levels respectively. The dependent variable is log monthly exports to the US as recorded by the US Census Bureau for 3-digit NAICS manufacturing industries, covering Nov 2006 to Apr 2009; this is aggregated at the exporter level in the top panel, and at the exporter-industry level for the bottom panel. The Crisis variable is an indicator equal to 1 from Sep 2009 and thereafter, except in Column (8) where the cutoff month is Mar 2009. The upper panel controls for month fixed effects, while the lower panel controls for industry-month fixed effects. Columns (3) and (5)-(9) control for Log(K/L) and Log(H/L), as well as Crisis X Log(K/L) and Crisis X Log(H/L). Columns (4)-(9) control for Log(GDP) and Log(GDPpc), as well as Crisis X Log(GDP) and Crisis X Log(GDPpc). Column (6) uses the three-month interbank rate for IBrate instead of the one-month rate. Column (7) uses a three-month lag of the one-month rate for IBrate. Column (9) drops TUR from the sample. Results are similar if clustering by country-industry is adopted instead in the lower panel. Country variables included as controls on the right-hand side are 1996-2005 averages.

Table 3
The Global Financial Crisis and Credit Channels of Comparative Advantage: EXTFIN

	Dependent variable: Log (Industry exports to the US)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<u>Crisis = 1: Sep 09 and after</u>						3m rate	Lag rate	Mar 09	Less TUR	Less 325
Ibrate X EXTFIN	-0.020** [0.009]	-0.018** [0.009]	0.000 [0.010]	-0.007 [0.008]	-0.009 [0.011]	-0.008 [0.011]	-0.009 [0.011]	-0.008 [0.010]	-0.027 [0.025]	-0.055 [0.042]
Crisis X Ibrate X EXTFIN		-0.006 [0.005]	-0.005 [0.007]	0.002 [0.006]	-0.002 [0.006]	-0.002 [0.006]	-0.003 [0.007]	-0.003 [0.007]	0.012 [0.014]	-0.010 [0.024]
Log(K/L) X log(k/l), Log(H/L) X log(h/l)?	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Log(GDP) X Ind fe, Log(GDPpc) X Ind fe?	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind-Month and Cty-Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cty-Ind fixed effects	No	No	No	No	No	No	No	No	No	No
Observations	18040	18040	16825	17410	16825	16825	16825	16825	16200	16016
R-squared	0.68	0.68	0.70	0.74	0.73	0.73	0.73	0.73	0.74	0.72
Ibrate X EXTFIN	-0.007 [0.005]	-0.002 [0.003]	-0.003 [0.003]	-0.001 [0.003]	-0.001 [0.003]	-0.001 [0.003]	-0.008 [0.006]	-0.002 [0.005]	0.001 [0.004]	0.027** [0.012]
Crisis X Ibrate X EXTFIN		-0.006* [0.003]	-0.006 [0.004]	-0.004 [0.003]	-0.008** [0.004]	-0.008** [0.004]	-0.007** [0.003]	-0.009** [0.004]	-0.013* [0.007]	-0.006 [0.007]
Log(K/L) X log(k/l), Log(H/L) X log(h/l)?	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Log(GDP) X Ind fe, Log(GDPpc) X Ind fe?	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind-Month and Cty-Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cty-Ind fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18040	18040	16825	17410	16825	16825	16825	16825	16200	16016
R-squared	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.96

