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Financial Contagion: Spillovers Through Banking Centers*

Caroline Van Rijckeghem** and Beatrice Weder***

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Abstract: This paper presents evidence that spillovers through shifts in bank lending can help explain the pattern of contagion. To test the role of bank lending in transmitting currency crises we examine a panel of data on capital flows to 30 emerging markets disaggregated by 11 banking centers. In addition we study a cross-section of emerging markets for which we construct a number of measures of competition for bank funds. For the Mexican and Asian crises, we find that the degree to which countries compete for funds from common bank lenders is a fairly robust predictor of both disaggregated bank flows and the incidence of a currency crisis. In the Russian crisis, the common bank lender helps to predict the incidence of contagion but there is also evidence of a generalized outflow from all emerging markets. We test extensively for robustness to sample, specification and definition of the common bank lender effect. Overall our findings suggest that spillovers through banking centers may be more important in explaining contagion than similarities in macro-economic fundamentals and even than trade linkages.

Keywords: Contagion, Currency Crisis, Financial Spillovers

JEL classification: F30, F32, F34

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I. Introduction

International banks are one of the major sources of financing for emerging economies and also one of the most volatile ones.[1] The understanding of banks' responses to crisis is, therefore, an important link in explaining the international transmission of currency crisis. In the wake of the recent currency crises observers have pointed to a number of reasons why banking centers may add to financial contagion. These can be classified into two types of financial contagion. The first has been called the "common bank lender channel". It assumes that two countries that depend on a common bank lender are vulnerable to spillovers through this linkage. The common bank lender channel presupposes that banks' responses to unexpected losses are fairly mechanistic. Banks' needs to rebalance their portfolios following losses in the primary crisis country lead to an automatic reduction of bank lending to other countries in which they hold positions. The second kind of contagious response also leads to outflows but, in contrast with the common lender channel there is no need for a real linkage through losses. In other words, even if banks had no exposure in the primary crisis country they might still react with a generalized reduction of credit to other emerging markets, due to revisions of expected returns in this asset class or a generalized increase in risk-aversion.

The aim of this paper is to test the importance of financial contagion through banking centers in the most recent episodes of currency crises in emerging markets. The paper concentrates on bank lending as a channel and ignores other players such as hedge funds, institutional investors (pension and insurance funds) and dedicated mutual funds. It focuses on the effect on money and debt markets, not on equity markets. The main, though not exclusive, focus of the paper is on the common bank lender effect.

To test the importance of the common bank lender channel in transmitting currency crises we first examine the relationship between bank exposure in the country where a balance of payments crisis first occurs in each episode of currency instability (the "ground zero" country) and bank flows to other emerging markets. The idea is that a bank will reduce its exposure to

[1] Table 1 illustrates this point. In Asia, for example, banks were the single largest group of creditors before the crisis and bank lending was the most volatile component of capital flows during the crisis. In 1996, net flows from banks into 29 emerging markets accounted for US$ 120 billion, or about a third of total private inflows. In 1997 banks had reduced their share to about 9 percent of private inflows and by 1998 net inflows had turned into net outflows of about US$30 billion. By comparison, other private capital flows have been much more stable.

other emerging markets if it was highly exposed to a ground zero country, in order to restore capital adequacy, meet margin calls, or reduce risk-exposure (as dictated by Value-at-Risk-like models used by banks). In the absence of data on bank-by-bank lending, BIS data by nationality of lender are used as a proxy. [2] In addition to testing for a common bank lender channel, we also check for the existence of generalized shifts in credit to emerging markets.

Second we complement this "banking center by banking center" analysis (where the number of observations for each country equals the number of lending countries) with a more aggregated analysis based on exchange market pressure in emerging markets (1 observation per emerging market). In order to do this, we construct a measure of competition for bank funds based on BIS data. Again, the idea is that if a country competes intensively for funds from a bank which is highly exposed to a crisis country (the common bank lender), adjustments to restore capital adequacy, meet margin calls, or adjust exposures, will lead to reduced lending to the second country.

Earlier work on the "common bank lender" channel of contagion has been conducted by Kaminsky and Reinhart (1998) (KR) and Caramazza, Ricci, and Salgado (1999) (CRS). We discuss this work in greater detail in the next section. The approach proposed in this paper adds to the existing literature in a number of ways. First, we examine both disaggregated bank flows, i.e. by creditor and emerging market, and aggregate measures of contagion. Disaggregated flows have not yet been examined in the literature. Second, when examining aggregate measures of contagion we test several channels of contagion simultaneously. KR and CRS do not directly control for trade linkages when investigating the common bank lender channel (they do examine regional effects and trade linkages by themselves, while controlling for macro-economic fundamentals). Third, we propose a more comprehensive measure of competition for funds, which looks beyond the role of the most important lender, to provide a summary measure of competition for funds. This measure takes into account the role of European banks, which as a whole, even if not individually, tended to be more important than the US banks in the Mexican crisis and the Japanese banks in the Asian crisis.[3] Finally, we examine a number of alternative finance indicators (including indicators in the

[2] This is an unavoidable limitation of the data. To the extent that within a country, some banks specialize in one emerging market, and some in others, the data will not capture financial linkages between countries well; this could lead to insignificant results, even when the common lender effect is present.

spirit of KR and CRS) to test the robustness of our results and we also use a continuous indicator of exchange market pressure to offer more nuanced differentiation across countries.

The remainder of the paper is organized as follows. Section II discusses bank lending as a channel of contagion in the context of the theoretical and empirical literature and presents some informal evidence on bank losses in support of a common bank lending channel. Section III describes our methodology and data. The main results are presented in section IV. Section V concludes.

II. The Common Bank Lender Channel

This section places the common bank lender channel in the context of the channels of contagion identified in the theoretical and empirical literature.[4] It also documents the existence of bank losses to make the case that the common lender channel is potentially relevant empirically.

It greatly clarifies the exposition to start by classifying contagion in two categories, following Masson (1998), namely pure contagion and spillovers.[5] *Pure contagion*, refers to those crises triggered by a crisis elsewhere but which cannot be explained by changes in fundamentals or by any sort of "mechanical" spillover but are possibly caused by shifts in market sentiments (increased risk aversion) or changes in interpretation given to existing information (an increased perception of risk or a "wake-up call").[6] *Spillovers*, on the other hand, result from "real" inter-linkages between the affected countries. For instance, *spillovers through trade links* have been prominent in the discussion about contagion (see Eichengreen, Rose, and Wyplosz (1996) and Glick and Rose (1999)). The most direct form of link is through bilateral trade: with high levels of bilateral trade, a financial crisis in one country (and the associated fall in demand) will negatively affect all trading partners. A more indirect trade link is through competition in third markets. In this case, a financial crisis (and the associated

[3] European banks' exposure to Latin America was about double that of US banks at end-1994 and European banks' exposure to Asia was about 40 percent greater than that of Japanese banks in mid-1997 (BIS, various issues).
[4] See for instance Wolf (1999) for a survey of this literature
[5] Masson (1996) distinguishes an additional set of reasons--monsoonal effects--for why currency crises tend to be closely bunched in time. Monsoonal effects arise from economic shifts in industrialized countries, such as increases in industrialized country interest rates.
[6] See Masson (1998, p. 4).

depreciation of the exchange rate) in one country affects other countries that export to the same markets.

