Crises and contagion: the role of the banking system

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1.   Introduction

It is only very recently that banking and currency crises have started to be analysed from a unified perspective. The literature on "twin crises" has unveiled the important complementarities between bank insolvency and currency instability, stressing that causation may run in either direction. In the last few years, empirical studies have focused on the relevance of imbalances in the banking sector to currency devaluations. At the same time, the literature on currency crises has turned attention to the tendency of financial crises originating in one country to spread internationally. This line of research into what is usually referred to as "contagion" has just started to disentangle the specific role of banks in the international transmission of shocks. A seminal contribution by Miller (1998) has provided examples of domestic banking crises causing financial distress in foreign countries and of currency crises abroad inducing domestic bank runs.

The relevance of domestic and foreign banks in transmitting shocks across countries emerged clearly during the Asian crisis. One can define a transmission channel as a mechanism through which a financial crisis in country A brings about a financial crisis in country B. For example, a currency crisis in A might cause a sharp decline in its imports; the consequent reduction of exports in B may induce pressures on its exchange rate such that, eventually, B also faces a currency crisis (the so-called trade channel). In this paper we are concerned with channels operating through the banking system, which may be in A, in B or in a third country C. We focus on channels in which banks are involved because we believe that the banking system has specific characteristics which have to be taken into account when designing policies aimed at containing systemic risks. Unlike other papers, we do not distinguish between crises due to the *normal interdependence* between countries A and B and crises occurring because of some *discontinuity in the transmission mechanism*, since we are interested in the role of banks tout court.[2] Moreover, we ignore the transmission channels based on optimal portfolio rules even if the banking sector is directly involved. In fact, in the current globally integrated world, banks invest in international financial markets and, like other institutional investors, they can transmit shocks through portfolio rebalancing decisions. However, this channel is not bank-specific. Here, we analyse transmission mechanisms originating from changes in the value of collateral and in capital ratios, from bank runs and bank panics and from moral hazard (see Figure 1).

The first channel hinges on the specific lending function of banks. Loan contracts typically require the borrower to provide *collateral*. If the occurrence of a currency crisis reduces the market value of stocks in a country, each economy that has been backing its liabilities with those stocks as collateral has to "mark to market"; otherwise, it can face a reduction in its credit lines from the banking system. Moreover, if the bank itself has been lending to firms in the crisis country, the resulting rise of non-performing loans worsens its "value-at-risk". It follows that the bank - in order to comply with binding *capital adequacy constraints* - will have to withdraw capital from other countries, leading to a credit crunch.

The second transmission channel is connected to the function of transforming asset maturities. Banks provide a transformation of securities with short maturities, offered to depositors, into securities with long maturities that other agents desire. This "transformation" service leaves banks vulnerable to *runs* that can potentially be transmitted to the whole domestic banking system (*bank panics*). Bank run models, as in the seminal paper by Diamond and Dybvig (1983), allow for two different equilibria: a "good" equilibrium, where only "few" investors withdraw in the short term, leaving the bank with enough liquidity to repay all its creditors, and a "bad" equilibrium, where all depositors withdraw in the

[2]   In two related papers, Corsetti et al (2000a and 2000b) provide a theoretical appraisal of studies on contagion and interdependence and an empirical analysis of the occurrence of contagion during the Asian crisis.

short term, bringing about bankruptcy. This feature of the banking system gives rise to two different classes of bank runs. First, a crisis in a country modifies the *information set* available to all agents. As a consequence, depositors in other countries may simply switch from a good to a bad equilibrium (sunspot), or they may revise their views on the quality of other banks' assets. In the latter case, herd behaviour induced by asymmetric information can make the occurrence of a bank panic more likely. Second, in models where the multiplicity of equilibria disappears, the probability of a bank run can be related to the *structure of the economy*. Hence, one can find that a shorter maturity of capital inflows, a larger share of foreign currency denominated debt and higher domestic and international interest rates increase the probability of a banking crisis. Moreover, in globally integrated financial markets, banks from different economies may form a network of firms (credit chain) that can internationally spread problems affecting a specific bank in a single country.

Figure 1
Banks' activities
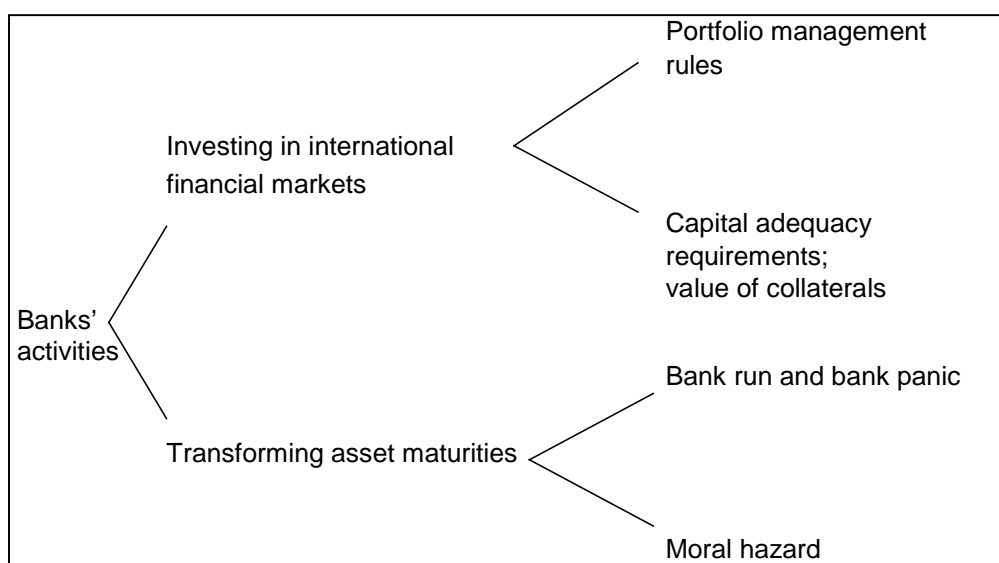
In order to reduce the risk of runs, public authorities may offer guarantees on deposits. *Moral hazard* resulting from implicit or explicit government guarantees, from confidence in international rescue packages or, similarly, from the belief that some borrowers are "too big to fail" may provoke excessive capital inflows that banks eventually channel towards risky or unprofitable plans. Such overborrowing, in turn, can translate into unsustainable imbalances that make the economy vulnerable to international shocks and sudden reversals of capital flows.

In the next section, we present some stylised facts related to the channels discussed above, assessing inter alia the vulnerability to contagion stemming from the concentration of loans from the same lender. In Section 3, we examine at a theoretical level the channels that favour the transmission of financial shocks through the banking system. Finally, we discuss some empirical evidence, reviewing the variables (both bank-specific factors and macroeconomic indicators) that the literature has found to be significant in determining the probability of banking and currency crises. In particular, among the channels discussed in the paper, the presence of a common lender and of an explicit deposit insurance scheme have recently been identified as significant sources of instability. Section 5 concludes.

