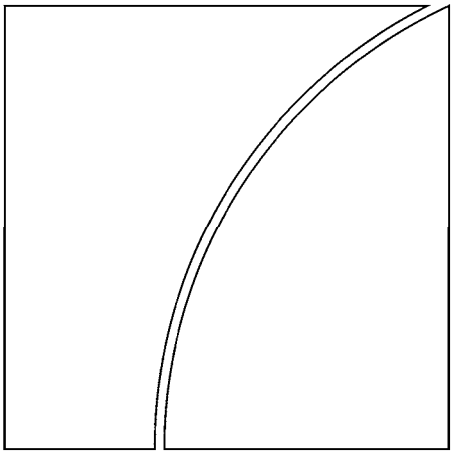
Committee on the Global Financial System



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Funding patterns and liquidity management of internationally active banks

Report submitted by a Study Group established by the Committee on the Global Financial System

This Study Group was chaired by Mário Mesquita of the Central Bank of Brazil

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Preface

In June 2009, the Committee on the Global Financial System (CGFS) held a series of roundtables with private sector participants to discuss the drivers and implications of the sharp decline in international banking activity since the intensification of the financial crisis in the second half of 2008. These discussions suggested that the severe funding strains during this episode might lead to significant changes in the operations of international banks, especially with respect to funding approaches and liquidity management.

In September 2009, the CGFS followed up on this initial exploration by launching a project to investigate a range of short- and longer-term issues pertaining to changes in the organisation of international banking in response to the crisis. The report on funding patterns and liquidity management of internationally active banks is part of this project. It was prepared by a Study Group established by the CGFS which brought together representatives from 16 central banks under the chairmanship of Mário Mesquita of the Central Bank of Brazil.

The report paints a nuanced picture of changes in funding practices and liquidity management of international banks in response to the crisis, drawing input from Study Group members as well as from roundtable discussions and bilateral interviews conducted with private banks. It complements CGFS Report 37 on the functioning and resilience of cross-border funding markets, published in March 2010.

Following the discussion of an initial draft by the CGFS in March 2010, the revised report was presented to central bank Governors at the Global Economy Meeting in May 2010, where it also received endorsement for publication. We hope that this report will inform the current debate on changes in international banking in response to the global financial crisis.

Donald L Kohn

Chairman, Committee on the Global Financial System
Vice Chairman, Board of Governors of the Federal Reserve System

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Executive summary

The risks and complexities associated with funding and liquidity management of international banks became apparent during the global financial crisis. As liquidity in major bank funding and FX swap markets evaporated, sizeable maturity mismatches across currencies added to balance sheet pressure on internationally active banks. Partly as a result, international banking activity declined sharply in late 2008.

Against this backdrop, the present report, prepared by a Study Group chaired by Mário Mesquita (Central Bank of Brazil), investigates changes in funding and liquidity management of international banks in response to the crisis. It also presents the Group's preliminary assessment of possible consequences of greater decentralisation in funding and liquidity management for the efficiency and resilience of financial systems. The report draws on roundtable discussions and bilateral interviews with private banks conducted by Study Group members.

Funding and liquidity management practices of international banks are diverse and cover a whole spectrum between centralised and decentralised operations. Intermediate cases, where some degree of multinational funding is combined/coordinated with centralised liquidity management, are common. There are good reasons for this diversity, ranging from history, cost efficiencies, risk appetite, the cost/risk trade-off, the asset mix, management experience, and the presence of global imbalances, local currencies and regulation. Numerous regional and institutional factors at play call for a nuanced assessment of the overall balance and policy implications.

In discussions with the Study Group, banks generally defended their practices and policies, and were critical of aspects of ongoing or expected regulatory initiatives. Nevertheless, the underlying picture is of change, albeit partial and heterogeneous across institutions. In particular, after the global financial crisis, international banks seem inclined to marginally and gradually increase local funding of local assets, rebalancing rather than completely changing their funding practices. On the other hand, the crisis seems to have led international banks to increase centralisation of liquidity management, through tighter monitoring of liquid reserves and short-term liabilities at headquarters.

