

## **Exports and Financial Shocks**

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### **Abstract:**

A number of observers have suggested that one reason for the dramatic decline in the world export to GDP ratio was due to declines in the availability of trade finance. This paper is the first to match exporters with the institutions that provide them with trade finance and establish a causal link between the health of these banks and export growth. We exploit Japanese matched bank-firm data to examine whether banks transmit financial shocks to exporters in the financial crises during the 1990s. Our point estimates suggest that the trade finance channel accounts for about one third of the decline in Japanese exports in the financial crisis of 1990s.

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## 1. Introduction

One of the most striking features of the financial crisis of 2008 was the collapse in international trade. Figure 1 plots the ratio of world trade to GDP for a sample of the largest economies in the world.<sup>1</sup> As one can see from this plot, the decline in world exports was much greater than the decline in world GDP. While GDP fell 10 percent between the first quarter of 2008 and the first quarter of 2009, exports plunged 28 percent, which amounts to a 761 billion dollar decline. Interestingly, the decline was much larger than what would have been predicted by standard gravity and macro models of trade that base export changes on changes in supply, demand, and relative prices (c.f. Chinn (2009), Campbell et al (2009), and Levchenko et al. (2009), and OECD (2009)).

The puzzling drop has prompted a number of observers to postulate that trade finance may be partially responsible for the decline (c.f. Auboin (2009), Dorsey (2009) and OECD (2009)). This view is largely based on anecdotal evidence from bank surveys that indicate that finance conditions tightened during this period. However, as Dorsey (2009) has noted, it is difficult to separate cause and effect. Moreover, the standard proxies for trade finance used in the literature – e.g. trade credit or short-term credit – are extremely noisy measures of trade finance, making conclusions based on these variables hard to interpret. Our study overcomes these difficulties by using unique matched firm-bank data to examine the link between finance and exports during the Japanese financial crises of the 1990s. This is the first paper to match exporters with the institutions that provide them with trade finance and establish a causal link

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<sup>1</sup> We used the set of countries that report quarterly seasonally adjusted export and GDP data from national sources (see data appendix for more details). These countries are Australia, Belgium, Canada, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom, United States, Hong Kong, South Korea, and Taiwan. Jointly, they accounted for 70 percent of world GDP and 72 percent of world exports in 2007.

between the health of these banks and export growth. Importantly, we also demonstrate that domestic sales are not affected by the health of banks providing trade finance. This establishes that financial shocks affect exports differently than domestic sales. Moreover, the point estimates suggest that the partial effect of bank crises on exports accounts for about one third of the dramatic drop in exports observed in the Japanese financial crisis of 1997-8.

Proponents of a trade finance channel between banks and exporters note that exports are more sensitive to financial shocks due to the higher default risk and working capital requirements associated with international trade. In particular, exporters rarely have the capacity or willingness to evaluate counter-party default risk and usually turn to banks to provide payment insurance and guarantees. Moreover, the longer time-lags associated with international trade require greater export working-capital financing than those with domestic transactions. As a result, virtually every exporter works with a bank or other financial institution to obtain credit or export guarantees. For example, Marc Auboin (2007), using data from the Joint BIS-IMF-OECD-World Bank Statistics on External Debt for 2004, estimates that 90 percent of trade transactions involve some form of credit, insurance or guarantee issued by a bank or other financial institution. We will henceforth refer to this nexus of financial arrangements as “trade finance” – i.e. the use of financial intermediaries to manage an exporter’s payment risk and terms. The fact that exporters depend so heavily on financial institutions for working capital and risk insurance suggests that if a credit crunch causes banks to limit trade finance, exports are likely to be differentially affected.

The Japanese case of the 1990s provides an interesting laboratory for understanding the role played by trade finance. First, like the 2008 crisis, the Japanese crisis was prompted by dual land and equity bubbles that spread to the banking sector. Second, both crises featured defaults in short-term bank lending markets that caused investors to become wary of lending to some banks

but not others. And finally, Japan is the only country, to our knowledge, that releases matched bank-firm data that enables researchers to examine whether and how banks transmit financial shocks to exporters.

Our basic empirical strategy is to exploit the fact that some firms within an industry in a particular year relied on relatively healthy banks for trade finance while others relied on less healthy institutions. We use this within industry-year variation to identify how a firm's export growth rate changed with the health of the banks supplying it with trade finance. The usage of industry-time fixed effects sweeps out all macro, and industry supply and demand shocks to ensure that our identification is based only on the health of a firm's bank. The fact that exports by these firms are affected by the health of the institution providing trade finance but domestic sales are not, underpins our contention that financial shocks affects a firm's exports and domestic sales differently. Moreover, the point estimates suggest that these effects are economically as well as statistically significant: the partial equilibrium impact of bank crises accounts for about one third of the dramatic drops in exports observed in past Japanese financial crises.

Our paper builds on and contributes to a number of literatures. The notion that financial shocks and capital constraints matter for loan supply and investment has been well-established. In seminal work, Peek and Rosengren (1997, 2000, and 2005) were able to document that when Japanese banks became unhealthy in the 1990s, they lent less in the US and that this resulted in lower construction activity in states that were heavily dependent on Japanese banks. This work establishes the importance of bank collateral in determining the willingness of banks to lend as hypothesized by Bernanke and Gertler (1989). Similarly, Klein, Peek, and Rosengren (2002) demonstrate that foreign direct investment flows are sensitive to the financial health of the banks supplying the firm with credit. Finally, Harrison, Love and McMillan (2004) show how capital

market restrictions negatively affect firms financing constraints. Jointly, these papers establish a clear link between bank health, lending, and foreign investment.

A number of authors in the international finance literature have examined the possibility that trade credit or the availability of short-term credit might affect exports (c.f. Ronci (2005), Berman and Martin (2009), Iacovone and Zavacka (2009), Levchenko, Lewis, and Tesar (2009)). While some of these studies have found positive associations, others have found no association, or even negative associations. Possible reasons for this are endogeneity problems coupled with the fact that greater usage of trade finance can cause trade credit to rise or fall.<sup>2</sup> For example, the most common form of trade finance – the letter of credit – can either increase or decrease the amount of trade credit on an exporter’s balance sheet. On the one hand, letters of credit reduce the risk of the transaction for exporters by shifting all of the importer’s default risk to the banks involved in the transactions. This channel implies that lowering the costs of letters of credit would tend to make it easier for firms to extend trade credit and hence increase its usage. On the other hand, letters of credit typically contain an export working capital loan that specifies that the exporter will be paid when the goods are shipped as opposed to the usual 30 to 90 days after the goods arrive; this means that letters of credit can also reduce the amount of trade credit on an exporter’s balance sheet.<sup>3</sup> Thus, even if one believes that trade finance is important, it is not clear what association one should expect between trade credit usage and exporting.