Spillovers through financial market inter-linkages emerge from shifts in investors portfolios.[7] The common bank lending channel belongs in this category. There are several, possibly simultaneous, mechanisms how *banking centers* can cause cross-border spillovers. Losses in one country could lead banks to sell off assets in other countries in an attempt to restore their capital-adequacy ratios. A similar mechanism is at work if investors upon receiving a margin call based on the decline in price in one asset decide to sell assets in other countries (Calvo, 1999). Importantly, if banks are confronted with losses on their securities portfolio or a rise in non performing loans in one country they are likely to try to reduce their overall value at risk. Risk management techniques may then dictate a reduction in exposure in the riskiest markets or in credit lines in historically correlated markets (Folkerts-Landau and Garber, 1998). [8]

The underlying presumption in all cases is that bank exposures in countries affected by the primary financial crisis were large, implying substantial potential losses, and hence the need to restore capital asset ratios, meet margin calls, or readjust risk exposures, thus accounting for the common bank lender effect. Therefore, a first informal test of the common bank lender effect is to gauge the extent of bank losses in the crisis episode.

By a number of accounts international banks lost a sizable amount of money in the Asian and Russian crises. In the 4 Asian crisis countries (Korea, Indonesia, Malaysia, and Thailand), exposures ranged from 20-30 percent of capital for banks from the United States, France, Germany and the United Kingdom, and 70 percent of capital in Japan.[9]

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[7] Dornbusch, Park, and Claessens (1999) provide the references to this literature.

[8] A number of further reasons for financial spillovers have been discussed in the literature. To the extent that investors allocate fixed proportions of their assets to (individual) emerging markets, changes in the weight given to the emerging market asset class as a whole affect all countries equally (Buckberg, 1996). Asymmetric information can amplify the effects of portfolio rebalancing (Kodres and Pritsker, 1999). Lack of liquidity is a further reason why a crisis in one market may lead financial intermediaries to liquidate other emerging market assets (Goldfajn and Valdes, 1997). Finally, regulations involving ratings, such as regulations which disallow holdings of non-investment grade securities, or link capital requirements to them, may also play a role. To the extent that downgrades are implemented more frequently in emerging markets after a crisis, this may well add to the sell dynamics in a crisis.

[9] Capital refers to aggregate tier 1 capital for the ten largest banks, except for Germany where the concept used is shareholders' equity. The source of data is "Mature Banking System Exposures to Asia," IMF memorandum (March, 6, 1998), based on Moody's (1998).

The aggregate non-performing rate on loans to the four crisis countries was expected to be about 25-30 percent. Citing exposure to Asia, rating agencies put a large number of mature market banks on review, and implemented a number of downgrades.[10] In Russia, exposures were smaller, but expected losses greater—about 90 cents on the dollar. For European banks, exposure of 9 selected banks is estimated at $8 billion in Russia, compared to $48 billion in the 4 Asian crisis countries. Provisions as of October 1998, were $2.3 billion in Russia and $7.1 billion in the 4 Asian crisis countries, respectively. Based on market views of ultimate losses of 90 percent of exposure in Russia and 30 percent in Asia, this means losses are expected to be about half as large in Russia as in the four Asian crisis countries.[11] German (both commercial and Landes-banken), Swiss, Austrian, French, and US banks had the largest exposures. [12] This informal evidence on banks' exposures and actual losses suggests that the common bank lender channel may have been important in transmitting currency crisis.

Earlier work on the "common bank lender" channel of contagion has been conducted by Kaminsky and Reinhart (1998) and Caramazza, Ricci, and Salgado (1999). Kaminsky and Reinhart (KR) identify a bank lending channel, a liquidity channel, and a trade channel. They proceed to form clusters of countries based on these channels and show that these clusters tend to be regional, a fact that could explain regional contagion. In the case of bank lending, they distinguish a cluster of countries which borrows from Japanese banks and one which borrows from US banks. [13] They show that the probability of a crisis in a certain bank lending cluster conditional on crises having happened in that cluster tends to be higher than the unconditional probability of crisis.[14] However, given the large overlap between lending

[10] In early January 1998, Moody's put 10 European banks on review (5 from France, 4 from Germany, and one from Britain). Moody's also put on review the ratings of Bank of Tokyo-Mitsubishi and Dai-Ichi Kangyo Bank and shifted to a negative outlook for Sumimoto Bank and Industrial Bank of Japan. In the US, it shifted to a negative outlook for JP Morgan, Citicorp, and Bankers' Trust. IBCA and Standard and Poor's generally took similar actions, with IBCA implementing a number of downgrades (IMF, 1998).

[11] Casualties of the Russian crisis included Deutsche Bank (which lost its AAA S&P rating in end-August 1998), Austrian RZB (whose short-term rating was placed on CreditWatch with negative implications by S&P), JP Morgan (which was placed on review for a possible downgrade by Moody's citing its exposure to emerging markets), Bankers Trust (which was downgraded by S&P and Fitch-IBCA), and Merrill Lynch (S&P revised its ratings outlook to negative). Based on Salomon Smith Barney, "European Banks: The Time to Buy Has Arrived," (October 14, 1998).

[12] "European Banks Weather the Russian Storm," Standard and Poor's Credit Analysis Service (October 7, 1998) and US Banking Quarterly Review, Third Quarter 1998.

[13] The Japanese bank cluster comprises Indonesia, Malaysia, and Thailand; the US bank cluster includes Argentina, Brazil, Chile, Colombia, Mexico, the Philippines, Uruguay, and Venezuela.

[14] The sample covers the period 1970-1998 and 20 countries. The Korean and Russian crises are not included reflecting country coverage. The authors find that conditional on the majority of countries in a bank cluster experiencing a crisis, the probability of crisis jumps to 83.5 percent, compared to an unconditional probability of

continued

clusters and regional clusters, the results do not constitute a definite case that the pattern of contagion is caused by a common bank lender effect as opposed to a different type of regional effect, such as the trade channel.[15] Caramazza, Ricci, and Salgado (CRS), using BIS data, define a common bank lender for each crisis as the country that lent the most to the first country in crisis in each of the major crises. [16] In the Mexican crisis the common bank lender is the United States, in the Asian crisis, it is Japan, and in Russia, it is Germany. They then show that countries experiencing crises relied more on the common bank lender for funding than non-crisis countries (the share of external bank liabilities held by the common bank lender was 10 percent higher). Also, crisis countries were somewhat more important to common bank lenders than non-crisis countries (they accounted for a 5 percentage point higher share of the external loan portfolio of the common lender than the average noncrisis country). [17] The common bank lender effect appears strongest in the Mexican and Asian crisis; weak findings for the Russian crisis are seen by the authors as "the result of a global flight to quality and liquidity affecting a broad group of countries, not just those with close financial market linkages to Russia." (CRS, p. 81) We reconstruct the measures of KR and CRS below in a comprehensive examination of the common lender effect.