Notes: Standard errors are clustered by country, with *, **, and *** denoting significance at the 10%, 5%, and 1% levels respectively. The dependent variable is log monthly exports to the US as recorded by the US Census Bureau in 3-digit NAICS manufacturing industries, covering Nov 2006 to Apr 2009. The Crisis variable is an indicator equal to 1 from Sep 2009 and thereafter, except in Column (8) where the cutoff month is Mar 09. The upper panel controls for industry-month and country-month fixed effects, while the lower panel controls for industry-month, country-month, and country-industry fixed effects. Columns (3) and (5)-(10) control for Log(K/L) X Log(k/l) and Log(H/L) X Log(h/l), as well as Crisis X Log(K/L) X Log(k/l) and Crisis X Log(H/L) X Log(h/l). Columns (4)-(10) control for Log(GDP) X Industry fixed effects and Log(GDPpc) X Industry fixed effects, as well as Crisis X Log(GDP) X Industry fixed effects and Crisis X Log(GDPpc) X Industry fixed effects. Since the lower panels control for country-industry fixed effects, we drop Log(K/L) X Log(k/l), Log(H/L) X Log(h/l), Log(GDP) X Industry fixed effects and Log(GDPpc) X Industry fixed effects, from the relevant specifications as these cannot be identified. Column (9) drops TUR from the sample. Column (10) drops NAICS 325 from the sample. Results are similar if clustering by country-industry is adopted instead. Country variables included as controls on the right-hand side are 1996-2005 averages.

Table 4
The Global Financial Crisis and Credit Channels of Comparative Advantage: TANG

	Dependent variable: Log (Industry Exports to the US)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Crisis = 1: Sep 09 and after						3m rate	Lag rate	Mar 09	Less TUR	Less 325
IBrate X TANG	0.036 [0.164]	0.074 [0.145]	0.307** [0.142]	0.243* [0.131]	0.261* [0.147]	0.274* [0.147]	0.236* [0.132]	0.234* [0.128]	0.298 [0.494]	0.314* [0.156]
Crisis X IBrate X TANG		-0.119 [0.085]	-0.159 [0.094]	-0.1 [0.104]	-0.136 [0.110]	-0.14 [0.115]	-0.02 [0.086]	-0.024 [0.110]	-0.263 [0.237]	-0.177 [0.125]
Log(K/L) X log(k/l), Log(H/L) X log(h/l)?	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Log(GDP) X Ind fe, Log(GDPpc) X Ind fe?	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind-Month and Cty-Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cty-Ind fixed effects	No	No	No	No	No	No	No	No	No	No
Observations	18040	18040	16825	17410	16825	16825	16825	16825	16200	16016
R-squared	0.68	0.68	0.70	0.74	0.73	0.73	0.73	0.73	0.74	0.72
IBrate X TANG	0.199* [0.105]	0.159 [0.115]	0.166 [0.121]	0.173 [0.123]	0.198 [0.131]	0.214 [0.130]	0.256* [0.126]	0.220* [0.111]	0.116 [0.156]	0.207 [0.146]
Crisis X IBrate X TANG		0.053*** [0.015]	0.035* [0.019]	0.059** [0.023]	0.026 [0.040]	0.025 [0.038]	-0.011 [0.038]	0.003 [0.032]	0.075 [0.060]	-0.01 [0.054]
Log(K/L) X log(k/l), Log(H/L) X log(h/l)?	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Log(GDP) X Ind fe, Log(GDPpc) X Ind fe?	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind-Month and Cty-Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cty-Ind fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18040	18040	16825	17410	16825	16825	16825	16825	16200	16016
R-squared	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.96

Notes: Standard errors are clustered by country, with *, **, and *** denoting significance at the 10%, 5%, and 1% levels respectively. The dependent variable is log monthly exports to the US as recorded by the US Census Bureau in 3-digit NAICS manufacturing industries, covering Nov 2006 to Apr 2009. The Crisis variable is an indicator equal to 1 from Sep 2009 and thereafter, except in Column (8) where the cutoff month is Mar 09. The upper panel controls for industry-month and country-month fixed effects, while the lower panel controls for industry-month, country-month, and country-industry fixed effects. Columns (3) and (5)-(10) control for Log(K/L) X Log(k/l) and Log(H/L) X Log(h/l), as well as Crisis X Log(K/L) X Log(k/l) and Crisis X Log(H/L) X Log(h/l). Columns (4)-(10) control for Log(GDP) X Industry fixed effects and Log(GDPpc) X Industry fixed effects, as well as Crisis X Log(GDP) X Industry fixed effects and Crisis X Log(GDPpc) X Industry fixed effects. Since the lower panels control for country-industry fixed effects, we drop Log(K/L) X Log(k/l), Log(H/L) X Log(h/l), Log(GDP) X Industry fixed effects and Log(GDPpc) X Industry fixed effects, from the relevant specifications as these cannot be identified. Column (9) drops TUR from the sample. Column (10) drops NAICS 325 from the sample. Results are similar if clustering by country-industry is adopted instead. Country variables included as controls on the right-hand side are 1996-2005 averages.