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<sup>2</sup> Although “trade credit” and “trade finance” are sometimes used interchangeably, this can be confusing because “trade credit” has a clear definition in accounting and a looser one in finance. In particular, whenever a firm receives an order for goods or services that will be paid later, it records a “trade credit” on the accounts receivable section of its balance sheet. This is true regardless of whether the purchaser is foreign or domestic, so firms with a lot of trade credit on their books may not do any *international* trade. In finance, “trade credit” is also sometimes used to refer to working capital loans used to finance international trade credits on the balance sheets of exporters. In order to avoid confusing these two senses of trade credit, we will always refer to “trade credit” in the accounting sense and refer to export working capital loans and other means of financing these trade credits as trade finance.

<sup>3</sup> Similarly, “export factoring” (selling a discounted bill, corresponding to the export account receivable to a financial institution) and “forfaiting” (selling medium to long-term receivables to a financial institution at a discount) are other major forms of trade finance that also have ambiguous effects on trade credit depending on

As a result of complexities involved in measuring fluctuations in the availability of trade finance, much of the international trade literature has followed Kletzer and Bardhan (1987) who have examined how long term access to external finance affects comparative advantage. This work does not focus on high-frequency shocks to the supply of trade finance *per se*, but rather on the more general supply of external finance to firms. Chaney (2005) develops a model in which firms are liquidity constrained and must pay a fixed cost in order to export. This means that there will be suboptimal entry into the export market. Similarly, Manova (2008) provides compelling evidence that capital market liberalizations enable export sectors with greater external capital needs to expand over the long run. Both papers are important in understanding why firm financing might matter for exporters who need external capital funds to cover fixed costs or other long-term needs, but neither paper addresses the impact of financial shocks on firms that are already engaged in exporting. Most recently, Bricogne et al. (2009) have found that French exporters in sectors that were more dependent on external finance tended to contract more than those that were less dependent on external finance during the current crises, but this work leaves open the question of whether there was a distinct trade finance channel or indeed whether the exports of these firms behaved differently from their domestic sales, which is at the center of our work.

The structure of the remainder of the paper is as follows: In section 2, we discuss the reasons why exporters might be especially sensitive to financial shocks. Section 3 discusses some basic facts about the Japanese downturn in the 1980s with the aim of establishing some

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whether the insurance or working capital loan effects dominate. These forces are further complicated by the fact that risk premia and borrowing costs may vary widely across countries, time, and industries making it very difficult to assess whether firms with higher or lower levels of trade credit on their balance sheet have better or worse access to trade finance.

important parallels between Japan's financial crisis and the recent crisis. Section 4 then presents the Japanese firm-level evidence, and Section 5 concludes.

## **2. Why Might Trade Finance Matter?**

Trade finance encompasses a series of payment methods for exporters and importers that govern the timing and security of payments. While these are concerns for domestic transactions as well, international trade differs from domestic trade in two important dimensions that make it much more sensitive to financial shocks. First, international transactions are often seen as much more risky than domestic transactions. This is, in part, because firms often have difficulty understanding and using foreign legal systems in the event of default or delayed payment (see, for example, Anderson and Marcouiller (2002)). Moreover, exporters often have much less information about counter-party risk and therefore are less willing to extend trade credit, themselves. These two factors help explain why export insurance is such an enormous business. For example, according to the Berne Union, the leading association of export credit insurance providers, their members had an export credit insurance exposure of totaled 1.4 trillion dollars in 2008.<sup>4</sup> This, of course, does not include the implied insurance guarantees contained in letters of credit and other trade finance instruments.

A second reason why exporters use trade finance is that international trade takes significantly more time to execute than domestic trade. Djankov, Freund, and Pham (2006) found in a sample of 180 countries that the median amount of time it takes from the moment the good is ready to ship at the factory until the goods are loaded on a ship is 21 days. Similarly, the median amount of time it takes from the time that a typical good arrives in a port until the good

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<sup>4</sup> Source <http://www.berneunion.org.uk/bu-total-data.html>.

arrives in the purchaser's warehouse is 23 days. If we couple this with Hummel's (2001) estimate that the typical good imported into the US by sea spends 20 days on a vessel, we can see that it is not uncommon for goods to spend approximately two months in transit. Even in OECD countries, which have the most streamlined procedures, it takes 11 days for a good to reach a port or arrive from a port. These data suggest that firms engaged in international trade are likely to be more reliant than domestic firms on working capital financing to cover the costs of goods that have been produced but not yet delivered.

Indeed, the available data suggests that trade finance is extremely important and commonplace as a means of reducing counter-party risk and of securing working capital funds. Although measurement problems have caused many countries to stop collecting trade finance data, the best evidence based on 2004 data suggests that 90 percent of trade transactions involve some form of credit, insurance or guarantee issued by a bank or other financial institution (Auboin (2007)).

Moreover, despite the variety of techniques used to finance trade, the vast majority of these involve the exporter not receiving payment until after the goods are delivered. According to a joint Bankers' Association of Finance and Trade, International Monetary Fund survey, only 19 percent of all international trade transactions were done on a cash-in-advance basis in the fourth quarter of 2007. Since the remaining payment methods typically do not require the importer to pay until 30 to 90 days after delivery, the data strongly suggest that in most cases the exporter must find a means of obtaining working capital to finance trade. In other words, an exporter who does not secure trade finance will typically not be paid for 2 to 6 months after the goods are shipped. As a result most exporters seek a financial institution to provide trade finance.

Although exporters need not rely on private banks for this purpose, in practice, they do. For example, Auboin (2009) finds that 80 percent of the providers of trade finance are private banks.

The fact that banks are the principle suppliers of trade finance makes it very likely that the supply of this trade finance is going to be closely tied to the health of the banks. In particular, as the health of banks deteriorates, it becomes increasingly difficult for these financial institutions to raise funds either through interbank borrowing or the issuance of new bonds or equity. The termination of these sources of liquidity force unhealthy institutions to cut back on their lending. This is likely to have a particularly large impact on trade finance because the short maturities of trade finance and its need to be constantly renewed make it particularly sensitive to a bank's inability to extend new credit. Moreover, since exports are much more finance dependent than domestic sales for the reasons outlined above, one might expect that exports are likely to be particularly sensitive to financial shocks.