As outlined in the introduction, this paper adds to the literature by examining disaggregated data on flows by bank centers, by simultaneously controlling for other channels of contagion, and by proposing more complete measures of the common lender effect, as well as testing extensively for the sensitivity to measurement of both the common lender effect (the paper tests the KR and CRS measures) and of contagion.

III. Empirical Strategy and Data

We focus on three episodes of financial instability in emerging markets, the ones originating with Mexico, Thailand and Russia. For each episode we run two sets of regressions that test for a common lender effect. The first set examines flow data disaggregated by banking center and takes the following form:

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crisis of only 31 percent; they also find that including information on crises elsewhere in a bank cluster improves the quadratic probability scores compared to forecasts which control for fundamentals only. (KR, Table 6).

[15] Using the same method, the authors also find evidence in favor of both a regional and a trade effect.

[16] Their sample includes 41 emerging markets.

[17] The authors hypothesize that the latter facet might be important as creditors might prefer to reduce exposures more than proportionately in countries where their exposure is high, "simply because of the greater availability [of assets] in their portfolio" rather than carrying out across the board cuts (CRS p. 69).

$$\Delta \text{Exposure}_{ci} / \text{Exposure}_{c} = \alpha + \beta\ (\text{Exposure}_{c0}, / \text{Exposure}_{c}) + \gamma\ (\text{Exposure}_{ci} / \text{Exposure}_{c}) + \delta\ \text{Trade}_{i} + \varphi\ \text{Macro-Controls}_{i} + \varepsilon$$

where Exposure_{ci} represents bank flows from a creditor country c to an emerging market i, Exposure_{c} is the total exposure of a banking center c to emerging markets as a whole, and Exposure_{c0} is exposure of a bank creditor c to the ground zero country. A significant β, the coefficient on $\text{Exposure}_{c0}/\text{Exposure}_{c}$, is evidence in favor of a common lender effect. A significant γ points to the presence of generalized inflows or outflows proportional to initial exposure, as one would expect to find when there is a general shift in investor's attitudes towards investing in emerging markets. Trade linkages are captured in two ways—as direct trade and as trade competition in third markets. The macro-controls include a set of standard control variables (see below).

The second set of regressions are of the following form:

$$\text{Contagion}_{i} = \alpha_{0} + \beta\ \text{FundsComp}_{i} + \delta\ \text{Trade}_{i} + \varphi\ \text{Macro-Controls}_{i} + \varepsilon$$

where contagion is either a binary variable that takes the value 1 if the country had a currency crisis in the particular episode, or, a continuous indicator of exchange market pressure. The common lender effect is represented by the variable "competition for funds" (FundsComp) which measures the extent to which country i competes for funding from the same banking center as the ground zero country. It is measured in a number of ways, described below. Again, a significant β is evidence in favor of a common lender effect.

The first method has the advantage that it allows a more direct test of the common lender effect, because of the disaggregation by creditor, but suffers from a certain drawback. Flows proxy only the *quantity response*, whereas reduced supply of credit could also manifest itself as higher yields with unchanged flows. Thus, flows might not register a decline in supply even if there is contagion.[18] By combining information on flows and yields into a proxy for contagion (see below), the second method circumvents this problem, but at the cost of greater

[18] A case in point is Argentina, where inflows of USD 1.3 billion were recorded in the second half of 1998, reflecting the Argentine government's strategy of prefinancing its borrowing requirement, but at a cost of rising yields and of the inclusion of sweeteners such as warrants into bond contracts.

aggregation (since there is only one market-clearing interest rate per emerging market, assuming perfect competition).

Measures of the common lender effect

In the first set of regressions—the panel regressions on banks' flows—the common lender effect is measured simply as the exposure of every banking center to the primary crisis country.

The second set of regressions—the cross-country regressions on exchange market pressure—require a summary measure of the common lender per country. We construct two measures of the intensity of competition for funds and test for alternative definitions of the common bank lender. Our main indicators are $FundsComp_I$(shares) and $FundsComp_{II}$(absolute). They are comprehensive that is they include all banking centers for which data is available. $FundsComp_I$(shares) is calculated as follows:

$$FundsComp_I(shares) = \Sigma_c \ (b_{0c} + b_{ic})/(b_0 + b_i) \ * \ [1 - | ((b_{0c}/b_0) - (b_{ic}/b_i)) | \ / \ ((b_{0c}/b_0) + (b_{ic}/b_i))] \quad (1)$$

where 0 stands for the ground zero country, c stands for the common lender, b_{ic} represents bank credit from a banking center c to country i. The indicator is a weighted average of the importance of a common lender for country i and the ground zero country. The first component of the equation is a measure of the overall importance of the common lender (say German Banks) for countries i and 0 (say Korea and Thailand). The second component captures the extent to which countries i and 0 compete for funding from the same creditors.[19] This indicator is the analog to the indicator of trade competition in third markets by Glick and Rose (1998).

[19] For instance, if Korea and Thailand receive the same share of their bank lending from German banks, the second component of the equation is at the maximum, namely 1. If German banks then also contribute an important share of borrowing by Korea and Thailand, then there will be a high contribution to the overall measure of competition. Competition for funds between the two countries will be intense, which in turn means that Korea's vulnerability to a cut-off from funding caused by losses of German banks in Thailand will be high.

A variant of this measure uses the *absolute* value of credits obtained from the common lender, rather than the *share* of bank lending obtained from the common lender, as follows:

$$FundsComp_{II}(absolute)= \quad \Sigma_c (b_{0c} + b_{ic})/(b_0 + b_i) \; * \; [1- \left| ((b_{0c}) - (b_{ic})) \right| / ((b_{0c}) + (b_{ic}))] \qquad (2)$$

To test for sensitivity in measurement, we constructed two alternative sets of indicators of competition for funds: the first is a binary indicator in the spirit of Kaminsky and Reinhart (KR) and the second is a set of three continuous variables based on the definitions of Caramazza, Ricci, and Salgado (CRS).

The *KR indicator* takes the value 1 if a country obtained the majority of its funds from US banks ahead of the Mexican crisis, from Japanese banks ahead of the Thai crisis, or from German banks ahead of the Russian crisis. These three countries are chosen because they were the most important common lender to the ground zero countries during their crises. In terms of the notation introduced above, taking the Mexican crisis as an example, KR_i=1 if b_{iUS}/b_i exceeds the ratio for other creditor countries.