Table 5
The Global Financial Crisis and Credit Channels of Comparative Advantage: TCRED

	Dependent variable: Log (Industry Exports to the US)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<u>Crisis = 1: Sep 09 and after</u>						3m rate	Lag rate	Mar 09	Less TUR	Less 325
Ibrate X TCRED	-0.176 [0.479]	-0.468 [0.554]	0.178 [0.506]	0.060 [0.392]	0.102 [0.387]	0.080 [0.379]	0.109 [0.378]	-0.035 [0.431]	-0.142 [1.321]	0.118 [0.545]
Crisis X Ibrate X TCRED		0.901* [0.480]	0.685 [0.418]	0.982* [0.480]	1.010* [0.510]	1.058* [0.547]	0.639 [0.429]	0.897 [0.620]	1.806** [0.731]	1.113* [0.582]
Log(K/L) X log(k/l), Log(H/L) X log(h/l)?	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Log(GDP) X Ind fe, Log(GDPpc) X Ind fe?	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind-Month and Cty-Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cty-Ind fixed effects	No	No	No	No	No	No	No	No	No	No
Observations	18040	18040	16825	17410	16825	16825	16825	16825	16200	16016
R-squared	0.68	0.68	0.70	0.74	0.73	0.73	0.73	0.73	0.74	0.72
1m Ibrate X TCRED	1.180*** [0.353]	0.877** [0.413]	0.941** [0.428]	0.943* [0.462]	1.037** [0.468]	1.122** [0.457]	1.239** [0.541]	1.076** [0.454]	0.849 [0.623]	1.080* [0.531]
Crisis X 1m Ibrate X TCRED		0.397** [0.146]	0.316** [0.142]	0.410** [0.172]	0.365* [0.186]	0.371** [0.180]	0.185 [0.164]	0.286 [0.198]	0.457 [0.355]	0.236 [0.251]
Log(K/L) X log(k/l), Log(H/L) X log(h/l)?	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Log(GDP) X Ind fe, Log(GDPpc) X Ind fe?	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind-Month and Cty-Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cty-Ind fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18040	18040	16825	17410	16825	16825	16825	16825	16200	16016
R-squared	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.96

Notes: Standard errors are clustered by country, with *, **, and *** denoting significance at the 10%, 5%, and 1% levels respectively. The dependent variable is log monthly exports to the US as recorded by the US Census Bureau in 3-digit NAICS manufacturing industries, covering Nov 2006 to Apr 2009. The Crisis variable is an indicator equal to 1 from Sep 2009 and thereafter, except in Column (8) where the cutoff month is Mar 09. The upper panel controls for industry-month and country-month fixed effects, while the lower panel controls for industry-month, country-month, and country-industry fixed effects. Columns (3) and (5)-(10) control for Log(K/L) X Log(k/l) and Log(H/L) X Log(h/l), as well as Crisis X Log(K/L) X Log(k/l) and Crisis X Log(H/L) X Log(h/l). Columns (4)-(10) control for Log(GDP) X Industry fixed effects and Log(GDPpc) X Industry fixed effects, as well as Crisis X Log(GDP) X Industry fixed effects and Crisis X Log(GDPpc) X Industry fixed effects. Since the lower panels control for country-industry fixed effects, we drop Log(K/L) X Log(k/l), Log(H/L) X Log(h/l), Log(GDP) X Industry fixed effects and Log(GDPpc) X Industry fixed effects, from the relevant specifications as these cannot be identified. Column (9) drops TUR from the sample. Column (10) drops NAICS 325 from the sample. Results are similar if clustering by country-industry is adopted instead. Country variables included as controls on the right-hand side are 1996-2005 averages.