Obviously, if firms can easily switch between sources of trade finance, problems in one financial institution need not create difficulties for an exporter. However, there is good reason to believe that it is difficult to rapidly find another source of financing in the event that an exporter is cut off. In particular, any new financial institution interested in providing trade finance, would need to carefully examine the risk of the exporter, the importer, the purchaser's financial institutions, and the reasons why the original financier refused credit. While this certainly can be done, it is likely to take time to complete the analysis during which exports are likely to be delayed. Thus, the mere fact that exporters can find alternative sources of finance does not mean that they can do so sufficiently rapidly to prevent an interruption in their shipments.

The foregoing discussion suggests that financial shocks are likely to be transmitted to exporters through two channels. First, financial institutions that have difficulty raising new funds

may raise the rates that they charge for export credit. This, indeed, happened in the 2008 crisis: an IMF-BAFT survey of 88 banks in 44 countries revealed that the average spreads on letters of credit, export credit insurance, and short to medium-term trade related lending rose by 40, 64, and 31 basis points respectively in the fourth quarter of 2008 relative to the fourth quarter of 2007. Given that the typical spread on a letter of credit is 10-16 basis points (c.f. Auboin (2009)), these represent substantial increases in the costs of these instruments. Second, banks may simply refuse to extend credit at any price in an effort to bring their balance sheets into line. Indeed, the same survey revealed that 57 percent of banks believed that part of the decline in trade finance transactions was due to a tightening of credit availability at their own institution. If credit was drying up in the crisis, this is likely to have made it more difficult for exporters or other banks to assume the risk and working capital needs associated with an export shipment after an exporter's main bank holds back on financing.

In sum, our discussion of trade finance suggests a potentially important linkage between exports and the financial sector. Because of the higher risk and working capital needs of exporters, they are more reliant on banks than domestic firms. This means that exports are likely to be more related to financial conditions than domestic sales. In order to examine this, we first present an overview of the Japanese financial crisis and then turn to the firm-level evidence to identify the financial market connection.

### **3. The Japanese Credit Crunch**

There are a number of reasons why Japan provides an ideal case for examining the impact of financial crises on exporters. Japan's financial crisis of the 1990s has a number of striking parallels to the more recent global 2008 crisis that make it especially relevant for

understanding what happened more recently.<sup>5</sup> The major driving forces of the crises in both periods were twin real estate and stock market bubbles. In Japan, stock prices peaked in December of 1989, and real estate prices peaked in 1991. By 1995, Japanese stock prices had fallen 49 percent from their peak and commercial and residential real estate prices in the 6 largest cities of Japan had fallen 60 and 44 percent, respectively. This had asymmetric effects on financial institutions: Japanese banks that had lent heavily in the real estate sectors, e.g. the Long-Term Credit Bank (LTCB) and Nippon Credit Bank, were particularly hard hit by a sudden rise in non-performing real estate loans coupled with big losses in their equity portfolios. Similarly banks with long-term liabilities suffered heavy losses as Japanese interest rates fell.

Initially, the disclosure of non-performing loans and other losses was highly imperfect, but bank analysts soon began to realize that many Japanese financial institutions were insolvent. This became much more public with the emergence of the “Japan Premium” in the mid 1990s which reflected the fact that investors were unwilling to extend short-term credit to Japanese banks unless the banks paid a substantial risk premium. Hoshi and Kashyap (2001) succinctly describe what happened in Japan next:

“Slowing growth in 1997 uncovered more bad loans, and in November 1997 a crisis erupted. On 3 November, Sanyo Securities, a mid-sized securities firm famous for having the world’s largest trading floor during the speculative frenzy of the late 1980s, suspended part of its operations and filed for bankruptcy protection. This was the first postwar default in the overnight interbank loan market, a shocking event. Then Hokkaido Takushoku Bank...was no longer able to secure funding in the interbank market. It was forced to close on 17 November, marking the first failure of a major bank in postwar Japan. A week later, on 24 November, Yamaichi Securities, one of the Big Four security houses, collapsed following rumors (which subsequently proved true) that it had suffered huge losses.” (p. 276)

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<sup>5</sup> The details of Japan’s crisis have been extensively examined elsewhere (see Hoshi and Kashyap (2001) for an excellent discussion), so we will only highlight a few of the relevant details here.

Interbank overnight loan rates in Japan skyrocketed, with the Japan premium hitting 100 basis points, as Japan's short-term credit markets seized up. This closely mirrored the collapse in interbank liquidity markets in the US. As Peek and Rosengren (2000 and 2005) convincingly document, this produced a massive credit crunch in Japan in which banks reduced their willingness to provide new loans. By the end of 1998, LTCB – the ninth largest bank in the world – had to be nationalized with \$50 billion in bad loans (Tett (2004) p. xi).

As the foregoing discussion makes clear, there were important similarities between Japan in the 1990s and the crisis of 2008. Both crises were initially caused by real estate price collapses that caused bad loans to spread from specialized mortgage lenders to banks and other financial institutions. In both events, the proximate cause of the crisis came from defaults in markets used by banks to secure short-term funds – the Tokyo interbank market in Japan, and, more recently, Lehman's default causing money market funds to be wary of lending to financials. And, as we will document next, both were followed by dramatic declines in exports.

#### **4. Evidence from Firm-Level Data**

Our basic sample of firms is drawn from the Development Bank of Japan (DBJ) database of unconsolidated corporate reports. Between 1986 and 1999, the DBJ collected data on exports and loans for every firm listed on a stock exchange. The 600 to 700 manufacturing exporters in our sample, on average, accounted for 80 percent of all Japanese merchandise exports over this time period. In general, the Japanese fiscal year runs from April in year  $t$  until March in year  $t+1$ , with the accounting year of 82 percent of firms ending in March and 10 percent of firms ending in November or December. Figure 2 shows how well changes in exports of our sample of firms track those of the overall economy. In this figure, we plot the aggregate export data from the

Ministry of Finance, which is on an April to March basis, with the aggregate export data in our sample of firms. As one can see from the figure, aggregate export growth computed from our sample of firms follows Japanese exports from official sources quite closely. This suggests that our data is likely to capture any aggregate movements in Japanese exports.

In order to identify which financial institutions are providing these firms with trade finance, we supplement the DBJ data with data obtained from the *Japan Company Handbook*. The *Japan Company Handbook* provides information on each firm's reference banks. These are banks, listed in order of importance, which handle most of the firm's transactions. For each firm in the sample, we write down its main "reference bank". In cases where a firm's main bank was a regional bank, and therefore probably not active internationally, we identified the bank most likely to provide trade finance as the first large commercial bank on the list of reference banks.<sup>6</sup> Although listed Japanese firms often deal with multiple banks, it is generally agreed that the main bank identified in this manner typically handles the firm's payment settlement accounts and foreign exchange dealings (c.f. Aoki, Patrick, and Sheard (1994), p. 3). Nevertheless, we examine alternative ways of identifying the main bank in the robustness section.