Three *CRS indicators* are derived. The first (CRS,%borrower) measures the importance of the common lender (the one most affected by the crisis in the ground zero country) *to the borrowers*, and is calculated as the share of funds obtained from US banks, Japanese banks, and German banks, respectively. It is the continuous counterpart of the binary KR indicator. The second indicator (CRS,%lender) measures the importance of a borrower *to the common lender* (again the one most affected by the crisis in the ground zero country). It is captured by the share of a borrower in total cross-border lending by the US, Japanese, and German banks, respectively. The third indicator (CRS,Interactive) is calculated based on the interaction (multiplication) of the first two CRS indicators. Again taking the Mexican crisis as an example, $CRS1_i= b_{iUS}/b_i$, $CRS2_i= b_{iUS}/b_{US,}$ and $CRS_i=CRS1_i*CRS2_i$.

All indicators refer to the positions of banks on the eve of the respective crisis episodes (December 1994 for Mexico, June 1997 for Thailand, and June 1998 for Russia).

BIS Data

We use the BIS' semi-annual consolidated data covering banking systems in 17 industrialized countries (the "reporting area"[20]). The data include lending through banking offices located outside the reporting area, but of the same nationality as countries in the reporting area (BIS, 1995, p. 82). Claims on affiliates of banks with head offices outside of the host country (e.g. the London branch of a Brazilian bank), are in principle included under the country of the parent bank (i.e. as claims on Brazil) (BIS, 1995, p. 93). The data in principle cover all on-balance sheet claims on countries outside the reporting area, including deposits and balances placed with banks, loans and advances to banks and non-banks, holdings of securities, and participations. The data (in principle) include local claims of affiliates in outside-area countries in non-local currency, as well as net asset positions in local currency (p. 83). There are only a few exceptions to these rules (pp. 83-84). Investment banks are generally covered, the U.K. being the exception. Hedge funds are not covered by the data.

Market participants have been skeptical of the usefulness of the BIS data, pointing out that it captures only on-balance sheet positions, whereas banks typically hedge their positions with off-balance sheet positions (using instruments in the country at hand, or correlated ones, e.g. ahead of the February 1999 Brazilian devaluation, some investors shorted the Mexican peso in lieu of the Real). Maintaining such hedges is nevertheless expensive, and hence tends to be done more when a crisis is widely anticipated, as was the case in Brazil. For the Mexican, Asian, and Russian crises, which were generally not anticipated, the data is more likely to capture overall positions closely. [21] A second caveat is that hedge funds are not covered by the data. To the extent that commercial and investment banks maintain sizeable exposures to hedge funds and hedge funds were invested heavily in ground zero countries, this means that the data misses indirect exposures of banks to ground zero countries.

[20]The countries that report bank lending by nationality of lender are: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Luxembourg, Netherlands, Norway, Spain, Sweden, United Kingdom, United States.

[21] Off-balance sheet data is not available which would permit us to accurately calculate exposures and risks. First, this data is generally not compiled, except for the US, where the Federal Financial Institutions Examination Board does compile comprehensive information which comprises off-balance sheet data. Second, even when the data is available, true exposures and risks are difficult to calculate. This is because off-balance sheet positions include a myriad of factors, including interbank deposits, commitments, derivatives, and letters of credit. Some (e.g. letters of credit) go in the direction of increasing exposure, some in the direction of reducing exposure (derivatives). However, in the data, derivative positions which reduce risk (hedges) are counted as part of the off-balance sheet position, and hence appear to increase exposure, because of exposure to the counterparty which

continued

Definition of contagion

Contagion is defined as the spread of a currency crisis from the ground zero country. We identify Mexico (1994), Thailand (1997), and Russia (1998) as ground zero countries and do not attempt to explain the reasons of their respective currency crisis. We only attempt to explain the subsequent targets of attacks.

We use two contagion variables. The main one is a binary variable from Glick and Rose (1998) for the Mexican and the Asian episodes. They used newspaper reports to determine which countries were victims of contagion. We then constructed an analogous crisis indicator for the Russian episode based on the views of IMF economists to determine if a particular country suffered from contagion in the wake of the Russian crisis. We defined contagion broadly as "sufficiently persistent fallout to raise worries about a possible currency crisis, and involving a change on the order of 10% in either reserves, the exchange rate, or interest rates (i.e. 1000 basis points)." This binary variable has the advantage that it captures what was widely perceived as a crisis. The disadvantage is that the classification as a crisis is subjective and not available for a large number of small countries (respondents were asked to indicate when they did not know the answer for a country). The list of countries is shown in Appendix Table 1.

We also use a continuous variable of exchange market pressure that is a weighted average of the depreciation rate, the percent decline in reserves, and the normalized change in domestic interest rates. [22] This pressure index is calculated 1, 3 and 6 months following the month in which the initial crisis occurs. We are interested in contagion which is sufficiently severe to be reflected in monthly data.[23] While objective, this measure captures pressures which are unrelated to contagion from Russia, but reflect idiosyncracities (e.g. war) of the country.

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has to fulfil the contract (see "Mature Banking System Exposures to Asia," IMF memorandum (March, 6, 1998)).

[22] Our main variable for interest rates is the money market rate. If this variable is not available we use the t-bill rate, if this variable is not available we go on to check the discount rate, the deposit rate, and the lending rate, in that order. We normalize the change in interest rates by dividing it by 1 plus the level in interest rates. When normalized in this fashion a change in interest rates is proportional to the percent change in the price of the underlying instrument, irrespective of the level of interest rates. Hence pressure from capital outflows, as proxied by the change in price of instruments, is comparable across countries.

[23] At the daily frequency, almost all emerging markets were affected after the Mexican, Asian, and Russian crises, but we are only concerned with pressures which are sufficiently large and persistent as to lead to worry about a possible balance of payments crisis.

Control Variables

We consider two variables that capture *spillovers through trade links.* The first indicator of trade competition we consider is direct trade, calculated as the percent of total exports destined for the ground zero country.[24] A second indicator of trade linkages is indirect trade competition, that is competition in third markets. We use the concept of the trade share index provided by Glick and Rose (1998), which is based on a formula similar to equation (1).[25] A high value of this index indicates that the country's exports compete intensely with the ground zero country in third markets.

The *macroeconomic controls* are drawn from a set of variables that have been used in the empirical literature on currency crisis.[26] We include the variables that have been shown to be relevant in explaining the incidence of currency crisis;[27] the level of M2 over international reserves, the percentage change in credit to the private sector, the percentage change in the real effective exchange rate,[28] and the current account balance as a percent of GDP. All variables are computed from IFS and are compiled for the period previous to the beginning of each episode of currency instability to avoid contamination of the annual data by the crisis (i.e. we use 1994 data for Mexico, 1996 data for Thailand, and 1997 data for Russia). Using data prior to the realization of a currency crisis is necessary since the crisis will usually completely alter the macroeconomic picture.