2.   Stylised facts

Before carrying out a theoretical examination of the international transmission channels for shocks that involve the banking sector, we provide some stylised facts describing the recent evolution of borrowing/lending flows, the occurrence of bank runs and bank panics and the diffusion of deposit insurance schemes.

(1) The United States, Japan and Germany - which are the main international creditors - tend to concentrate their loans in specific regions of the world. Moreover, countries belonging to the same region tend to borrow from the same lender.

Developing countries ("DCs" in this section) rely heavily on foreign funds to finance their economic activity.[3] The United States, Japan and Germany provide most of the foreign loans these countries require. Data from the Bank for International Settlements (BIS) show that at the beginning of the 1990s loans from the three lenders amounted to over half (53%) of the total liabilities of DCs vis-à-vis BIS reporting countries. At the end of the decade, this share was still close to 45%, despite the very sharp reduction in Japanese lending.

After the two major crises that hit DCs in the 1990s (the Mexican crisis and, later, the Asian-Russian crisis), the flows of loans from advanced economies to the DCs have decreased drastically. In 1990, the *United States* was strongly exposed to DCs, which were receiving almost 70% of total US bank loans to non-residents. Most of these credits, about 60%, were directed towards Latin America; 23% were directed towards Asia-Pacific countries. At the beginning of 2000, the shares of lending to Latin America and to Asia (out of total lending to DCs) were approximately the same - 57% and 24%, respectively - but the share of US exposure to DCs collapsed to less than 20%.

A similar pattern of events characterises the *Japanese banking sector*. The weight of DCs in the balance sheet of Japanese banks increased in the mid-1990s, but, at the end of the decade, it shrank quickly. Loans by Japanese banks to DCs have always been concentrated towards the Asia-Pacific region. In 1990, 54% of Japanese loans to DCs were directed to Asia-Pacific countries; this share increased to over 80% in 1996 and dropped to 76% in 1999.

Also, the relative exposure of the *German banking sector* to DCs witnessed a sharp reduction after the crises. Nonetheless, the relative weight of international credits to Asia-Pacific countries almost doubled, from less than 12% of total loans to DCs in 1990 to over 22% at the end of the decade.[4]

A second feature of bank loans to DCs is that countries in the same area tend to share the same borrower. Consider *Latin American countries* at the end of 1994 a few days after the outbreak of the *tequila crisis*.[5] As the first column of Table 1 shows, in 1994 there were eight countries for which liabilities vis-à-vis the United States represented more than 30% of their total external indebtedness; the area as a whole was indebted to the US banking system by more than 32% of its total external liabilities.[6]

In the years following the *tequila crisis*, the relative weight of loans from US banks declined. However, at the end of the decade, the countries of the region were still highly indebted to the United States (see the second column of Table 1). Their share of liabilities vis-à-vis the common lender is still well above 20%, and in Mexico the share is higher than 30%. Also, the aggregate value shows that, in Latin America, bank loans from the United States have a smaller but still very important weight today (the share is about 24%).

A similar pattern emerges for the *Asia-Pacific region* in the late 1990s. The data show that, at the end of the second quarter of 1997, more than 35% of the region's total external liabilities were due to Japanese banks. In Table 2, among the most indebted countries, we find all the major economies that were involved in the Asian crisis (Indonesia, South Korea, Malaysia and Thailand). After the crisis, the weight of external liabilities to Japan declined quickly in the region, reaching 24% at the end of the decade (it had been 36% in 1997). Though the share of external liabilities to Japan decreased in all countries, for some countries the share of indebtedness to Japan is still higher than 30%.

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[3] We use the Bank for International Settlements' definition of developing countries.

[4] German banks have considerable exposure to eastern European countries. However, due to the subject of the paper, we focus on Asia-Pacific and Latin American countries.

[5] Data for the second quarter of 1994, before the beginning of the Mexican crisis, do not differ significantly.

[6] Each entry is the amount owed by that country to the lender, divided by that country's total debt to BIS reporting countries (grand total).

Table 1
Shares of indebtedness to the United States

Country/region	1994	2000
Argentina	30.7	19.2
Bolivia	35.4	23.0
Brazil	30.0	25.8
Chile	31.6	21.2
Colombia	30.1	24.0
Mexico	38.6	30.2
Uruguay	36.5	21.6
Venezuela	33.9	26.4
Latin America	32.2	24.4

Table 2
Shares of indebtedness to Japan

Country/region	1997	2000
China	35.9	21.2
Indonesia	41.7	29.3
South Korea	33.4	24.6
Malaysia	37.5	32.5
Thailand	55.8	39.3
Asia-Pacific	35.8	23.8

(2) The degree of vulnerability to contagion in Asia-Pacific and Latin America has sharply decreased since the period of crisis.

A situation in which many countries borrow from the same lender is not necessarily risky, provided that the lender's exposure vis-à-vis each country is not large. For instance, if the share of US external loans vis-à-vis Latin American countries had been negligible in 1994, the risk of a sudden reversal of funds due to the attempt to restore capital ratios by US banks following a default in the region would have been small. US banks were, instead, highly exposed to these countries: almost 60% of their loans to DCs were to Latin America, with Mexico receiving 17% of total external loans.

The following index provides an evaluation of the risk of "importing" a financial crisis due to the presence of a common lender. First, choose an arbitrary threshold of indebtedness to a single lender (say, 30% of total liabilities, as in Tables 1 and 2) and select the group of countries which are above this limit. Then, consider the country in the group for which the exposure of the lender is maximum. Finally, multiply the share of indebtedness of each economy towards the common lender with the value of the maximum exposure identified in the second step.[7] For Latin American countries in 1994, this procedure implies the shares in Table 1 are multiplied by 17% (ie the weight of Mexico, the

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[7] The index does not take into account the possibility that a country will have large relative indebtedness but a small absolute exposure vis-à-vis the common lender. It also ignores the impact that different degrees of liquidity have on the behaviour of creditor banks. However, previous work (eg Van Rijckeghem and Weder (1999), Caramazza et al (2000)) has shown that it provides a good approximation of the vulnerability stemming from the common lender channel.

Table 3
Index of vulnerability

Country	Crisis year	2000
Argentina	521.9	57.6
Bolivia	601.8	69.0
Brazil	510.0	77.4
Chile	532.1	63.6
Colombia	511.7	72.0
Mexico	656.2	90.6
Uruguay	620.5	64.8
Venezuela	576.3	79.2
China	324.2	2.4
Indonesia	376.6	58.6
South Korea	301.6	49.2
Malaysia	338.6	65.0
Thailand	503.9	78.6

maximum in the portfolio of US banks). Table 3 reports the values of this index (multiplied by 10,000) for both Latin American and Asia-Pacific countries in the crisis year and in the first quarter of 2000.[8]

It is easy to see that the two periods differ sharply. In 1994 the value of the index in the eight Latin American countries was always above 500, signalling a very high concentration on the same source of funding and, at the same time, a large exposure of the lender vis-à-vis the region. At the beginning of 2000 the index was always below 100, indicating both the lower indebtedness of Latin American countries to the United States (the average for the zone as a whole dropped from over 32% in the crisis year to less than 25%) and the relative reduction in the exposure of the US banking system (the maximum value in the first quarter of 2000 was 3% vis-à-vis Mexico). For Asian emerging economies the index again shows a sharp decrease after the crisis: both the concentration on Japan as source of financing and the exposure of the Japanese banking system vis-à-vis Asia-Pacific countries were considerably lower at the beginning of 2000.