Our next task is to measure the health of banks. The major problem we face is that during the 1990s Japanese banks employed a wide variety of techniques to hide losses on their balance sheets. As a result, Peek and Rosengren (2005) argue stock returns are much better measures of bank health than standard capital adequacy ratios, and we follow their suggested methodology.<sup>7</sup>

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<sup>6</sup> We defined the set of internationally active banks as Japan's "city banks" plus a few other prominent banks, giving us a sample of 15 banks: Dai-Ichi Kangyo Bank, Sakura Bank, Fuji Bank, Bank of Tokyo-Mitsubishi, Asahi Bank, Sanwa Bank, Sumitomo Bank, The Daiwa Bank, Tokai Bank, Taiyo-Kobe Bank, Saitama Bank, Industrial Bank of Japan, Long-Term Credit Bank, Hokkaido Takushoku Bank, Kyowa Bank, Kyowa-Saitama Bank, Mitsui Bank, Mitsui-Taiyo-Kobe Bank, Mitsubishi Bank, and the Bank of Tokyo.

<sup>7</sup> Peek and Rosengren (2005) argue, "it is widely believed that Japanese bank capital ratios are substantially overstated... For example, Bank of Japan Governor Masaru Hayami told Parliament that the capital ratios of Japanese banks in March 2001 would have been only 7 percent rather than the reported 11 percent had they been held to the U.S. standards of capital adequacy. An even lower, and likely more prudent, estimate of the state of

In particular, for each main bank listed as a reference bank, we computed the monthly market-to-book (MTB) value as the average monthly share price multiplied by the number of shares outstanding and divided by the book value of its equity. All of these data were taken from the Pacific Basin Capital Markets (PACAP) database. We then defined the log change in the MTB value as the 12 month log difference of this number.

Ultimately, we are going to examine whether changes in the MTB value help us to understand future export performance. In order to do this, it is useful to define the lagged change in bank health as the lagged log change in the bank's market-to-book value over the 12 month period prior to the close of the company's books. This lets us examine whether a collapse in the market value of a bank in one year is associated with slower export growth in a subsequent fiscal year. This is perhaps best understood in the context of an example. If a firm's fiscal year ends in March, we would be interested in whether the change in the market-to-book value of its main bank between March of 1997 and March of 1998 was associated with slower growth in exports from fiscal year 1998 to fiscal year 1999.

Figure 3 portrays the dispersion in our measure of bank health over the course of our sample. We only portray the data for March on March changes because most of the firms in our sample close their books in that month, and this keeps the figure less cluttered. The line indicates the log change in the median market-to-book value in our sample of main banks. As one can see, the typical bank saw its market value rise dramatically in the bubble years and fall sharply as non-performing loans accumulated in the 1990s. The worst years for Japanese banks

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capitalization of Japanese banks is that the reported 10-percent capital ratios of the big banks represent a capital ratio of only about 2 percent once the public funds injected into the banks, the value of deferred taxes, and the "profits" from the revaluation of real estate holdings are subtracted from the banks' capital... *To the extent that analysts are able to penetrate the veil of reported capital and nonperforming loan ratios, widely viewed as deviating substantially from the true extent of bank problems, stock returns should reflect the best estimates of bank health.*" (Emphasis added)

were 1992 – the year after land prices peaked and the first wave of bank failures began – and 1997 – as Japan was wracked by a another series of bank failures. Interestingly, if we compare Figures 2 and 3 we can see that both of these years were followed by very low export growth.<sup>8</sup> However, what is critical for our study is the heterogeneity in the returns of different banks. In most years, the difference between the bank with the highest return and the bank with the lowest was approximately one half log unit, which suggests that, in the typical year, some banks had returns that were 65 percentage points higher than others. In other words, the real estate crash did not affect all banks equally, and there was enormous heterogeneity in bank performance. We will exploit this cross-bank variation in how non-performing loans affected different banks in our identification strategy.

One possible concern about this methodology is that there might be an endogeneity problem arising from the fact that lower export levels might affect bank balance sheets. One could think of two possible channels through which this effect might be manifest. First, if a firm exports less, the bank will earn less money on its trade finance contracts, and therefore the bank's profits will be lower. To get some sense of a main bank's exposure through this channel we can multiply the typical spread on an export credit contract (reported to be around 20 basis points) by the volume of firm exports times the typical duration of a trade credit contract (0.25 years). If we deflate this number by the market value of the bank, we can get a sense of how much the stock price of a bank would move if the firm stopped exporting and hence the firm's demand for export financing fell to zero in that year.<sup>9</sup> In this case, the median implied stock price movement would only be  $6.2 \times 10^{-5}$  percent, which suggests that the observed export growth rates

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<sup>8</sup> The low export growth in 1987 is probably associated with a dramatic appreciation of the yen in 1986.

<sup>9</sup> We decided to do this calculation for 1993, the midpoint of our sample.

of a firm are only likely to have miniscule impacts on the stock price of the typical bank supplying trade finance.

A second possible channel for endogeneity is through firm default. If a decline in exports is associated with a greater default probability, a bank's share price might decline when a firm's exports decline. In order to assess this risk to the bank, we computed the median value of a main bank's loan to an exporter as a share of the main bank's market value. For our sample of firms and banks, this number came to only 0.005 percent. This means that the banks in our sample had a sufficiently diversified lending portfolio, so that a default on the typical loan to any given firm would again only move the bank's stock price by a trivial amount. Therefore, the massive bank stock-price movements we observe in our sample could not possibly have been driven by the export growth of the firms in our sample. A much more plausible story is that the troubles experienced by Japan's banks in the 1990s were driven by the collapse in asset prices associated by the eighty percent decline stock and land prices.

Our identification strategy, then, is to assume that non-performing loans in Japan affected bank health, which in turn affected the ability of banks to provide trade finance. If exports are credit sensitive, then one should expect to see a relationship between the health of the institution that is most likely to provide the firm with trade finance and the export behavior of the firm. Obviously, there are a large number of other factors that are related to export growth. However, most of these – e.g. industry demand, factor endowments, exchange rates, and factor prices – can be thought of as common to all exporters within an industry at a moment in time. We, therefore, include industry-year dummies in our specifications to eliminate any bias arising from these sources.<sup>10</sup> Our basic estimating equation is:

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<sup>10</sup> The DBJ data divides manufacturing into 108 sectors which comprise our industry dummies.

$$(1) \quad \Delta \ln(\text{Exports}_{fit}) = \alpha_{it} + \beta \Delta \ln(\text{MTB}_{fit-1}) + \varepsilon_{fit},$$

where  $\text{Exports}_{fit}$  corresponds to the exports of firm  $f$  in industry  $i$  at time  $t$ ,  $\text{MTB}_{fit}$  is the market-to-book value of the reference bank for that firm, and all Greek symbols are parameters to be estimated. Our identification strategy, then, is based on how the export growth of firms within a narrowly defined industry in a particular year varies with the health of the banks providing those firms with trade finance.