[24] Calculated for 1994, 1996, and 1997 from "Direction of Trade Statistics" IMF, Washington.
[25] For the Russian crisis we calculated the trade share indicator for 1997 from the "Direction of Trade Statistics" IMF, Washington.
[26] See e.g. Kaminsky, Lizondo and Reinhart (1997).
[27] The "tequila" effect was cast in terms of macroeconomic fundamentals, notably the state of the banking sector and external competitiveness (Sachs, Tornell, and Velasco, 1996); similarly for the Asian crisis (Radelet and Sachs, 1998 or Tornell 1998). See also Frankel and Rose (1996), Kaminsky, Lizondo and Reinhart (1997), and Corsetti, Pesenti and Roubini (1998).
[28] Defined as in Glick and Rose as the average in the 12 months before the crisis divided by the average in the previous 3 years.

IV. Results

This section presents a number of findings pertaining to the common lender effect. We start with the evidence from the bank flow data and then move to evidence from exchange market pressure regressions.

Table 2 provides the results based on a panel of data on bank flows to each emerging market disaggregated by 11 creditors, [29] for a subset of 30 emerging markets. [30] The flow from a given creditor to a given emerging market, the dependent variable, is scaled by the creditor's total claims on emerging markets. Recall, that the common lender effect is tested by including creditor country exposure to the ground zero country as an independent variable. A given creditor's claims on an emerging market (again scaled by a creditor's total claims on emerging markets) is introduced as an independent variable, to test whether inflows and outflows are proportional to exposure (generalized inflows and outflows). Two types of regressions are run. In the first, trade competition and macro-controls, which vary across but not within countries, are included. In the second, which corresponds to fixed effects, country-dummies replace these control variables.

The results point to the existence of a common lender effect in the Mexican 1994 and Asian 1997 crises, but not the Russian crisis. For the Mexican crisis, the results point to a small common lender effect which is significant at the 5 or 10 percent level of significance, depending on whether fixed effects or macro-controls are used. For each 1 dollar additional exposure to Mexico, flows are lower by 1 cent on average per emerging market. At the same time, the data point towards a generalized inflow of funds in the wake of the Mexican crisis. For each dollar of exposure, flows increase by on average 13-14 percent of initial exposure, and this effect is statistically significant. Among macro-controls, only private sector credit growth and the current account are statistically significant and bear the anticipated sign. Trade competition is not significant in this regression, but this is not conclusive as to the role of

[29] While the BIS coverage comprises claims of 17 countries, data-coverage is insufficient for 5 of these (Denmark, Finland, Ireland, Norway, and Sweden). Luxemburg was also dropped as a creditor country because of inconsistency of the timing with the rest of the sample. This leaves us with Austria, Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, Spain, the U.K., and the U.S.

[30] The countries are Argentina, Brazil, Chile, China, Colombia, Czech Republic, Ecuador, Egypt, Hungary, India, Indonesia, Israel, Jordan, Kenya, Korea, Malaysia, Mexico, Morocco, Nigeria, Pakistan, Peru, Philippines, Poland, Russia, South Africa, Sri Lanka, Taiwan Province of China, Thailand, Turkey, Venezuela, Zimbabwe. Of this set of 31 countries, the ground-zero country is excluded in the regressions, leaving 30 countries.

trade competition in contagion, as the regression at hand captures only the effect on bank flows.

For the Asian crisis, the effect is economically significant as well as statistically significant. For each additional dollar in exposure to Thailand, flows per emerging market fall by 4 cents, on average. To illustrate the magnitudes involved, consider the case of US and Japanese banks. The difference between the US and Japanese banks, for whom exposures to Thailand were 3.5 and 25.5 percent of their total exposure to emerging markets, meant, according to the regression results, that Japan would have reduced its exposure, relatively to the US, by almost 1 percent (22*0.04) of its total emerging market exposure, on average, in each of the emerging markets where it invests. Summing over the 30 emerging markets in our regressions, this amounts to almost 30 percent of initial exposure to emerging markets, a very sizeable figure. The remaining control variables indicate that there is neither a generalized inflow or outflow of funds. The real exchange rate and trade competition are statistically significant and of the correct sign.

Turning to the case of the Russian crisis, the results point to a generalized outflow, of some 8-9 percent of initial exposures, which is highly significant statistically. The common lender effect is not statistically significant.[31] M2 over reserves, growth in credit to the private sector, and the real exchange rate are statistically significant and of the correct sign.

From this it appears possible that contagion from the Russian crisis was generalized, reflecting an increase in perceived risk or in risk aversion. As noted above, because pressures to withdraw funds can appear in either quantities (flows) or prices (yields), the regressions are not a conclusive test, however. We now turn to regressions of exchange market pressure which do not suffer from this identification problem.

Table 3 reports the results from our second set of regressions, probit estimates for the binary crisis indicator using our preferred indicators of competition for funds. The dependent variable takes the value one if the country experienced substantial balance of payments pressures following a crisis in a ground zero country. The sample is now broader and includes

[31] This could be related to the limitations of the data, in particular the exclusion of indirect exposure to Russia through hedge funds. Germany is excluded from this regression because German bank investments in Russia continued

all developing countries for which data are available, so as to ensure a sufficient number of observations. Bold entries have the expected sign and are significant at the 10 percent level or better.

The estimates now show a significant common lender effect in all three crisis episodes: competition for funds is significantly associated with the probability of a contagious currency crisis in each country.[32] After accounting for the effect of funds competition, macro-variables and trade links are not always significant.[33]

Next we test alternative measures of the competition for funds. Table 4 summarizes the results of 12 regressions with alternative definitions for funds competition. All estimates include the five control variables but only the z-Statistics of the variables of interest are displayed. Bold entries have the expected sign and are significant at the 10 percent level or better. The first set of 9 regressions tests the finance indicators proposed by CRS and the next set of 3 test those proposed by KLR. From the table it appears that the results are not always robust to the choice of indicator of funds competition. In particular, results are insignificant for all alternative indicators during the Asian crisis episode and for all 3 crisis episodes for the KR indicator. This lack of robustness appears linked to the high correlation with trade linkages, as we show next. Before turning to this, one issue to note is that the results point to a strong role for the exposure of the most affected common lender (i.e. the US, Japan, or Germany) in a given emerging market (CRS %lender), as opposed to the reliance of *that emerging market* on the most affected common lender (CRS %borrower). Furthermore, it is the former indicator which seems to drive the significant results for the interactive CRS indicator.

Trade linkages and competition for funds were highly correlated ahead of all crisis episodes, in particular ahead of the Asian crisis. Figure 1 illustrates the relationship between trade competition in third markets (a measure of how much a country shared the same export markets with a ground zero country) and competition for funds based on shares (a measure of how much a country shared the same creditors with a ground zero country). Appendix Table 2

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were to a large extent guaranteed by the state. When Germany is included, the coefficient on the common lender effect is positive (i.e. of the wrong sign) and statistically significant.