(3) In the last 20 years, the number of banking crises has escalated. However, episodes of bank runs and bank panics have not been frequent.

While there seems to be a broad consensus on the theoretical definitions of sound and unsound banking systems see, for example, Lindgren et al 1996, the empirical identification of a banking crisis is not a simple task. Studies are strongly conditioned by the availability and the quality of data, especially for developing countries, by the difficulties of finding homogenous sources of data at the firm level and by the lack of high-frequency data, which complicates the task of detecting crises on a timely basis. Most empirical works have defined a banking crisis by considering one or more of the following factors: the ratio of non-performing assets to total assets in the banking system; the closure or failure of important banking institutions; the occurrence of large-scale bailouts, conducted either by the government or by the private sector (eg through mergers or takeovers); the occurrence of large scale nationalisations of banks; the cost of rescue operations; the occurrence of extensive bank runs; and a fall in the stock prices of banking institutions.[9]

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[8]   For the Asia-Pacific region, the largest exposure of Japanese banks was vis-à-vis Thailand in 1997 Q2 (9%) and vis-à-vis South Korea in 2000 Q1 (2%).

[9]   See Section 4 for detailed examples of definitions of banking crises.

Also reflecting such data-related problems, few studies have compared the frequency of banking crises over long horizons. Recently, Kaminsky and Reinhart (1999) have considered a sample of 20 industrial and developing countries, over the period 1970-95. In their sample, banking crises are rare during the 1970s, with only three episodes taking place. The number of banking crises per year more than quadruples after 1980, when 23 banking crises are recorded. The relevance of the phenomenon in the last 20 years is acknowledged in Lindgren et al (1996), which provides one of the most extensive studies on banking crises. These authors examined all IMF member countries, from 1980 to 1995. Since the beginning of the sample period, 133 countries, among the over 180 member countries of the IMF, have experienced *crises* or *significant problems* in the banking sector.[10] Developing and industrial countries alike have been affected, as well as all economies in transition.

Despite the large number of crises, episodes of bank runs and bank panics have not been very frequent. Lindgren et al (1996) analyse a sample of 34 countries which have experienced crises or significant problems in the banking sector, providing a large set of information on both the causes and consequences of the crises. The sample comprises 19 developing economies, eight transition economies and seven industrial countries: 36 cases of banking sector problems are singled out (for one country, Argentina, three different episodes have been considered). In this sample, bank panics have been recorded in seven cases and "sporadic" runs on individual banking institutions in just a few other episodes. Moreover, in only two cases (Argentina in 1995 and Philippines in the first half of the 1980s) can the bank panic be considered as the main cause of the failure or closure of the institution involved. In particular, in the Philippines, rural and thrift banks failed in 1981 partly because of a confidence crisis sparked by fraud in the commercial paper market. The fraud that triggered the run - known as the Dewey Dee Affair - is described in Nascimento (1991):

> "In January 1981, Dewey Dee, an industrial magnate who had borrowed heavily in the commercial paper market, fled the country, leaving behind an estimated 500-800 millions of pesos of debt. The news sent a wave of panic through money market investors and small depositors."

This episode had a very strong impact on confidence: the commercial paper market collapsed, many non-bank money market institutions went out of business and, finally, the panic propagated to rural and thrift banks. Bank panics again took place in the Philippines shortly thereafter. Following the announcement by the government of a moratorium on external debt payments in October 1983, a series of runs on the banks ensued and, unlike what had happened in 1981, important commercial banks were also hit.

The present situation, characterised by relatively infrequent episodes of bank runs, contrasts with the picture prevailing before deposit insurance schemes were heavily resorted to. For instance in the United States, the so-called Free Banking Era (1837-63) and the National Banking Era (1863-1914) were both affected by recurrent nationwide bank panics. Since the introduction of federal deposit insurance, in 1934, widespread episodes of bank runs have not taken place. The empirical relevance of bank runs as a cause of banking crises is, however, still a debated question. According to some authors, both in recent and in past periods, runs have been only a symptom of the banks' weaknesses, rather than the cause. Most banking problems have been due to a deterioration in the asset quality, rather than to bank runs. Some empirical evidence on this issue is discussed in Section 4.

(4) The number of countries with explicit deposit insurance schemes has increased sharply since 1980. The characteristics of these schemes have been adjusted in recent years, in order to reduce the risks arising from moral hazard and other agency problems.

The IMF has recently conducted an extensive survey on 72 countries with different deposit protection systems, analysing their characteristics (see Garcia (1999)). While the first explicit deposit insurance scheme for national banks was established in the United States as late as 1934,[11] other countries did not follow this lead until the 1960s. In April 1999, of the 72 systems reviewed by the IMF, 68 were explicitly defined by law or regulation. Interestingly, only 18 schemes were adopted before 1980. As

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[10] A *crisis* is defined as a situation in which a sizeable group of financial institutions have liabilities exceeding the market value of their assets, and the economy experiences bank runs or other portfolio shifts, the collapse of some financial firms and government intervention. Extensive unsoundness of the banking sector, short of a crisis, is termed a *significant problem*.

[11] Some states within the United States began a deposit insurance scheme earlier, as did Czechoslovakia.

the incidence of banking crises escalated, 50 new formal schemes were implemented: 19 during the 1980s and 31 during the 1990s.

The acceleration in the implementation of formal deposit insurance schemes was particularly strong in Europe and in Africa. The 1994 European Union Directive on Deposit Guarantees - which requires countries to set up a deposit insurance scheme to which banks are forced to adhere - has led many countries to revise or to establish deposit protection systems. In countries that are, or aspire to be, members of the European Union, a standardisation of practices concerning some characteristics of the schemes (like the compulsory or voluntary nature of bank membership and the coverage limits) has been enhanced. In Africa, the implementation of formal schemes did not accelerate until 1999, when six countries (Cameroon, the Central African Republic, Chad, the Republic of Congo, Equatorial Guinea and Gabon) ratified a treaty that established a common central bank and set the rules of an explicit deposit insurance scheme.