Table 1 presents the results from these regressions. We drop firms whose export growth is in the top and bottom one percentile.<sup>11</sup> The first two columns present regressions of the log change in exports on the lag change in the log market-to-book value of the bank most likely to be supplying trade finance. In the first column we report results with year dummies, and in the second column, we report results with industry-year fixed effects. The estimated coefficient with industry-year dummies is about 0.08, which means that when a firm's main bank suffered a 30 percent decline in its market-to-book value, the firm's annual exports declined 2.7 percent.

In Column 3 of Table 1, we check whether we have the correct lag structure in the change in the market-to-book value. The results indicate that a change in the market-to-book value, from say December 1996 to December 1997 will affect exports growth from the calendar year 1997 to 1998, thus the fall in exports occurs in the year following the slump in bank health. Column 3 shows that a 2-period lagged change in market-to-book value has no effect on exports.<sup>12</sup> All the effects appear to be contained within the year following the change in bank health. This implies that the effects of a decline in bank health are short-term as one would expect if a decline in bank health led to a one-time decline in the ability of the bank to raise financing.

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<sup>11</sup> Including these outliers tends to magnify the effect of bank health on exports.

<sup>12</sup> The contemporaneous change in market -to-book value is also insignificant.

If we assume banks initially had enough capital, one might expect that declines in bank health should have a larger impact on the ability of financial institutions to raise capital than increases in bank health because declines in capital might adversely affect a bank's ability to finance a firm but increases in bank capital might not cause an exporter to borrow more. In order to examine this, we interact the change in the market-to-book value with a dummy that equals one if the change was positive ("up"). The negative coefficient on the interaction term in Column 4 indicates that our results are largely driven by declines in bank health leading to declines in the exports of firms dependent on these banks. Thus it appears that the channel driving our results is declines in bank health resulting in banks cutting back on trade finance.

An important part of our argument supporting a linkage between the financial sector and exports is that exporters depend on trade finance in order to make sales abroad because of the risks associated with exporting coupled with the higher need for working capital financing. In order to test whether we have identified an export-specific effect or merely a general effect applicable to all sales, we replaced the dependent variable with the log change in domestic sales for the same sample of firms in the last column of Table 1. As we can see from the table, firms whose main bank became unhealthy do tend to sell less, but the effect is not statistically or economically significant.

One might suspect that one possible reason for this is that Japanese exporters only have trivial amounts of domestic sales, and hence their domestic sales changes are largely noise. In fact, this is not the case – the median share of domestic sales in total sales is 88 percent. Nevertheless, to check that this result is not driven by domestic sales being small for exporters, we examine whether there is a differential effect for firms that have high export shares. We define a dummy, "large", that is equal to one if the firm's export share was in the top 25<sup>th</sup>

percentile, which includes all firms that exported more than 23 percent of their sales. Column 6 shows that domestic sales are equally unresponsive to changes in the main bank's health for firms with large or small export shares. This result is particularly striking given that we do not drop firm-years in which exports are zero; thus, in 10 percent of the observations, all of the firm's sales are domestic sales. This result suggests that, while the impact of bank health on the export behavior of firms is very clear, there is no such association between domestic sales and the health of the firm's main bank.

The domestic sales results have two important interpretations. First, the fact that the health of the bank providing trade finance is associated with export changes but not domestic sales changes strongly suggests that these results are driven by the additional financing needs of exporting relative to selling domestically *even within the same set firms*. Second, if one thought that reverse causality was driving our results, one should expect it to be even more of a problem for domestic sales because most firms sell more in the domestic market than abroad. The fact that we find no association between domestic sales and bank health suggests that the share price changes of these banks was not being driven by the sales of the manufacturing firms, which is consistent with the conventional wisdom that Japanese banks ran into trouble because of their real estate lending portfolios.

In Table 2, we show that the results are robust to alternative bank matching methods and to different measures of bank health. It is possible that we sometimes fail to identify the right bank providing trade finance. Therefore, in Table 3, we examine how robust our results are to our matching scheme. Other researchers have used the bank providing the largest level of loans to a firm as the means of identifying the main bank. In order to examine the sensitivity of our results to our method of matching firms and banks, we identified the main bank as the largest

lender to the firm among “city banks”, i.e. commercial banks. Japanese city banks are known to be involved in trade finance, so firms that borrow heavily from city banks are likely obtain trade finance with them as well. In the first column of Table 3, we identify the main bank, as the city bank providing the largest loan to each exporter.<sup>13</sup> Then, in Column 2, we rerun the regression identifying the main bank as any first listed reference bank in the Japan Company Handbook, even if it is a regional bank, expanding the sample of banks from 15 to 43. The results are not qualitatively different from those in our baseline specification, indicating that other reasonable methods of identifying which bank handles most of the firms’ trade finance transactions seem to yield similar results.

Our measure of bank health relies on share and equity values in the closing month of each accounting year. There may be concern that a particular month may be atypical, thus in Column 3 of Table 3, we define the market-to-book value as the average of the market-to-book value in the last 3-months of each accounting period, in order to smooth out any unusual fluctuations. We see that the results are robust to this alternative definition.

Another potential problem is that we use the same industry-year dummies for firms whose accounting years end in different months in a year. This potentially could cause problems because not all of the months fall within the same 12 month period. To make sure this is not causing a problem, we reestimated the baseline equation with only those observations where the accounting year ends in March, and again we see that the results are robust (see Column 4).

In Table 3, we address various sources of possible endogeneity and selection biases. In principle, it is possible that bank health may be correlated with other firm performance variables. Although we have argued that it is highly unlikely, we check that our results are robust to this

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<sup>13</sup> If there was no loan in a year, we used the main bank in the previous year. If there were no loans over the whole sample period we dropped the firm from the estimation in this column.

possibility by following Klein, Peek and Rosengren (2002) and include firm performance measures in the first column. We include the log change in a firm's total assets and the log change in a firm's total profits, measured as the ratio of net income to assets. Both of these coefficients are positive. However, the growth in profits becomes insignificant when both measures are included. Moreover, the point estimate on the change in market-to-book value is unaffected by the inclusion of these firm performance measures.