[32] We report the measure for competition for funds (i.e. based on shares or absolute values) with the highest significance level (see Table 3).

[33] The trade variable is either direct of indirect trade competition depending on which is significant in a regression which includes macro-controls. For a discussion of the power of macroeconomic fundamentals in predicting currency crisis see Berg and Pattillo (1999).

shows that this high correlation with trade linkages is present for most indicators of competition for funds.[34]

Table 5 summarizes the results of 18 estimates. Again, each entry represents the result of a separate regression based on the specification in Table 3, but excluding trade controls. Excluding trade linkages, all measures of competition for funds tend to be significant.[35] The only exception is the Russian crisis, where the CRS(%borrower) and the KR indicator are not significant. Thus the results show a significant common lender effect for almost all variants of measurement, but they also confirm the findings in our first set of regressions, namely that the most fragile results are obtained for the Russian crisis.

Next, we test the sensitivity of our results to the definition of contagion. As an alternative contagion indicator we use a continuous indicator of exchange market pressures measured at 1, 3 and 6 months after the initial crisis. This indicator has the advantage of taking into account the intensity of the crises and also allows us to investigate the question of timing in contagion. [36]

Table 6 summarizes the results for 27 regressions, for three time horizons, three crisis episodes, and for each of the three indicators of competition for funds. The regressions include macro-controls, but not trade controls. There is little evidence of a common lender effect in the Mexican crisis: with the exception of the KR indicator none is significant. In Thailand, by contrast, all funds competition variables are significant at the 3 and 6 month horizons. Finally, for Russia there is mixed evidence, one indicator is significant at the 1

[34] The role of trade finance contributes to this high correlation; furthermore, it is likely that the historical expansion of bank lending started by financing trade (where the issue of collateral is not problematic) and then gradually expanded into other lending as banks became more knowledgeable about a country. This would lead to a pattern of bank lending that follows the trading routes. Note also that the indicators for competition of funds and for trade are more general than the above argument suggests. They are not measuring the extent to which trade and finance are linked between any two pairs of countries, that is, a high correlation does not necessarily imply that, for instance, Swiss banks lend to Asian countries and also take in a large share of their exports. It is sufficient that Swiss banks lend mostly to Asian countries and that Asian countries' exports compete intensely in another third market (e.g. the US).

[35] Similarly, trade linkages are not always robust to the inclusion of financial linkages, but are always significant when financial linkages are excluded. The relationship between finance and trade is examined in detail in Van Rijckeghem and Weder "Sources of Contagion: Is it Finance or Trade?".

[36] For instance, one might expect that financial contagion would be relatively quick while trade contagion could take longer to work its way through. However, expectations of trade contagion would tend to make the distinction irrelevant. One might also expect the timing of financial contagion to be linked to the start of a recession which would cause an increase in non-performing loans, although, again, expectations of losses could bring this effect forward.

continued

month horizon (KR) and two at the 6 month horizon (FundsComp and CRS). Recall that a drawback of using a statistical indicator such as the pressure indicator is that it captures non-contagious exchange market pressure. This may explain the lack of results for Mexico, in particular, where the pressure index at the three month horizon ranges from a negative -159 in Zambia to a positive 17 in Chad (compared to a pressure index in Mexico of 38).

Table 7 examines a subset of 45 emerging markets, to address the concern that the results may be driven by the inclusion of a number of developing countries which attract no capital flows to speak of. The control variables are as in Tables 5 and 6. The results from Table 5 are largely confirmed–most finance indicators are significant. Where finance loses (some of) its significance is in the Russian crisis episode (the CRS(%lender) becomes insignificant).

V. Conclusions

This paper has provided empirical evidence in support of the view that spillovers through common bank lenders were important in transmitting the Thai, and possibly the Mexican and Russian currency crises as well.

Regressions based on panel data for 11 creditor countries and 30 emerging markets point to a large and statistically significant common lender effect during the Thai crisis. The effect is somewhat smaller in the Mexican crisis and not statistically significant in the Russian crisis. In the Russian crisis, the withdrawal of funds seems to have been more generalized, pointing to the role of "wake-up calls" concerning emerging markets or a general increase in risk-aversion.

Cross-country regressions confirm the existence of a common lender effect in the Thai crisis. These results are quite robust to the definition of the finance indicator, to the use of a market pressure index in lieu of a binary crisis indicator and to sample. They are not always robust to the inclusion of trade competition, reflecting the high correlation between competition for funds and trade and finance.

While the regression results are not robust to specification (the use of a market pressure index in lieu of a binary crisis indicator) in the Mexican crisis or to sample for the Russian crises, the common lender effect is significant in a sufficiently large number of specifications–that the existence of such an effect cannot be dismissed.

Future research on the common lender effect will have to address the absence of data, both the absence of bank-by-bank data and of more meaningful data which would encompass off-balance sheet positions as well as indirect exposures through hedge funds. These are formidable tasks, but it may be possible to proceed based on well-chosen proxies for off-balance sheet positions and indirect exposures through hedge funds. Another area for further research involves extending the data back in time to cover the 1982 Mexican debt crisis, for which Kaminsky and Reinhart's research suggest a common lender effect could be present. Because the BIS data is not published until 1984, this would involve obtaining and consolidating data on individual countries.

Following the Brazilian crisis, the question arises whether the common lender phenomenon is only of historical interest. After all, it seems that there was little contagion—financial or otherwise—after the Brazilian devaluation. A possible explanation is that investors have learned to differentiate between emerging markets and that risk assessment instruments such as VAR have been adjusted to take into account the probabilities of rare, high risk events. It is more likely, however, that the Brazilian crisis is not a good test of the importance of financial contagion because the crisis appears to have been widely anticipated (cfr. high interest rates) and investors were mostly hedged against a devaluation. Thus, financial contagion might well continue to be an important channel of contagion in future unexpected crisis episodes.

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Table 1: Net Private Capital Flows to 29 Emerging Market Economies

	1994	1995	1996	1997	1998
in billion of US $					
Banks	43.4	99.5	120.4	30.9	-29.1
Other Creditors	30.0	23.4	78.8	88.7	49.4
Direct Investment	67.2	81.4	93.3	116.2	120.4
Portfolio equity	29.4	24.4	35.7	25.7	2.4
Total private flows	170.0	228.7	328.2	261.5	143.1

Source: IIF (1999).