Table 6
Financial Development and Trade Flows during the Global Financial Crisis

		Dependent variable: Log (Industry Exports to the US) PC/GDP = Private Credit / GDP								
<u>Crisis = 1: Sep 09 and after</u>		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Ind Char:	EXTFIN	EXTFIN	EXTFIN	TANG	TANG	TANG	TCRED	TCRED	TCRED
PC/GDP X Ind Char		0.317*** [0.082]	0.303*** [0.082]	0.035 [0.108]	-4.030*** [1.224]	-3.851*** [1.210]	-3.536** [1.684]	-4.141 [4.678]	-3.600 [4.674]	-9.872* [4.996]
Crisis X PC/GDP X Ind Char			0.055*** [0.019]	0.020 [0.027]		-0.681*** [0.240]	-0.468* [0.264]		-2.063 [1.496]	-2.185 [2.278]
Log(K/L) X log(k/l), Log(H/L) X log(h/l)?		No	No	Yes	No	No	Yes	No	No	Yes
Log(GDP) X Ind fe, Log(GDPpc) X Ind fe?		No	No	Yes	No	No	Yes	No	No	Yes
Ind-Month and Cty-Month fixed effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cty-Ind fixed effects		No	No	No	No	No	No	No	No	No
Observations		43507	43507	39864	43507	43507	39864	43507	43507	39864
R-squared		0.69	0.69	0.74	0.69	0.69	0.74	0.68	0.68	0.74
Crisis X PC/GDP X Ind Char			0.048** [0.020]	0.007 [0.026]		-0.758*** [0.230]	-0.731** [0.287]		-1.867 [1.271]	-3.051 [2.201]
Log(K/L) X log(k/l), Log(H/L) X log(h/l)?			No	Yes		No	Yes		No	Yes
Log(GDP) X Ind fe, Log(GDPpc) X Ind fe?			No	Yes		No	Yes		No	Yes
Ind-Month and Cty-Month fixed effects			Yes	Yes		Yes	Yes		Yes	Yes
Cty-Ind fixed effects			Yes	Yes		Yes	Yes		Yes	Yes
Observations			43507	39864		43507	39864		43507	39864
R-squared			0.96	0.96		0.96	0.96		0.96	0.96

Notes: Standard errors are clustered by country, with *, **, and *** denoting significance at the 10%, 5%, and 1% levels respectively. The dependent variable is log monthly exports to the US as recorded by the US Census Bureau in 3-digit NAICS manufacturing industries, covering Nov 2006 to Apr 2009. The Crisis variable is an indicator equal to 1 from Sep 2009 and thereafter. The upper panel controls for industry-month and country-month fixed effects, while the lower panel controls for industry-month, country-month, and country-industry fixed effects. The industry characteristic in Columns (1)-(3) is EXTFIN, that in Columns (4)-(6) is TANG, and that in Columns (7)-(9) is TCRED. For each industry characteristic, the first two columns are lean specifications containing no auxiliary controls, whereas the third column controls for Log(K/L) X Log(k/l), Log(H/L) X Log(h/l), Log(GDP) X Industry fixed effects and Log(GDPpc) X Industry fixed effects, as well as their respective triple interactions with the Crisis dummy. Since the lower panels control for country-industry fixed effects, and the private credit variable is not time-varying, we can only identify the Crisis X PC/GDP X Ind Char triple interaction coefficient in these specifications. Results are similar if clustering by country-industry is adopted instead. Country variables included on the right-hand side are 1996-2005 averages.