Alternatively, it may be the case that more successful banks work with more successful exporters. This would bias our results because banks with higher market value growth might be associated with firms with higher export growth on average. To guard against this, we include bank fixed effects in Column 2. As we can see, our results are robust to this potential problem.

The data suggests that the possibility of selection bias arising from strong banks choosing to finance strong exporters is remote. Numerous studies have found that main bank relationships tend to be extremely stable over time (Aoki, Patrick and Sheard (1994), Yafeh (1995), and Hoshi and Kashyap (2001)). In order to show this in our data, we define "switchers" as firms that change their main banks when not forced by a bank merger. The results indicate that only 7 percent of our sample of firms ever changed main banks between 1987 and 1999. To test whether these switchers might be driving our results, we restricted our sample of firms to those who stayed with the same main bank throughout the sample period. We report the results from this exercise in Column 5 of Table 3. The results are unchanged from those with the full sample, indicating that whatever selection process is at work to link firms and banks, it is not the explanation for our results.

Another selection issue arises from the fact that, by measuring bank health as the log change in market-to-book value, we have no measure of bank health when banks fail and their

share price goes to zero. This may be desirable because it is not clear that market-to-book values are relevant if banks are nationalized. However, in order to test whether our results are sensitive to this sample selection, we replaced our measure of bank health with the percent change in market-to-book value. This measure is bounded below at -1 when a bank's share price goes to zero. The results in the Column 6 of Table 3 are almost identical to those in our main specification indicating that the inclusion or exclusion of bank failures does not qualitatively affect our conclusions.

A final possible selection issue arises from firms that enter or exit the export market. Again, there are several reasons to believe, *ex ante*, that this is not going to be important for understanding our results. First, since the firms in our sample are all listed, they tend to be larger than the typical firm, and hence there is much less entry and exit than samples drawn from census data. Second, it is hard to imagine that the inability to obtain short-term export financing from a *particular* bank would be a reason why a firm would alter a long-run decision about whether to enter an export market. Third, the inability of a firm to obtain export financing from a particular bank in a moment in time might cause a firm to lose some contracts, but it is unlikely that this would cause it to make the long-run decision to exit the export market altogether.

These arguments notwithstanding, we checked if our results were robust to the possibility that trade finance affected entry and exit. In order to do this, we estimated a Heckman correction using maximum likelihood. We model the probability of being selected in the sample on the firm's productivity (as measured by the firm's value added per worker relative to the industry maximum each year, where the industry is defined at the 3-digit level, comprising 52 industries),<sup>14</sup> since high productivity is likely to induce entry and low productivity is likely to

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<sup>14</sup> We did not to define the maximum productivity at the more disaggregated 4-digit level because in many years and many industries there would only be one exporting firm, leading to a relative productivity measure equal to one.

induce exit (i.e. as in Melitz (2003)). We also include the log change in the market-to-book value of its main bank, year dummies to account for macro shocks, and bank fixed effects. The results of this selection equation indicate that the probability of exporting rises with productivity as one should expect, as seen in the bottom part of Column 5 in Table 3. However, the point estimate for the coefficient on the change in the bank's market-to-book ratio in Column 5 is almost identical to that in our baseline specification in Column 2 of Table 3. Thus selection into and out of exporting does not seem to be biasing our results.

Thus far, we have been largely concerned with statistical significance and the robustness of our results, but we have given scant attention to the economic significance. Our results can be thought of as the partial effect of a financial shock to banks on exports through the export finance channel. Declines in bank health may have many additional impacts on exporting through channels that are captured in our dummies. For example, declines in bank health may be correlated with more general credit contractions, macro policies, and demand changes that could also affect exporting. Therefore, we need to emphasize that we can only focus on the direct impact of bank health on firm exports and not the general equilibrium effects.

Nevertheless, it is useful to get a sense of the magnitudes of our estimated changes relative to the aggregate changes in exports. As one can see from Figure 2, the banking crisis of 1997-1998 coincided with a substantial decline in Japanese exports in 1998. As the Japanese banking crisis intensified, the Nikkei index of all bank stocks fell by 35 percent or 0.43 log units between December of 1996 and December of 1997. This was followed by a very sharp decline in Japanese exports. Between calendar year 1997 and calendar year 1998, real Japanese exports fell 10.5 percent. Multiplying this log change by the estimated coefficient on bank health in the Heckman correction specification (Table 3, Column 5), gives us an implied drop in exports due

to financial shocks of 3.3 percent – about one third of the aggregate drop in exports. Although obviously macroeconomic factors also played an important role, our results indicate that the partial effect of trade finance on exports identified in this paper can account for a large share of the aggregate decline.

## **5. Conclusion**

Traditionally, trade economists have thought of capital markets impacts on trade as affecting comparative advantage or entry into export markets through the supply of long-term capital. While international macroeconomists have identified several possible channels through which trade finance might affect aggregate export levels, the evidence has been mixed because of the difficulty of obtaining suitable aggregate data.

Our paper fills this gap by using matched bank-firm data that enables us to identify the transmission mechanism from the banks that supply firms with trade finance to the export behavior of those firms. Our results suggest that there is a causal link from shocks in the financial sector to exporters that make exports decline even faster during banking crises. The magnitudes of these bank- induced export declines are of sufficient magnitude to explain about one third of the drops in Japanese exports that we observed during the Japanese financial crisis of 1997. At the very least, our results establish an important linkage between exports and the health of banks in one of the world's largest economies. However, since the available evidence suggests that exporters in many countries are highly dependent on trade finance, these results suggest that financial shocks are likely to play important roles in export declines in other countries as well. Moreover, in the current crisis when both the importer's and the exporter's financial institutions were likely compromised, one might expect even larger effects.

Our results have a number of implications for future research. First, they point to important linkages between the often separate fields of international trade and international finance. Moreover, the important linkages between exporters and their financiers may have particular relevance for countries that often suffer from financial crises. Finally, our results also provide strong support for an international financial accelerator that helps explain how financial shocks affect the real sector and are propagated internationally.