The most important trend concerning deposit insurance seems to be the shift from an implicit scheme to an explicit formal scheme. Many countries currently maintaining explicit guarantees have, in fact, reformed their pre-existing implicit insurance. Of the four countries surveyed by the IMF and reported in Garcia (1999) that do not maintain formal guarantees on deposits, only Kuwait has never considered the implementation of explicit schemes. In Bolivia and Costa Rica, explicit schemes are under discussion or under preparation; in Honduras, the current banking law mentions that a deposit insurance law would be passed, but, in April 1999, the draft had still to be presented to parliament.[12]

Revisions of explicit guarantees have tended towards imposing compulsory adherence to the deposit insurance scheme on banking institutions. These reforms - aimed at reducing adverse selection problems - have occurred not only in Europe as a result of the 1994 Directive on Deposit Guarantees, but also in the Middle East and in the Americas.[13]

Generally, deposit insurance covers only retail deposits and only up to a certain amount. In order to reduce the room for moral hazard, the coverage limit should be low enough to encourage large depositors and sophisticated creditors (like foreign creditors and other banks) to closely monitor the investment activity of banks; on the other hand, the limit should also be sufficiently high to fully insure small depositors, typically unable to engage in an effective monitoring of banking institutions. As a rule of thumb, the IMF suggests that deposits should be guaranteed up to a limit not exceeding two times the per capita GDP. In the IMF sample, the average coverage limit is three times the per capita GDP, with the highest average in Africa and the lowest in Europe. Some countries, however, offer full coverage for all deposits and also for other liabilities.[14] Most of these countries began to offer full coverage when they declared a financial emergency, with the intention to shift to limited coverage when the conditions in the banking system became sounder. For instance, the current insurance scheme in Japan - which covers all depositors and creditors - is planned to end in March 2002 (see Freixas et al (1999a)). Sweden and Finland have already retracted the full coverage offered during their banking crises and have replaced it with limited coverage.

Finally, almost all countries with explicit deposit insurance have shifted to a system of coverage per depositor, rather than per deposit, in order to lower the effective coverage ratio and to discourage behaviours aimed at circumventing the limits.

3.　　　Transmission channels

The role of the banking system in the transmission of financial shocks is closely related to the level of development of the credit market. In particular, Aghion et al (1999) show through a theoretical dynamic

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[12] Dermirgüç-Kunt and Detragiache (2000) consider a different sample, where 23 other economies - mainly Asian and African countries - still maintain an implicit scheme.

[13] Note that if the adherence of banking institutions to a deposit insurance scheme is voluntary and charges a fixed premium, the scheme is likely to attract weaker institutions while repelling stronger banks.

[14] These countries are Colombia, Ecuador, Indonesia, Japan, South Korea, Malaysia, Mexico, Thailand and Turkey. Kuwait - which has an implicit scheme - is also supposed to cover all deposits.

open economy model that countries with an intermediate degree of development of the banking system (such as emerging markets) can be much more vulnerable to external shocks than not only countries with a highly efficient financial sector, but also countries with an underdeveloped banking system. Hence, the impact of financial shocks transmitted through the mechanisms analysed in the following sections is likely to be much stronger in emerging economies.

3.1 Common lenders and the value of collateral

In the current scenario of growing integration among banks from different countries, a common lender may be the main source of funds for several countries.[15] A problem that may arise in this context concerns the competition for funds from the same bank. When a common lender is highly exposed to a crisis country, adjustments to restore capital ratios or to reduce risk exposure may lead to a sudden cutting of credit lines to other economies. In fact, if a bank faces an increase in non-performing loans in one country, it is likely to reduce - by choice or because of regulation - its overall value-at-risk. In practice, it may shift away from lending and increase its holding of government bonds. It follows that other countries borrowing from the affected bank will become vulnerable to a retrenchment of their credit lines. Moreover, if these countries' liabilities have a short maturity and the bank's rebalancing needs are large, the crisis can trigger large capital outflows from other countries. For instance, consider the case in which the firms from two countries, A and B, borrow from the same banking system (say, country C). When a crisis hits A, banks from C may be unable to have the credit issued to country A repaid. This, in turn, implies that, in order to restore capital ratios, country C causes a credit crunch in country B by calling back the loans issued to B. In this way the productive sector of country B comes under pressure and eventually the whole country may face a crisis. Even if the economy of B is not linked to that of country A, the presence of a third party, C, causes the crisis to spread from one country to the other.

The problem arising from the existence of a common lender is twofold. On the one hand, the bank may be unwilling to extend new credits to other borrowers; on the other hand, it may refuse to roll over the existing loans. When borrowers are heavily dependent on the bank and do not have easy access to alternative sources of financing, the credit crunch may trigger a crisis in other economies too, independently of the state of fundamentals. However, three conditions must be met in order to have this transmission channel operating:

(i)   the bank's exposure in the country initially affected by a financial crisis is large, implying potential substantial losses and, in turn, the need to restore capital asset ratios or to readjust risk exposure;

(ii)   the same bank is an important source of credit for other countries;

(iii)   the potentially affected countries cannot easily find other sources of funding.

In particular, note that the third condition relies on some form of market imperfection. If the common lender does not roll over its loans in countries with sound fundamentals, other lenders could intervene in its place. However, the common lender might have a deeper knowledge of the borrowers' economies, given their past relationship or because of geographical proximity. By contrast, if potential lenders are unable to efficiently monitor borrowers, due, for instance, to larger initial costs, they might refrain from replacing the common lender.

A similar pattern of contagion is also at work when considering changes in the value of collateral. In fact, given that banks usually require some form of asset to back the granting of credit lines, debtors provide collateral, such as government bonds or stocks, to meet this requirement. When the value of these assets changes after a financial crisis, banks demand that the value of collateral be restored. As before, when country B provides collateral from country A and a crisis hits the latter economy, the banking system (now in country B) requires the firms to update the value of collateral, otherwise it has to reduce the amount of the outstanding loans. As before, a credit crunch in country B and the transmission of the crisis (from A to B) are the likely outcome in this framework.

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[15]   Countries borrowing from a common lender are typically in the same region (see Section 2). However, this is not always the case. For instance, in 1997, unlike other Southeast Asian economies that borrowed mainly from Japanese banks, the Philippines was mostly indebted to the United States.

Emerging economies, which require substantial foreign resources to finance productive activities, are particularly vulnerable to changes in the value of collateral. In fact, weak international financial links, reflected in the inadequate provision of international collateral, place limits on the country's ability to acquire external financing (Caballero and Krishnamuthy (1999)). For instance, consider a region that is economically open but has an underdeveloped bank-based financial market and suppose that an economy in this region is backing its funding with asset holdings in a neighbouring country. When a crisis hits the "collateral" economy, the lender will require sounder backing for its claims. If this is impossible, the lender will downgrade the creditworthiness of the debtor and reduce the amount of credit issued, by ceasing to roll over the existing loans or by requiring a repayment of its credits. This in turn implies that, during financial crises, the country's international collateral may turn out to be insufficient to finance its productive activity. Domestic firms needing foreign funds might trade domestic assets for international collateral at prices not in line with the country's fundamentals, exacerbating the initial shock.