Table 2: Disaggregated Contagion Indicators
Coefficients and T-Statistics of OLS estimates
Dependent Variable: Flows by Emerging Market (i) by Creditor (c) 1/

	Mexico	Thailand	Russia
With macro-controls			
Exposure of Creditor c to Emerging Market I 1/	**0.14** **11.50**	0.05 1.60	**-0.08** **-5.01**
Exposure of Creditor c to ground zero country 1/	**-0.01** **1.89**	**-0.04** **-2.00**	0.006 0.52
Credit to Private Sector (%change)	**-0.001** **2.85**	-0.0001 -0.09	**-0.002** **-1.65**
M2/Reserves	0.01 2.38	0.0003 0.39	**-0.03** **-2.16**
Real effective exchange rate appreciation	-0.04 -0.422	**1.00** **2.76**	**0.30** **1.77**
Current Account (percent GDP)	**-0.02** **1.71**	-0.0001 -0.03	0.001 0.29
Trade Competition	0.88 0.22	**-1.52** **-1.85**	9.52 1.22
Adjusted R-squared	0.31	0.01	0.10
Number of observations	307	277	239
With fixed effects			
Exposure of Creditor c to Emerging Market I 1/	**0.13** **9.11**	0.03 0.84	**-0.09** **-4.17**
Exposure of Creditor c to ground zero country 1/	**-0.01** **-2.07**	**-0.04** **-2.36**	0.01 1.10
Adjusted R-squared	0.42	0.17	0.12
Number of observations	318	319	299

Bold entries have the expected sign and are significant at the 10 percent level or better.
1/ As a percent of creditor j total exposure in emerging markets.
2/ Trade based on direct trade in Mexico and Russia; based on shares in Thailand.

Table 3: Contagion and Competition for Funds
Probit estimates. Dependent Variable: Binary Contagion Variable

	(1) Mexico	(2) Thailand	(3) Russia
Constant	-4.14	-3.53	-0.46
	-2.05	*-1.19*	*-0.21*
Funds Competition 1/	**4.97**	**3.31**	**3.75**
	2.67	***2.00***	***2.40***
Trade Competition 2/	**34.30**	1.42	**5.28**
	1.68	*0.88*	***1.86***
Credit to private	-0.01	-0.02	0.05
Sector (%change)	*-0.35*	*-0.75*	*1.49*
M2/ Reserves	-0.13	0.03	0.10
	-1.25	*1.26*	*1.38*
Real Exchange	2.18	0.80	-1.40
Appreciation	*1.22*	*0.30*	*-0.75*
Current Account	-0.03	0.01	0.02
	-0.83	0.13	0.44
McFadden R-squared	0.39	0.36	0.30
Number of observations	85	68	42

z-Statistic in Italics
Bold entries have the expected sign and are significant at the 10 percent level or better

*) Definition of contagion following the Mexican and Thai crisis are from Glick and Rose, for the Russian crisis based on assessments of IMF economist given in Appendix Table 1.
1/ Competition for funds based on absolute amounts in Mexico and Russia and based on shares in Thailand.
2/ Direct trade for Mexico and Russia. Competition in third markets for Thailand.

Table 4: Alternative Measures of the Common Lender Effect. Summary of results
z-Statistics of probit estimates. Dependent Variable: Binary Contagion Variable

	Mexico	Thailand	Russia
CRS, interactive	**2.44**	0.93	**2.18**
CRS, %borrower	0.63	0.64	-1.11
CRS, %lender	**2.79**	1.17	**2.29**
KR Finance Indicator	1.04	-0.24	-0.14

Results from 12 regressions, all based on the specification in Table 3: control variables are M2/reserves, growth of credit to private sector and real exchange rate appreciation and trade competition (Direct trade for Mexico and Russia. Competition in third markets for Thailand). All coefficients of controls are suppressed. Bold entries have the expected sign and are significant at the 10 percent level or better.

Table 5: Alternative Measures of the Common Lender Effect.
Summary of results from estimates that exclude trade linkages
z-Statistics of probit estimates. Dependent Variable: Binary Contagion Variable

	Mexico	Thailand	Russia
Funds Competition			
Shares	**2.66**	**3.44**	0.32
Absolute values	**3.10**	**3.13**	**2.04**
CRS			
Interactive	**2.74**	**2.02**	**1.84**
%Borrower	**1.83**	**2.41**	0.71
%Lender	**3.10**	**2.16**	**1.81**
KR Finance Indicator	**2.23**	**1.79**	0.71

Each entry is the result of a separate regression based on the specification in Table 3, excluding trade linkages. Bold entries have the expected sign and are significant at the 10 percent level or better.

Table 6: Continuous Contagion Indicators. Summary of results
T-Statistics of OLS estimates, Dependent Variable:
Continuous exchange market pressure Index

	Mexico	Thailand	Russia
1 Month after ground zero			
Funds Competition 1/	1.01	0.35	1.38
CRS Finance Indicator, Interactive	1.23	0.82	1.25
KR Finance Indicator	0.61	1.00	**2.26**
3 Month after ground zero			
Funds Competition 1/	0.94	**1.79**	0.99
CRS Finance Indicator, Interactive	1.29	**1.76**	0.45
KR Finance Indicator	**1.81**	**1.99**	1.25
6 Month after ground zero			
Funds Competition	1.32	**3.43**	**2.29**
CRS Finance Indicator, Interactive	1.59	**1.90**	**1.90**
KR Finance Indicator	1.17	**2.33**	1.03

Each entry is the result of a separate regression based on the specification in Table 3, excluding trade controls in the finance regressions. Bold entries have the expected sign and are significant at the 10 percent level or better.
1/ Competition for Funds in absolute terms in Mexico and Russia; based on shares in Thailand.