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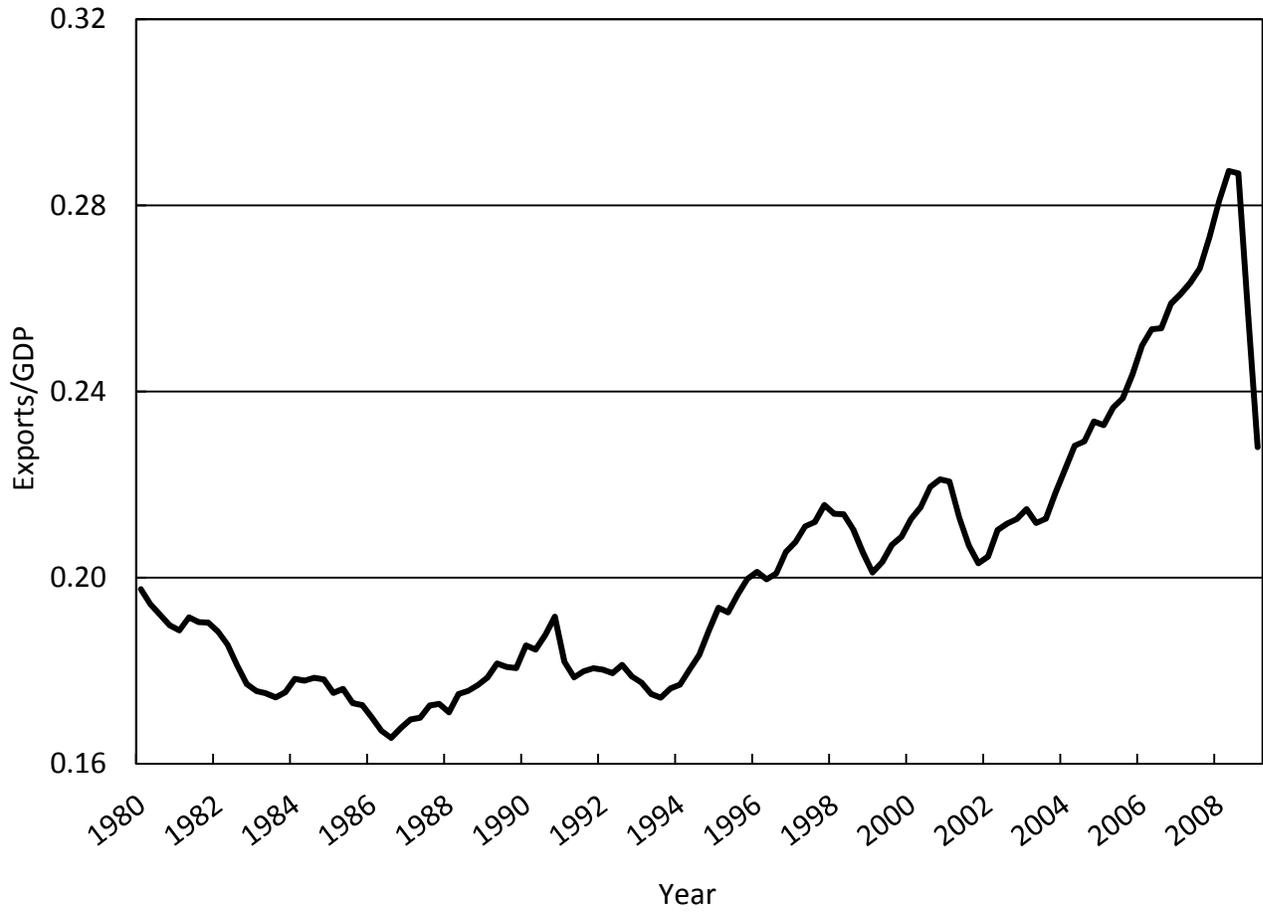
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[http://www.worldtrademag.com/Articles/Feature\\_Article/b6f48669e7b7d010VgnVCM10000f932a8c0](http://www.worldtrademag.com/Articles/Feature_Article/b6f48669e7b7d010VgnVCM10000f932a8c0) , September 4.