3.2   Bank runs and bank panics

3.2.1   Informational bank runs

The traditional explanation of a *bank run* is that when depositors observe large withdrawals from their bank, they might fear that a bankruptcy is soon to occur. Since bank assets are allocated on a *first come, first served* basis, when depositors expect a run they respond by rushing to withdraw their own deposit in an attempt to anticipate others. Withdrawals in excess of a bank's current expected demand for liquidity can cause bankruptcy. Banks, in fact, typically *transform* liquid liabilities into illiquid assets. This kind of service - which allows better risk-sharing among people with different consumption horizons (and provides the rationale for the existence of banks) - makes banks vulnerable to runs. Bank run models, as in Diamond and Dybvig (1983), exhibit multiple equilibria: a "good" equilibrium, which entails optimal risk-sharing, and a "bank run" equilibrium, which makes all agents worse off with respect to the allocation that they would have achieved without the bank intermediation (ie by trading in a competitive market).

An apparent inconsistency of the standard model is that bank runs should not be observed in equilibrium, because no one would deposit when a bank run is expected. However, the equilibrium could be selected contingently on a publicly observable random variable, provided that the probability of a run is small. As Diamond and Dybvig put it:

> "this [variable] could be a bad earnings report, a commonly observed run at some other bank, a negative government forecast, or even a sunspot. It need not be anything fundamental about the bank's condition".

Bank runs have drawn the attention of economists and regulators, because a run on an "illiquid" but solvent bank entails an *inefficient equilibrium*. Different classes of models provide different explanations of the causes of this market failure and prescribe different optimal policies aimed at preventing the problem. In the framework of Diamond and Dybvig, bank runs arise because of a *coordination problem*: depositors withdraw simply because they expect other depositors to withdraw and, by doing so, they trigger a (self-fulfilling) bankruptcy. In such a model, the optimal public policy is the implementation of a deposit insurance scheme financed with money creation. In other models (eg Chari and Jagannathan (1988)) the inefficiency is due to the presence of *informational asymmetries*: depositors are afraid that banks are insolvent, because they do not know the real state of banks' claims (and banks cannot credibly reveal it). Hence, a public policy should aim at reducing the informational asymmetries. In this perspective, Gorton (1985a) shows that a temporary "suspension of convertibility" (of the demand deposit into currency upon demand) could give banks the possibility of informing depositors that continued investment is mutually beneficial. Other authors consider as excessive "the anxiety" that bank executives and regulators have for this phenomenon and for its implications in terms of systemic risk. Hence - also in the light of past experiences in Scotland and New England (the Suffolk System) - they claim that banks should not be regulated at all (see, for instance, the discussions in Fama (1980), Gorton (1985b), Kaufman (1994) and Calomiris and Kahn (1996)).

Bank run models highlight several possible causes of the international transmission of financial shock. First, a currency or a banking crisis in one country may represent the *sunspot variable* that triggers a bank run (or an extensive bank panic) in another country. While this channel is very clear at a

theoretical level, it is very hard - if not impossible - to test it empirically. The crucial issue is that multiple-equilibria models of bank runs and contagion are not reproducible and there are no econometric methodologies to test them.

Second, the *revision of beliefs* following the crisis in another country may be another cause of the transmission. If agents observe widespread episodes of bankruptcy, they may interpret them as a signal of difficulties affecting the world economy. The resulting Bayesian update of the quality of banks' assets can trigger a sequence of withdrawals and failures. Even if the transmission of shocks through this channel is more closely related to the fundamentals, it does not always lead to efficient outcomes. In particular, Chari and Jagannathan (1988) show that agents can (mis)interpret liquidity withdrawals as produced by pessimistic information about banks' assets and their reaction can cause a bank panic.

Finally, contagious bank runs can occur in the presence of *asymmetric information*. In a recent model of bank panics, Chen (1999) modifies the standard Diamond and Dybvig framework by assuming that some depositors are better informed about the value of a bank's assets. Informed depositors enjoy an advantage, since they can withdraw earlier in bad circumstances in which the bank cannot fully repay all depositors. Uninformed depositors therefore have an incentive to respond to other sources of information, before the value of the bank's assets is revealed. Failures of other banks, interpreted as a signal of worldwide (or regional) difficulties, can be one such information source. Even if the information contained in bank failures is very noisy, uninformed depositors may still respond to it and withdraw. Moreover, informed agents, knowing that uninformed depositors withdraw early, can be forced to withdraw early too, even before they receive more precise signals about the asset. In this way, a single bankruptcy can easily trigger a contagious bank panic.

3.2.2   Structural bank runs

The literature on bank runs has produced interesting developments of the original Diamond and Dybvig model where a unique equilibrium emerges. In particular, Postlewaite and Vives (1987) have presented a framework in which there is a unique equilibrium that entails a positive probability of a bank run. In their model there is no exogenous event on which agents condition their behaviour and, at the same time, there are *no* equilibria without the possibility of bank runs. An important feature of this kind of model is the possibility of making some comparative statics, relating the probability of a run to the characteristics of the economy.

Building on a variation of the Postlewaite and Vives model, Goldfajn and Valdes (1997) focus on the role of banks as intermediaries between foreign investors and domestic enterprises. The banking system typically offers foreign investors assets with a shorter maturity, which attract *large capital inflows*. This intermediation has two main consequences: it results in larger movements of capital and, at the same time, it increases the risk of sudden reversals of flows. The effects of internal or external shocks are, in fact, amplified by the action of the domestic banking system and propagated to the rest of the economy. When a shock hits the economy (eg a negative productivity shock or a rise in the international interest rates), risk-averse foreign investors - by virtue of the shorter maturity of their assets - withdraw their funds. Clearly, in this framework, the banking system increases the vulnerability of the country to contagion: shocks (like a currency crisis abroad), which without intermediation would result only in relatively small capital outflows, can give rise to a disruptive financial crisis. Moreover, assets with shorter maturities imply larger capital inflows and, in turn, a higher probability of a run.[16]

Goldfajn and Valdes extended their analysis by including in the model a central bank and the possibility of a *currency mismatch* between assets and liabilities of the domestic banking system. If domestic banks find it optimal to offer (liquid) foreign currency denominated assets, the mismatch with their (illiquid) domestic currency denominated investments translates into a higher probability of runs. When a run on domestic banks occurs, the impact of capital outflows on official reserves increases the probability of a currency devaluation. Hence, the model not only provides an explanation of the

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[16]   In a related paper - but in a framework with multiple equilibria - Chang and Velasco (1998) have proved that larger capital inflows increase the level of indebtedness of the banking system and, in turn, the vulnerability of the country to a bank run, triggered by a refusal on the part of the creditors to roll over their loans.

recurrent "boom-bust" cycles of capital flows observed in many emerging markets, but it also presents a consistent framework in which banking and currency crises occur together.