Table 7
Accounting Standards and Trade Flows during the Global Financial Crisis

		Dependent variable: Log (Industry Exports to the US) ACCT = Accounting Standards								
<u>Crisis = 1: Sep 09 and after</u>		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Ind Char:	EXTFIN	EXTFIN	EXTFIN	TANG	TANG	TANG	TCRED	TCRED	TCRED
ACCT X Ind Char		0.006** [0.003]	0.006* [0.003]	0.001 [0.003]	-0.135*** [0.049]	-0.134*** [0.048]	-0.140** [0.054]	0.079 [0.184]	0.059 [0.184]	0.006 [0.205]
Crisis X ACCT X Ind Char			0.001 [0.001]	0.002** [0.001]		-0.005 [0.009]	-0.005 [0.010]		0.078 [0.050]	0.077 [0.060]
Log(K/L) X log(k/l), Log(H/L) X log(h/l)?		No	No	Yes	No	No	Yes	No	No	Yes
Log(GDP) X Ind fe, Log(GDPpc) X Ind fe?		No	No	Yes	No	No	Yes	No	No	Yes
Ind-Month and Cty-Month fixed effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cty-Ind fixed effects		No	No	No	No	No	No	No	No	No
Observations		24553	24553	23603	24553	24553	23603	24553	24553	23603
R-squared		0.64	0.64	0.69	0.64	0.64	0.69	0.63	0.63	0.69
Crisis X ACCT X Ind Char			0.001 [0.001]	0.002** [0.001]		-0.001 [0.003]	-0.008 [0.009]		0.013 [0.017]	0.017 [0.061]
Log(K/L) X log(k/l), Log(H/L) X log(h/l)?			No	Yes		No	Yes		No	Yes
Log(GDP) X Ind fe, Log(GDPpc) X Ind fe?			No	Yes		No	Yes		No	Yes
Ind-Month and Cty-Month fixed effects			Yes	Yes		Yes	Yes		Yes	Yes
Cty-Ind fixed effects			Yes	Yes		Yes	Yes		Yes	Yes
Observations			24553	23603		24553	23603		24553	23603
R-squared			0.96	0.97		0.96	0.97		0.96	0.97

Notes: Standard errors are clustered by country, with *, **, and *** denoting significance at the 10%, 5%, and 1% levels respectively. The dependent variable is log monthly exports to the US as recorded by the US Census Bureau in 3-digit NAICS manufacturing industries, covering Nov 2006 to Apr 2009. The Crisis variable is an indicator equal to 1 from Sep 2009 and thereafter. The upper panel controls for industry-month and country-month fixed effects, while the lower panel controls for industry-month, country-month, and country-industry fixed effects. The industry characteristic in Columns (1)-(3) is EXTFIN, that in Columns (4)-(6) is TANG, and that in Columns (7)-(9) is TCRED. For each industry characteristic, the first two columns are lean specifications containing no auxiliary controls, whereas the third column controls for Log(K/L) X Log(k/l), Log(H/L) X Log(h/l), Log(GDP) X Industry fixed effects and Log(GDPpc) X Industry fixed effects, as well as their respective triple interactions with the Crisis dummy. Since the lower panels control for country-industry fixed effects, and the accounting standards variable is not time-varying, we can only identify the Crisis X ACCT X Ind Char triple interaction coefficient in these specifications. Results are similar if clustering by country-industry is adopted instead. Country variables included on the right-hand side are 1996-2005 averages.

Appendix Table 1A
List of Countries with Interbank Rate Data (Datastream)

Australia (AUS); Belgium (BEL); Bulgaria (BGR); Canada (CAN); China (CHN); Germany (DEU); Denmark (DNK); Spain (ESP); Finland (FIN); France (FRA); Great Britain (GBR); Greece (GRC); Hong Kong (HKG); Hungary (HUN); Ireland (IRL); Italy (ITA); Japan (JPN); Malaysia (MYS); Netherlands (NLD); Norway (NOR); New Zealand (NZL); Poland (POL); Portugal (PRT); Romania (ROM); Singapore (SGP); Sweden (SWE); Thailand (THA); Turkey (TUR); Taiwan (TWN)

Note: Sample consists of 29 countries for which one-month interbank interest rate data was available from Thomson Datastream.