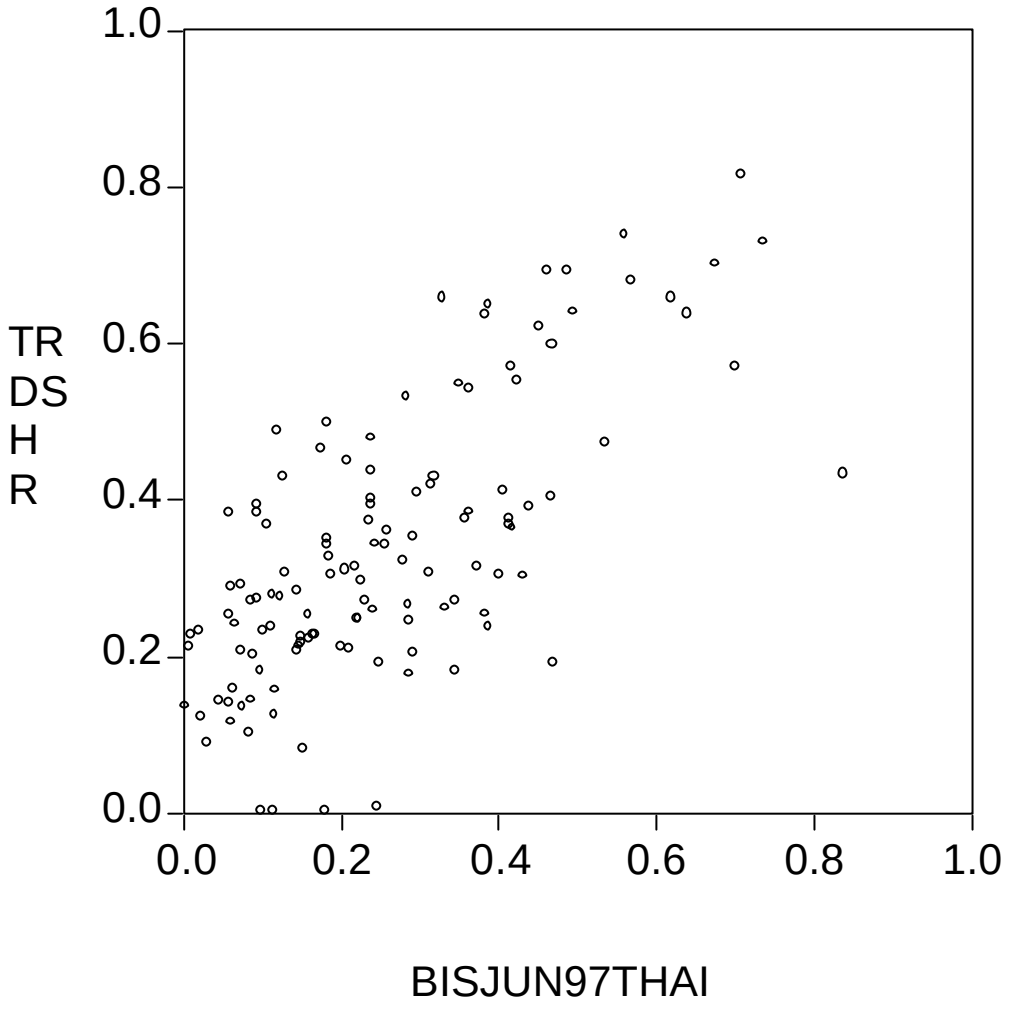
Table 7: Summary of Results for 45 Emerging Markets
z-Statistics of probit estimates, Dependent Variable:
Binary Contagion Variable

	Mexico	Thailand	Russia
Funds Competition			
Shares	**1.71**	**2.26**	0.16
Absolute values	**2.14**	**2.02**	**1.88**
CRS Finance Indicators			
Interactive	**2.34**	**1.85**	1.31
%Borrower	**1.80**	1.33	-1.05
%Lender	**2.49**	**2.14**	1.56
KR Finance Indicator	**1.67**	0.97	-0.61

Each entry is the result of a separate regression based on the specification in Table 3, excluding trade controls. Bold entries have the expected sign and are significant at the 10 percent level or better.

Sample of 45 economies includes: Argentina, Bolivia, Brazil, Chile, China, Colombia, Costa Rica, Cote d'Ivoire, Czech Republic, Ecuador, Egypt, Ghana, Greece, Hong Kong, Hungary, India, Indonesia, Israel, Jordan, Kenya, Korea, Latvia, Lithuania, Malaysia, Mauritius, Mexico, Morocco, Nigeria, Pakistan, Panama, Peru, Philippines, Poland, Portugal, Russia, Singapore, South Africa, Sri Lanka, Taiwan Province of China, Thailand, Turkey, Ukraine, Uruguay, Venezuela, Zimbabwe. Actual sample varies because of missing variables.

Figure 1: Trade Competition versus Competition for Funds (shares)
on the eve of in the Asian Crisis



Appendix Table 1. Countries that were affected in the crisis episode*

Mexican Crisis	Asian Crisis	Russian Crisis
Argentina	Argentina	Argentina
Brazil	Brazil	Belarus
Hong Kong	Czech Republic	Bolivia
Hungary	Hong Kong	Brazil
Indonesia	Hungary	Colombia
Peru	Indonesia	Czech Republic
Philippines	Korea	Ecuador
Thailand	Malaysia	Georgia
Venezuela	Mexico	Hong Kong
	Pakistan	Indonesia
	Philippines	Korea
	Poland	Mexico
	Singapore	Moldova
	South Africa	Pakistan
	Taiwan Province of China	Paraguay
	Viet Nam	Poland
		South Africa
		Tajikistan
		Thailand
		Turkey
		Turkmenistan
		Ukraine
		Uruguay
		Uzbekistan
		Venezuela

*Some of these countries are not included in the regressions for lack of available data.

Appendix Table 2: Correlation Matrix for Trade and Finance Indicators

Mexican crisis for 113 countries

	FC94 Shares	FC94 Absolute	CRS94 Interactive	CRS94 %Borrower	CRS94 %Lender	KRUS94	TRDSH94	TRDDIR94
FC94 Shares	1.00							
FC94 Absolute	0.56	1.00						
CRS94 Interactive	0.47	0.58	1.00					
CRS94 %Borrower	0.48	0.08	0.35	1.00				
CRS94 %Lender	0.47	0.68	0.87	0.20	1.00			
KRUS94	0.54	0.13	0.49	0.80	0.32	1.00		
TRDSH94	0.45	0.15	0.15	0.38	0.13	0.38	1.00	
TRDDIR	0.48	0.24	0.42	0.36	0.37	0.51	0.45	1.00

Thai crisis for 118 countries

	FC97 Shares	FC97 Absolute	CRS97 Interactive	CRS97 %Borrower	CRS97 %Lender	KRJA97	TRDSH96	TRDDIR96
FC97 Shares	1.00							
FC97 Absolute	0.73	1.00						
CRS97 Interactive	0.48	0.30	1.00					
CRS97 %Borrower	0.87	0.60	0.65	1.00				
CRS97 %Lender	0.50	0.35	0.99	0.64	1.00			
KRJA97	0.58	0.52	0.63	0.79	0.64	1.00		
TRDSH96	0.70	0.58	0.31	0.57	0.34	0.42	1.00	
TRDDIR96	-0.04	-0.05	0.02	0.00	0.03	0.14	0.04	1.00

Russian crisis for 120 countries

	FC98 Shares	FC98 Absolute	CRS98 Interactive	CRS98 %Borrower	CRS98 %Lender	KRGE98	TRDSH97	TRDDIR97
FC98 Shares	1.00							
FC98 Absolute	0.33	1.00						
CRS98 Interactive	0.38	0.51	1.00					
CRS98 %Borrower	0.52	-0.12	0.21	1.00				
CRS98 %Lender	0.28	0.67	0.89	0.01	1.00			
KRGE98	0.55	-0.14	0.20	0.71	0.01	1.00		
TRDSH97	0.41	0.17	0.26	0.18	0.23	0.26	1.00	
TRDDIR97	0.08	-0.18	-0.04	0.56	-0.10	0.37	0.20	1.00

FC= Funds competition, derived in the paper, based on equations (1) and (2).
CRS=measures suggested by Caramazza, Ricci, and Salgado (1999).
KR=measures suggested by Kaminsky and Reinhart (1998)., US, JA and GE= the main lender in crisis episode
TRDSH=trade competition in third markets.
TRDDIR=direct trade competition.