More recently, along the lines of Morris and Shin (2000), Goldstein and Pauzner (2000) have "solved" the coordination problem of Diamond and Dybvig by introducing some incomplete private information. In their "global game", a unique probability of a bank run emerges, which is a function of the characteristics of the demand deposit contract. Goldstein and Pauzner find that offering a higher *short-term interest rate* (ie offering a higher return to agents demanding early withdrawal) makes the bank more vulnerable to a run. Hence, internal or external shocks that have an impact on short-term interest rates make the occurrence of a financial crisis more likely.

Finally, contagion may be due to the presence of an *international interbank market*. To the extent that interbank loans are neither collateralised nor insured against, a bank failure may generate a chain of subsequent failures. On the one hand, an international interbank market - likewise national interbank markets - promotes efficient financial management,[17] and allows single banks' troubles to be limited. For instance, when a bank is affected by an idiosyncratic liquidity shock, the interbank market provides liquidity assistance. On the other hand, the existence of such a market increases the fragility of the banking system as a whole, since it cannot provide enough liquidity when the entire sector comes under pressure.

Freixas et al (1999b) consider banks facing uncertain liquidity needs. Long-term investment opportunities make it costly for banks to maintain liquid reserves. Thus, an interbank credit market where banks can obtain liquidity allows the reduction of the opportunity cost of maintaining liquid reserves. However, in the presence of illiquid investments, international interbank linkages expose the system to the possibility of a coordination failure, even if all banks are solvent. For instance, a liquidity shock in a foreign country may lead home depositors to believe that home banks will provide their liquidity to that country; the best response to such a belief is to withdraw home deposits, thereby generating a bank run at home. In a related paper, Allen and Gale (2000) show that contagion due to liquidity shocks depends on the degrees of completeness of the interbank linkages. When a region of the world is hit by a liquidity shock and the world demand for liquidity is larger than the world supply, international interbank linkages may propagate the shock to other regions. The consequences of such contagion turn out to be very strong if the interbank market is *incomplete* (ie each region is connected only with few other regions) and are attenuated if the market is *complete* (each region is connected with all the other regions). Finally, Kiyotaki and Moore (1997) developed a theoretical model of "credit chains" in which shocks are amplified and transmitted through a network of firms which borrow from, and lend to, each other. In such a network, temporary liquidity shocks to some firms may cause a chain reaction in which other firms get into financial difficulties.

3.3   Moral hazard

In order to reduce the risk of bank runs, many countries have implemented explicit insurance schemes for deposits. Even in the absence of explicit insurance, international investors may believe that their deposits and loans in some emerging economies are de facto publicly insured. As stressed by Diaz-Alejandro (1985), in many cases the public expects policymakers to intervene and save depositors and other creditors from losses when financial intermediaries run into trouble. Warnings that this kind of intervention will not be provided may simply appear to lack credibility, as expectations of a bailout are strengthened by past episodes of capital injections into the banking system.

Like any form of insurance, public guarantees on deposits create moral hazard. Moral hazard arises when the provision of guarantees modifies the incentive for the insured party to take preventive actions, increasing the probability of the occurrence of the event being insured against. In particular, moral hazard potentially modifies both the behaviour of international investors and the decisions of bank managers. First, the existence of explicit or implicit insurance for deposits and loans may induce a large amount of capital inflows. At the same time, it reduces the incentives of international investors to monitor the behaviour and the performance of the banks to which they are lending. Second, the possibility that the official sector will provide capital even in case of serious financial difficulties encourages bank managers and shareholders to take additional risks, so as to maximise the subsidy

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[17]   In particular, the decentralised operation of interbank lending facilitates *peer monitoring* (Rochet and Tirole (1996)).

implicit in such a rescue. In the case of negative shocks hitting the economy and reducing investment profitability, bank managers may not be more cautious in planning their investments. On the contrary, they may start to finance very risky projects in an attempt to recover their losses *gambling for redemption*.

Corsetti et al (1999) propose a model to explain the role of moral hazard in the unfolding of the Asian financial crisis. Their work focuses on moral hazard as the common source of overinvestment, excessive external borrowing and current account deficit.[18] Financial intermediation played a key role in channelling funds towards projects that were quite unprofitable from a social point of view. Because of moral hazard, national banks borrowed excessively from abroad and lent excessively at home. The production plans and strategies of the corporate sector largely overlooked the costs and riskiness of investment projects. Underlying this overlending syndrome may have been the presumption that short-term interbank cross-border liabilities would be effectively guaranteed either by direct government intervention in favour of international debtors, or by an indirect bailout through IMF programmes. To the extent that foreign creditors were willing to lend against future implicit bailout revenue, unprofitable projects and cash shortfalls were refinanced through external borrowing. This process, known as *evergreening*, translated into an unsustainable path of current account deficits, leading to the overall fragility of the system and to a significant vulnerability to shocks.

While Corsetti et al (1999) provide a theoretical framework consistent with the events observed in each Asian country hit by the crisis, their model does not explain why all the countries were hit at the same time. One possible explanation is that behaviours that arise because of moral hazard can be highly contagious. Moral hazard is, in fact, inherently forward-looking: a particular episode may create moral hazard only to the extent that it influences expectations of how a similar situation will be dealt with in the future. Hence, if foreign creditors make losses in a country where the public authorities were supposed to grant deposits and loans, they may also stop their investments in countries with a similar financial system. Note that the effects of moral hazard on bank managers and shareholders are likely to be negligible in countries with a well designed and effective system of prudential regulation and supervision. If a banking crisis in an emerging market economy reveals information about the weakness of banking supervision in other countries, banking and currency crises are likely to occur in the latter countries.

4.   Empirical literature

Following the recent episodes of currency and banking crises, the empirical approach to the analysis of financial distress, as well as the theoretical literature, have been witnessing renewed interest. As regards the role of the banking system, the empirical literature has focused on four main issues:

(i)   the relationship between banking and currency crises;

(ii)   the presence of a common lender in regional financial crises;

(iii)   the occurrence of bank runs and the causes of banking crises;

(iv)   moral hazard arising from the implementation of explicit deposit insurance schemes.

As for the first point, several authors (Kaminsky and Reinhart (1999 and 2000); Miller (1998); Van Rijckeghem and Weder (1999)) highlighted a common pattern in the unfolding of events. After a period of financial liberalisation and growth, a country faced with a recession (caused by a worsening of the terms of trade, by an overvalued exchange rate or by an increase in the cost of credit) is likely to experience banking problems. As the banks' situation worsens, the balance of payments shows growing imbalances and the currency is attacked by speculators. Eventually, the collapse of the exchange rate deepens the banking crisis, triggering a vicious spiral.