Appendix Table 1B
Summary Statistics of Country Characteristics

1-month interbank rates

	Min	5 th Pctile	Median	95 th Pctile	Max	Mean	Std Dev
Nov 06	0.46	1.70	3.66	8.07	19.24	4.59	3.21
Mar 08	0.85	1.22	4.31	10.27	16.35	5.04	3.01
Sep 08	0.74	1.28	4.66	12.99	18.12	5.42	3.39
Apr 09	0.15	0.27	1.01	10.78	13.31	2.47	3.24

**Appendix Table 2A
Industry Characteristics**

Summary Statistics

NAICS	Industry	External Finance Dep (EXTFIN)	Asset Tangibility (TANG)	Trade Credit (TCRED)	Phy Cap Intensity (Log(k/l))	Human Cap intensity (Log(h/l))
311	Food Manufacturing	-0.558	0.332	0.078	4.854	-1.424
312	Beverage and Tobacco Product Manufacturing	-0.452	0.321	0.044	5.132	-0.918
313	Textile Mills	-0.154	0.371	0.063	4.198	-1.893
314	Textile Product Mills	-0.335	0.264	0.024	3.313	-1.671
315	Apparel Manufacturing	-0.646	0.131	0.066	2.617	-1.943
316	Leather and Allied Product Manufacturing	-1.857	0.115	0.083	3.254	-1.853
321	Wood Product Manufacturing	-0.372	0.428	0.037	3.816	-1.820
322	Paper Manufacturing	-0.366	0.535	0.063	5.783	-1.459
323	Printing and Related Support Activities	-0.487	0.296	0.084	3.587	-0.628
324	Petroleum and Coal Products Manufacturing	-0.175	0.551	0.123	6.857	-1.040
325	Chemical Manufacturing	5.472	0.138	0.032	5.606	-0.848
326	Plastics and Rubber Products Manufacturing	-0.278	0.355	0.081	4.280	-1.571
327	Nonmetallic Mineral Product Manufacturing	-0.394	0.417	0.050	4.403	-1.562
331	Primary Metal Manufacturing	-0.364	0.406	0.084	5.584	-1.407
332	Fabricated Metal Product Manufacturing	-0.781	0.279	0.093	4.097	-1.391
333	Machinery Manufacturing	-0.237	0.182	0.070	4.380	-1.001
334	Computer and Electronic Product Manufacturing	0.435	0.116	0.054	4.686	-0.726
335	Electrical Equipment, Appliance, and Component Manufacturing	-0.288	0.197	0.080	3.973	-1.297
336	Transportation Equipment Manufacturing	-0.386	0.250	0.120	4.957	-1.643
337	Furniture and Related Product Manufacturing	-1.040	0.289	0.081	2.952	-1.387
339	Miscellaneous Manufacturing	0.549	0.135	0.042	3.597	-1.227

Notes: EXTFIN and TANG and TCRED are calculated based on 1996-2005 Compustat data. Log(k/l) and Log(h/l) are calculated based on 1996 NBER-CES data for US manufacturing. For more details, please see the Data Appendix.

Correlation Coefficients

	EXTFIN	TANG	TCRED	Log(k/l)
TANG	0.2420**			
TCRED	-0.1515	-0.2312**		
Log(k/l)	0.3594	0.5392**	0.2659	
Log(h/l)	0.4197*	-0.1292	-0.0119	0.3940*

Notes: ** and * indicate significance at the 5% and 10% levels respectively.