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**Figure 1**

**Quarterly Movements in the World Export to GDP Ratio**



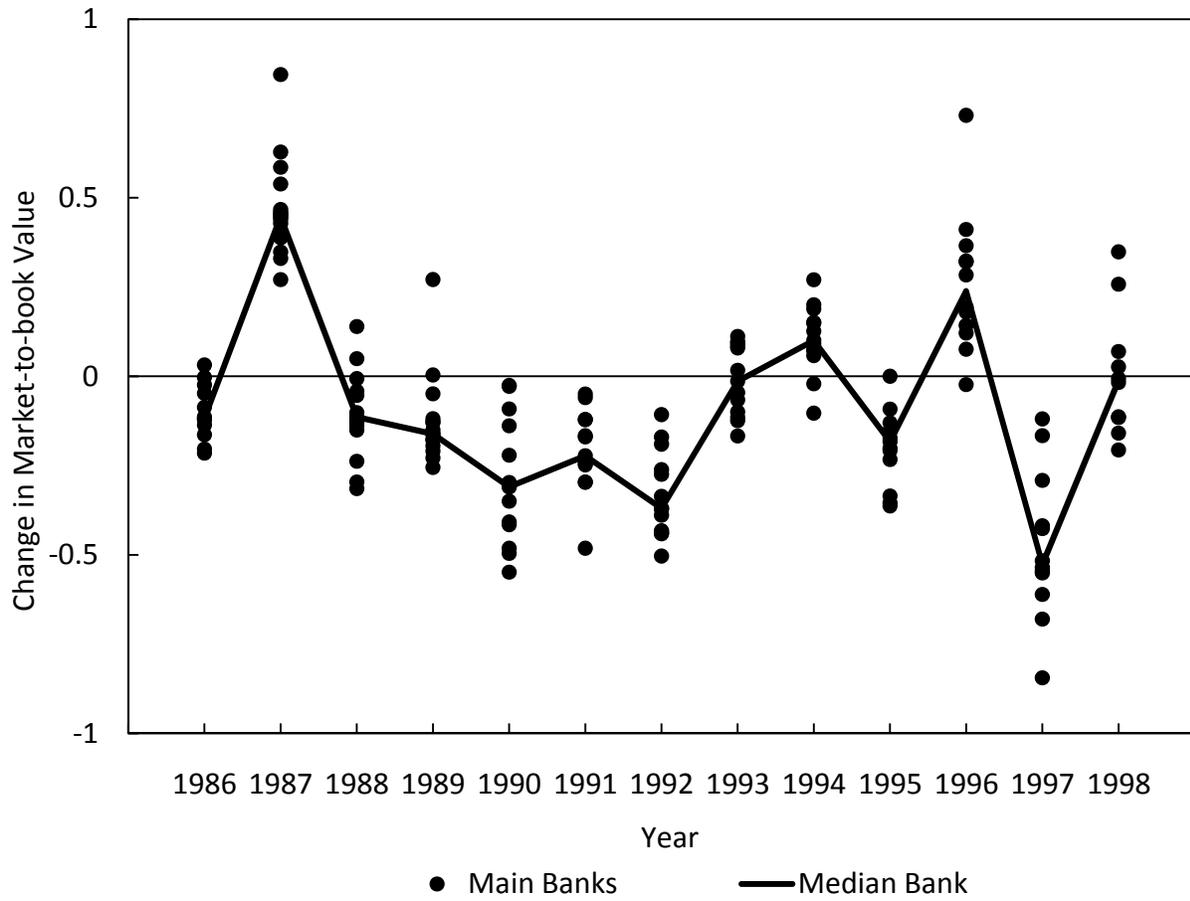
**Figure 2**

**Firm-Level and Aggregate Export Growth in Japan**



Figure 3

Change in the Market-to-book Value of Japanese Banks



**Table 1: Exports and Trade Finance**

Dependent variable	$\Delta \ln(\text{exports})_{f,t}$				$\Delta \ln(\text{domestic sales})_t$	
	(1)	(2)	(3)	(4)	(5)	(6)
			Lag MTB	Asymmetric effects		
$\Delta$ market to book value <sub>f,t-1</sub>	0.072*** (0.014)	0.077*** (0.018)	0.073*** (0.018)	0.107*** (0.017)	0.006 (0.011)	0.010 (0.010)
$\Delta$ market to book value <sub>f,t-2</sub>			-0.017 (0.023)			
$\Delta$ market-to-book Value <sub>f,t-1</sub> *up <sub>f,t-1</sub>				-0.083* (0.042)		
$\Delta$ market-to-book Value <sub>f,t-1</sub> *large <sub>f,t</sub>						-0.013 (0.013)
large <sub>b,t</sub> =1 if export share>0.23						-0.010*** (0.004)
Fixed effects:						
Year-industry	no	yes	yes	yes	yes	yes
Year	yes	no	no	no	no	no
Observations	7,016	7,016	6,987	7,016	7,922	7,922
Adjusted R <sup>2</sup>	0.07	0.15	0.15	0.15	0.29	0.29

Notes: In Column 4, up is equal to one if there is an increase in the market-to-book value. In Column 6, large is equal to one if the firm's export share is higher than 23 percent. Robust standard errors corrected for clustering at the bank level are in parentheses. \*\*\*Significant at the 1 percent level. \*\*Significant at the 5 percent level.

**Table 2: Alternative Measures of Main Bank and Market Timing**

<b>Dependent Variable: <math>\Delta \ln(\text{exports})_{f,t}</math></b>				
	(1)	(2)	(3)	(4)
	Alternative bank matching Loans	All Banks	MTB value: 3 months average	March accounting period
$\Delta$ market-to-book Value <sub><math>f,t-1</math></sub>	0.063*** (0.015)	0.061*** (0.015)	0.054*** (0.021)	0.060*** (0.019)
Fixed effects:				
Year-Industry fixed	yes	yes	yes	yes
Observations	6,550	7,022	6,889	5,932
R-squared	0.13	0.15	0.14	0.16

Notes: Robust standard errors corrected for clustering at the bank level are in parentheses. \*\*\*Significant at the 1 percent level. \*\*Significant at the 5 percent level. In Column 1, we use an alternative method for matching firms to banks - we assign a city bank that was the largest loan provider that year. If the bank had no loans from a city bank that year, we assign the previous years' city bank. In Column 2, we use the first listed reference bank from the company handbooks, even if the first reference bank is not a city bank. In Column 3, we define the market-to-book value as the average of the last 3-months of the accounting period. In Column 4, we only keep observations where the accounting period ended in March.

**Table 3: Heterogeneity and Selection**

<b>Dependent Variable: <math>\Delta \ln(\text{exports})_{f,t}</math></b>					
	(1)	(2)	(3)	(4)	(5)
	With firm characteristics	Bank fixed effects	No bank switchers	Percentage change in mtb value	Heckman selection
$\Delta \text{market-to-book Value}_{f,t-1}$	0.074*** (0.019)	0.077*** (0.018)	0.074*** (0.018)	0.060*** (0.019)	0.077*** (0.020)
$\Delta \ln(\text{assets})_{f,t}$	0.436*** (0.032)				
$\Delta \ln(\text{profits})_{f,t}$	0.051 (0.074)				
Fixed effects:					
Year-Industry	yes	yes	yes	yes	yes
Bank	no	yes	yes	yes	yes
<b>First stage:</b>					
Relative VA per worker <sub>t-1</sub>					0.192*** (0.067)
$\Delta \text{market-to-book value}_{b,t-1}$					-0.070 (0.109)
Fixed effects:					
Year					yes
Bank					yes
LR test ( $\rho=0$ )					$\chi^2(1)=46.04$
Observations	7,016	7,016	6,432	7,023	8,179
R-squared	0.18	0.15	0.15	0.15	

Notes: Robust standard errors corrected for clustering at the bank level are in parentheses. \*\*\*Significant at the 1 percent level. \*\*Significant at the 5 percent level. In Column 3, we drop any firm that switches their main bank during the sample period. In Column 5, the selection is a function of relative value added (relative to 3-digit industry by year), the change in market-to-book value, year effects, and bank effects. There are 1,167 censored observations and 7,012 uncensored observations

## Data Appendix

### Figure 1: World Exports to GDP

This was constructed using national sources.

Australia: the Australian Bureau of Statistics

Belgium: the Banque Nationale de Belgique

Canada: Statistics Canada

France: National Institute of Statistics and Economic Studies

Germany: Deutsche Bundesbank

Hong Kong: Hong Kong Census and Statistics Department

Italy: Istituto Nazionale di Statistica

Japan: Cabinet Office

Netherlands: Centraal Bureau voor de Statistiek

Norway: Statistik Sentralbyra

South Korea: Bank of Korea

Spain: Instituto Nacional de Estadística

Sweden: Statistiska Centralbyran

Switzerland: State Secretariat for Economic Affairs

Taiwan: Directorate General of Budget, Accounting and Statistics

UK: Office of National Statistics

US: Bureau of Economic Analysis

The exchange rates are from the Federal Reserve Bank for all the above countries, except for Hong Kong, South Korea and Taiwan, which are from the Hong Kong Monetary Authority, Bank of Korea and the Central Bank of China, respectively.

### Figure 2: Aggregate Export Growth in Japan

Japanese export data for each fiscal year was downloaded from the Japanese Ministry of Finance ([http://www.customs.go.jp/toukei/sui/html/time\\_e.htm](http://www.customs.go.jp/toukei/sui/html/time_e.htm)).

### *Firm Level Data*

Development Bank of Japan (2004) “Corporate Finance Data Bank”