Kaminsky and Reinhart (1999) report evidence of 26 banking crises and 76 currency crises in the last three decades. While during the 1970s there were only three banking crises, reflecting the highly regulated nature of financial markets during those years, in the 1980s and 1990s the number of

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[18]   For explanations of the "overborrowing syndrome", see also McKinnon and Pill (1996) and Giannetti (2000).

banking crises per year sharply increased, reaching an average of 1.44 per annum, up from 0.30 in the earlier decade. As the currency crisis episodes were almost constant over the period, it is possible to state that the twin crises phenomenon is a relatively recent one. Actually, in the 1970s only a single "twin episode" occurred (Argentina in 1977), whilst in more recent years the number of twin crises increased to 18. Moreover, in the latter period, only in five cases was a banking crisis not entwined with a currency crisis. Thus, knowing that a banking crisis is under way definitely helps to predict a future currency crisis.

In a later paper, Kaminsky and Reinhart (2000) highlight the role of indebtedness to a common source of funding as a source of vulnerability. They divide a sample of 20 countries into three different partitions and show that belonging to the same common lender cluster provides a better explanation of crisis transmission than other kinds of clustering. The first partition is dictated by *geographical closeness*, the second by *trade linkages* (bilateral and third-party) and the third by the *source of funding*. The authors report two important findings: (i) the probability of a currency crisis increases non-linearly with the number of crisis economies in the same cluster, in all three kinds of partition; (ii) knowing that there is a crisis in a country belonging to the same common lender group has a higher predictive power than knowing that the country belongs to the same trade cluster or to the same geographical cluster.

Although the "geographical" and "common lender" partitions are very similar, the authors report significant differences in the results. For instance, when 50% of the economies in a cluster are already experiencing a crisis, the probability of a crisis in an economy belonging to the same "common lender" cluster is 80% while the probability of a crisis in an economy belonging to the same "geographical" cluster is 50% (the unconditional probability of experiencing a crisis turns out to be only 30%).

Van Rijckeghem and Weder (1999) also focus on the relevance of the common source of funding. They find that there was a common lender in all recent bouts of international financial turmoil: the United States in Latin America in 1994-95, Japan in Southeast Asia in 1997 and a small group of European countries (Germany in particular) vis-à-vis transition economies during the 1998 Russian crisis. Starting from a "ground zero" country, defined as the economy where a currency crisis first occurred, they studied similarities among crisis economies with respect to international credit institutions.[19] The three "ground zero" countries are: Mexico for the *tequila crisis*, Thailand for the *Asian flu* and Russia for the *Russian virus*. Their estimates show that the structure of indebtedness is the most important factor in transmitting financial shock across countries. All the economies that experienced financial turmoil after the collapse of the ground zero economy had a liabilities structure similar to that of the starting country. Hence, the competition for funds is significantly associated with a higher probability of contagion. However, since the "infected" economies also had similar trade linkages with the ground zero economy, it is difficult to separate the two effects.

A different procedure is implemented by Caramazza et al (2000). They estimate a panel probit model in which one explanatory variable takes into account the source of financing. The common creditor in each of the major crises is identified as the country that lent the most to the first economy experiencing a speculative attack. Moreover, they consider the weight of the liabilities from the point of view of the lender. Both variables are significantly higher in the crisis economies than in the non-crisis ones. On average, the weight of crisis countries in the assets of the common lender is about 10 percentage points higher than the weight of unaffected economies, whereas the weight of the common lender in the liabilities of crisis countries is about 5 percentage points higher than its weight in the liabilities of unaffected economies.

As regards the causes of banking crises, we have already discussed in Section 2 that, in the last 30 years, besides a few anecdotal episodes, bank panics have been only a symptom of the banks' weaknesses, rather than the cause. Although there is not yet a unanimous consensus on the causes of banking crises, in most countries crises have taken place following a rise in the share of non-performing loans or other "asset-related" problems. For instance, Lindgren et al (1996) find that banking crises are mainly related to the fluctuations in the conditions of the real sector due to the business cycle. In the onset of a banking crisis, in fact, many countries have experienced a recession, large shifts in terms of trade and other economic shocks, or important non-economic events with an

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[19] With respect to the index proposed in Section 2, the Van Rijckeghem-Weder indicator has a major drawback: it can be constructed only ex post, namely, when the crisis has already hit at least one economy ("ground zero" country, in their words).

adverse economic impact. Generally, these macroeconomic factors have contributed to a further deterioration of an already weak financial system, characterised by low profitability, a large debt, low levels of cash and capital relative to assets and a high responsiveness to changes in domestic or foreign interest rates.

While the apparent irrelevance of bank runs in the most recent period might be due to the worldwide diffusion of deposit insurance schemes (see stylised fact 4, in Section 2), according to many authors even at the beginning of the century most banking panics did not show the characteristics of random events, like equilibria caused by agents' self-fulfilling beliefs, possibly unrelated to the real economy. Serious problems on the liabilities side of banks (eg strong declines in total deposits) have rarely occurred in US history and have been mainly concentrated in two periods: 1893 and 1930-33. However, such problems were often accompanied by a deteriorating macroeconomic outlook, which complicates the task of assessing the direction of causality.

Even during widespread episodes of contagion among banking institutions, it is difficult to find evidence of panics propagating because of self-fulfilling beliefs. An influential study by Gorton (1988) examines the seven panics which occurred during the US National Banking Era (1863-1914), when deposit insurance had still to be adopted by the United States. The results of his analysis are consistent with the view that such panics were systematic responses by depositors to a changing perception of risk based on the arrival of new information, rather than random events. Also Kaufman (1994), in his review of the episodes of bank contagion, argues that strong shocks at one bank or group of banks did not spill over randomly to other banks. With only rare exceptions, empirical studies focusing on equity returns on banks in the United States from 1970 to 1990 report strong evidence that contagion occurred only for the banks which were financially interconnected with the initially affected bank. For instance, after the failure of the "perceived" state-insured thrift institutions in Ohio and Maryland in 1985, depositors not only were able to differentiate between federally insured and federally non-insured institutions, but also correctly differentiated between "perceived" insured and "perceived" uninsured institutions.

The relationship between bank stability and moral hazard arising from the adoption of deposit insurance schemes is analysed by Demirgüç-Kunt and Detragiache (1998 and 2000) in two recent papers. They use a multivariate logit econometric model in which the dependent variable is a banking crisis dummy and they establish that an episode, in order to be considered a fully-fledged crisis, must meet at least one of the following conditions: (i) the ratio of non-performing assets to total assets in the banking system exceeded 10%; (ii) the cost of the rescue operation was at least 2% of GDP; (iii) banking sector problems resulted in a large-scale nationalisation of banks; (iv) extensive bank runs took place or emergency measures such as deposit freezes, prolonged bank holidays, or generalised deposit guarantees were enacted by the government in response to the crisis.

When at least one of the above conditions holds, the problem is interpreted as systemic in nature and regarding the whole banking sector. Over the period 1980-94, 31 episodes of systemic crisis are identified by the authors: 23 took place in developing countries and eight in advanced economies. In their first work, the econometric analysis shows that banking crises tend to be more likely when the macroeconomic environment is weak (ie characterised by slow GDP growth, high interest rates and growing inflation), when an explicit deposit insurance scheme is present and when the legal system is not effective in enforcing prudential supervision of the banking system. Moreover, the authors report some evidence that banking problems are more likely when a larger share of credit goes to the private sector and when the system is vulnerable to sudden capital outflows.