Appendix Table 3
The Global Financial Crisis and Credit Channels of Comparative Advantage: Joint Tests

Crisis = 1: Sep 09 and after Cty Char:	Dependent variable: Log (Exports to the US)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	IBRATE	IBRATE	IBRATE	PC/GDP	PC/GDP	PC/GDP	ACCT	ACCT	ACCT
Cty Char X EXTFIN	-0.026** [0.012]	-0.025* [0.013]	-0.001 [0.016]	0.286** [0.119]	0.275** [0.120]	-0.125 [0.177]	0.006 [0.005]	0.006 [0.005]	-0.001 [0.005]
Crisis X Cty Char X EXTFIN		-0.003 [0.007]	0.003 [0.010]		0.040 [0.025]	-0.003 [0.037]		0.002* [0.001]	0.003** [0.001]
Cty Char X TANG	-0.002 [0.178]	0.053 [0.155]	0.259* [0.144]	-3.516*** [1.282]	-3.370*** [1.269]	-3.534* [1.898]	-0.133** [0.051]	-0.132** [0.050]	-0.148** [0.056]
Crisis X Cty Char X TANG		-0.167 [0.100]	-0.160 [0.116]		-0.557** [0.236]	-0.403 [0.285]		-0.004 [0.009]	-0.003 [0.010]
Cty Char X TCRED	-0.758 [0.648]	-1.078 [0.762]	-0.118 [0.676]	6.083 [5.854]	6.220 [5.924]	-9.278 [7.052]	0.351 [0.227]	0.317 [0.231]	0.113 [0.246]
Crisis X Cty Char X TCRED		0.964 [0.581]	1.197 [0.740]		-0.521 [1.733]	-1.868 [2.757]		0.130** [0.058]	0.136* [0.069]
Log(K/L) X log(k/l), Log(H/L) X log(h/l)?	No	No	Yes	No	No	Yes	No	No	Yes
Log(GDP) X Ind fe, Log(GDPpc) X Ind fe?	No	No	Yes	No	No	Yes	No	No	Yes
Ind-Month and Cty-Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cty-Ind fixed effects	No	No	No	No	No	No	No	No	No
Observations	18040	18040	16825	43507	43507	39864	24553	24553	23603
R-squared	0.68	0.68	0.73	0.69	0.69	0.74	0.64	0.64	0.69
Cty Char X EXTFIN	0.006 [0.011]	0.009 [0.007]	0.012 [0.009]						
Crisis X Cty Char X EXTFIN		-0.003 [0.004]	-0.007 [0.007]		0.030 [0.025]	-0.034 [0.038]		0.001 [0.001]	0.002* [0.001]
Cty Char X TANG	0.179 [0.114]	0.154 [0.118]	0.198 [0.135]						
Crisis X Cty Char X TANG		0.035** [0.015]	-0.006 [0.054]		-0.659*** [0.224]	-0.702** [0.286]		-0.006 [0.005]	-0.005 [0.009]
Cty Char X TCRED	1.194** [0.488]	0.972* [0.480]	1.163** [0.549]						
Crisis X Cty Char X TCRED		0.294 [0.202]	0.211 [0.297]		-0.447 [1.471]	-3.143 [2.672]		0.051** [0.023]	0.069 [0.067]
Log(K/L) X log(k/l), Log(H/L) X log(h/l)?	No	No	Yes		No	Yes		No	Yes
Log(GDP) X Ind fe, Log(GDPpc) X Ind fe?	No	No	Yes		No	Yes		No	Yes

Ind-Month and Cty-Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cty-Ind fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18040	18040	16825	43507	39864	24553	23603	
R-squared	0.97	0.97	0.97	0.96	0.96	0.96	0.97	

Notes: Standard errors are clustered by country, with *, **, and *** denoting significance at the 10%, 5%, and 1% levels respectively. The dependent variable is log monthly exports to the US as recorded by the US Census Bureau in 3-digit NAICS manufacturing industries, covering Nov 2006 to Apr 2009. The Crisis variable is an indicator equal to 1 from Sep 2009 and thereafter. The upper panel controls for industry-month and country-month fixed effects, while the lower panel controls for industry-month, country-month, and country-industry fixed effects. The country characteristic in Columns (1)-(3) is the one-month interbank rate, that in Columns (4)-(6) is PC/GDP, and that in Columns (7)-(9) is ACCT. For each country characteristic, the first two columns are lean specifications containing no auxiliary controls, whereas the third column controls for Log(K/L) X Log(k/l), Log(H/L) X Log(h/l), Log(GDP) X Industry fixed effects and Log(GDPpc) X Industry fixed effects, as well as their respective triple interactions with the Crisis dummy. Since the lower panels control for country-industry fixed effects, and the private credit and accounting standards variables are not time-varying, we can only identify the Crisis X PC/GDP X Ind Char and Crisis X ACCT X Ind Char triple interactions in the respective specifications in Columns (5)-(6) and (8)-(9). Results are similar if clustering by country-industry is adopted instead. Country variables included on the right-hand side are 1996-2005 averages.