In the most recent paper Demirgüç-Kunt and Detragiache investigate the characteristics of deposit insurance schemes which are relevant in generating moral hazard. Their statistical analysis shows that such explicit deposit insurance schemes are, on average, detrimental to the stability of the banking system and that their negative impact tends to be stronger when the coverage offered to depositors is large and the scheme is funded and run by the government.

Many recent papers have broadly analysed the causes of banking crises in the past decade in both developed and developing countries. There are case studies on Mexico (González-Hermosillo et al (1997)), Finland (Pazarbasioglu (1997)), Venezuela (Herrero (1999)), Asian countries (Hardy and Pazarbasioglu (1998)) and many others. Furthermore, there are papers that focus on particular aspects of the banking system like liquidity (Vlaar (1999)) or the relationship between stock price crashes and banking crises (Vila (1999)).

Table 4

Significant explanatory variables in empirical works

Paper	Type of crisis	Bank-specific variables	Macroeconomic indicators
Caramazza, Ricci and Salgado (2000)	Currency	Bank lending maturity Reserve adequacy Common lender	GDP growth Current account balance Real exchange rate M2/international reserves
Demirgüç-Kunt and Detragiache (1998 and 2000)	Banking	Credit to private sector Deposit insurance	GDP growth GDP per capita M2/reserves Real interest rate Inflation
González, Pazarbasioglu and Billings (1997)	Mexico (1994-95)	Non-performing loans/total loans Non-securitised loans/total loans Total loans/GDP Deposit fund/non-performing loans	Real interest rate Nominal exchange rate
Hardy and Pazarbasioglu (1998)	Banking	Deposit liabilities Credit to private sector Foreign gross liabilities	GDP growth Inflation Real interest rate Real exchange rate Import growth
Herrero (1999)	Venezuela (1995)	Capital adequacy ratio Return on assets/total assets Operational costs/capital	GDP growth Real interest rate
Kaminsky (1999)	Currency	Banking crisis	Exports Real exchange rate Stock prices World real interest rate
	Banking	Deposit demand	M2 Real exchange rate Stock prices Foreign debt
Kaminsky and Reinhart (1999 and 2000)	Currency	Common lender	Asset return correlation Trade linkages (bilateral and third-party) Financial liberalisation
Pazarbasioglu (1997)	Finland (1991-92)	Lending rate Deposit rate Credit to business sector	GDP growth Share price index Inflation Expected investment
Van Rijckeghem and Weder (1999)	Currency	Common lender	Trade linkages
Vlaar (1999)	Currency	Short-term debt/reserves Short-term foreign debt/total foreign debt	Inflation International reserves Nominal exchange rate Real effective exchange rate M2

A summary of the variables that have been found to be statistically significant - in a selection of 10 recent papers - in triggering a financial crisis is offered in Table 4. Despite the differences in the statistical methods used and in both the dependent and the control variables considered, the table shows that many works have found the same significant indicators.

The first column of the table describes the kind of crisis considered in the study: when the paper deals with a sample of countries, the column shows whether the episode examined is a banking crisis or a currency crisis; when it focuses on a financial crisis in a single country, the period under investigation is reported. The second and third columns list the significant explanatory variables, divided into bank-specific and macroeconomic variables. Among the bank-specific indicators, liquidity, capital adequacy ratios and a common lender dummy are the most frequent significant variables. With regard to the macroeconomic indicators, GDP growth, inflation and trade linkages appear to improve significantly the prediction of financial crises.

5. Conclusions

The paper identifies three main channels for the international transmission of financial shocks through the banking system. The first channel hinges on the specific lending activity of banks and is connected with the value of collateral and capital adequacy requirements. When the same institution is the main source of funding for several countries, the increase in non-performing loans following a financial crisis in one of the borrowing economies may induce the common lender to require an early repayment of its outstanding credits elsewhere. Similarly, the collapse of the value of debtors' collateral may worsen their creditworthiness and negatively affect the confidence of international lenders.

The second transmission channel is connected to the function of transforming asset maturities, which leaves banks vulnerable to runs. The indeterminacy of equilibria in bank run models gives rise to two different classes of runs. First, the change in the information set due to a crisis in a foreign country may lead depositors in other countries to switch from a good to a bad equilibrium (sunspot) or to revise their views about the quality of other banks' assets (wake-up call). Second, the probability of a bank run can be related to the structure of the economy. In particular, the probability of a banking crisis increases with the share of foreign currency denominated debt and the level of domestic and international interest rates and decreases with the maturity of capital inflows. Moreover, in globally integrated financial markets, banks from different economies may form a network of firms (credit chain) through which problems affecting a specific bank from a single country can be transmitted internationally.

Financial shocks can also spread because of moral hazard. The presence of implicit or explicit insurance schemes, confidence in international rescue packages or, similarly, the belief that some borrowers are "too big to fail" may provoke excessive capital inflows that banks eventually channel towards risky or unprofitable plans. A banking crisis in a country characterised by such a system of guarantees may undermine the confidence of international investors in the reliability of similar systems, leading to large capital outflows and, eventually, a financial crisis in other countries.

The stylised facts presented in the paper show that the presence of a common lender characterised most of the countries involved in the tequila crisis and in the Asian flu. Moreover, preliminary empirical studies reviewed in our work find that the probability of a currency crisis increases significantly in the presence of a unique source of funding. Thus, a set of indicators of the vulnerability of the financial system should take into account the level of indebtedness vis-à-vis the same lender. A possible indicator - proposed in the paper - suggests that vulnerability to contagion through this channel has sharply decreased after the two recent crises of the 1990s, reflecting a higher degree of diversification of the sources of funding of developing countries and a reduced level of concentration of loans from the main lenders. A statistical analysis of the predictive power of this kind of indicator and its contribution to more traditional sets of variables signalling the fragility of the financial system is beyond the scope of the present work. The empirical evidence reported so far is, however, very promising.

Finally, both stylised facts and many case studies reported above agree on the view that most banking crises - especially in recent years - have not been associated with bank runs. The clear absence of problems on the liabilities side of banks' balance sheets might be due to the widespread diffusion of explicit deposit insurance schemes. As observed, the number of explicit guarantees on deposits has escalated during the last 20 years. Whilst guarantees might have been successful in curbing the

occurrence of bank runs, they might also have induced excessive risk-taking on the part of both international investors and domestic banks. In fact, empirical models have found that the very presence of public guarantees is a significant factor of risk. Hence, this evidence highlights the importance of an efficiently designed insurance scheme and of effective supervision of the banking system. Moreover, as noted in the paper, since industrial and emerging countries are differently affected by external shocks, policy instruments should be accurately tailored to the level of development of the credit market.

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