Appendix Table 4
Regression Coefficients underpinning Figure 3

month	(1)		(2)		(3)	
	Interbank X EXTFIN Coefficient	Std Error	Interbank X TANG Coefficient	Std Error	Interbank X TCRED Coefficient	Std Error
2	-0.004	[0.004]	0.155**	[0.060]	0.567**	[0.271]
3	-0.004	[0.005]	0.162**	[0.064]	1.025***	[0.319]
4	-0.004	[0.004]	0.074	[0.048]	0.464	[0.318]
5	-0.006	[0.005]	0.130*	[0.065]	1.116***	[0.293]
6	-0.001	[0.003]	0.134*	[0.066]	0.776*	[0.398]
7	0.003	[0.004]	0.043	[0.055]	0.680**	[0.260]
8	-0.006	[0.005]	0.182***	[0.056]	0.523*	[0.265]
9	-0.006	[0.004]	0.020	[0.065]	0.422	[0.260]
10	-0.010**	[0.004]	0.098	[0.079]	0.467	[0.349]
11	-0.006**	[0.003]	0.155***	[0.051]	0.200	[0.264]
12	-0.005	[0.003]	0.101	[0.073]	0.669*	[0.344]
13	0.000	[0.005]	0.091***	[0.032]	0.350	[0.249]
14	0.003	[0.006]	0.203**	[0.086]	0.631	[0.416]
15	-0.006	[0.005]	0.182**	[0.076]	0.754**	[0.338]
16	-0.003	[0.004]	-0.036	[0.120]	-0.151	[0.862]
17	-0.009**	[0.003]	0.159*	[0.085]	1.386***	[0.426]
18	-0.006**	[0.003]	0.234*	[0.120]	1.401***	[0.478]
19	-0.005*	[0.003]	0.212	[0.126]	0.912	[0.581]
20	-0.009***	[0.003]	0.150**	[0.061]	0.372	[0.421]
21	-0.002	[0.002]	-0.079	[0.072]	-0.351	[0.558]
22	-0.002	[0.003]	0.155	[0.108]	0.993***	[0.317]
23	-0.019	[0.011]	0.287***	[0.052]	1.238***	[0.264]
24	-0.002	[0.003]	0.192	[0.113]	1.376***	[0.367]
25	-0.002	[0.003]	0.217***	[0.074]	0.875***	[0.271]
26	-0.008**	[0.004]	0.211**	[0.096]	1.454**	[0.585]
27	-0.009	[0.006]	0.162**	[0.060]	1.043***	[0.258]
28	-0.011	[0.007]	0.158**	[0.077]	1.333***	[0.309]
29	-0.015***	[0.005]	0.175*	[0.100]	0.886***	[0.269]
30	-0.020***	[0.006]	-0.037	[0.147]	0.014	[0.696]
N	18040		18040		18040	
R ²	0.97		0.97		0.97	

Notes: Standard errors are clustered by country, with *, **, and *** denoting significance at the 10%, 5%, and 1% levels respectively. The dependent variable is log monthly exports to the US as recorded by the US Census Bureau in 3-digit NAICS manufacturing industries, covering Nov 2006 to Apr 2009. Each specification estimates the coefficient of the interbank rate interaction with EXTFIN, TANG or TCRED for each month in a pooled regression setting, while controlling for industry-month, country-month, and country-industry fixed effects. The term for the first month is omitted, to avoid a collinearity problem with the country-industry fixed effects. The reported coefficients are plotted in Figure 3.