With its disproportionate effect on international wholesale markets, the crisis highlighted the advantages of stable retail funding, which helped some international banks with decentralised funding structures weather the crisis relatively well. However, even international banks with decentralised structures acknowledge that reputational risks could trigger intragroup contagion in a crisis scenario. In this sense, the diversity in existing business models, with a mix of decentralised and centralised institutions, is itself likely to be a source of systemic resilience, provided the associated funding models rest on sufficient diversification.

Changes in international banks' liquidity management and funding could, however, become more comprehensive and come about faster if pushed by regulation. Legal or regulatory initiatives that move all banks in one direction could erode the supposed benefits when banks follow the same model – for instance, increased competition might render retail deposits less stable as a source of funding. It should also be noted that increased decentralisation will probably put a greater burden on local central bank liquidity provision in times of crisis. Whereas foreign parent banks' credible commitment to support local operations and ability to transfer funds can alleviate such pressure, this may come at the cost of weakening the parent.

The impact of new regulation encouraging decentralisation depends on the extent to which host country regulators implement the regulation and, in particular, whether they plan to do so with more stringent parameters and/or additional requirements than those laid down by international standards. A proliferation of host country regulation – not unlikely given that, as

shown by the crisis, the ultimate costs of bank failure lie with national authorities – could imply that global banking groups would have to decentralise important aspects of their liquidity management, hold more liquid assets in more locations, rein in currency and maturity mismatches, and reduce their reliance on intragroup funding (or restructure specialised operations).

Further decentralisation would make banks and financial systems more resilient to certain kinds of shocks, but would also entail additional costs. New regulation should avoid unduly constraining intragroup flows, which are crucial for the viability of more centralised funding and liquidity management approaches, and proved useful in crisis management. When applied to groups that find significant operational advantages through inter-office funding flows, highly restrictive regulation at the local level could impair an important channel of intermediation. The value of shifting liquidity across jurisdictions not only accrues to banks, but also plays an important role in intermediating longer-term structural imbalances inherent in the external positions of countries at different stages of economic and institutional development. Intermediating capital flows between surplus and deficit regions is a legitimate, welfare-enhancing role for international banks to play, and one that inevitably comes with a degree of cross-currency funding and reliance on swap markets.

1. Introduction

The financial crisis put many international banks under severe funding stress. Banks were confronted with dislocations in numerous cross-border funding and FX swap markets, including those that are highly liquid under normal conditions. Some funding strains led international banks to put greater emphasis on home office funding needs and on funding foreign credit extension in local markets. Mounting credit losses of parent banks led to pressure to shed risky assets in the second half of 2008. Partly in response to these developments, and in some cases possibly reinforced by a "home bias" created by government intervention, cross-border banking activity declined sharply.

This contraction in international banking activity resulted in a considerable tightening of financial conditions in many host countries.[1] Intragroup transfers of funds to parent institutions in some cases added to tensions in local funding markets. There were signs that credit supply constraints, for instance in trade finance, exacerbated the economic downturn.

Against this backdrop, the Committee on the Global Financial System (CGFS) held regional roundtables with the private sector to discuss the drivers and implications of the sharp decline in international banking activity since the second half of 2008. In September 2009, the CGFS set up a project to examine a range of short- and longer-term issues related to the organisation of international banking. This work follows earlier CGFS analysis of structural changes in international banking.[2] A first report, on the functioning and resilience of cross-border funding markets, was published in March 2010 (www.bis.org/publ/cgfs37.pdf). Another group is exploring possible longer-term implications of the crisis for the organisation of international banking.

The present report, prepared by a Study Group chaired by Mário Mesquita (Central Bank of Brazil), investigates changes in the funding and liquidity management of international banks in response to the crisis. It also presents the Group's preliminary assessment of possible consequences of greater decentralisation in funding and liquidity management for the efficiency and resilience of financial systems. The report draws on roundtable discussions and bilateral interviews with private banks conducted by Study Group members.[3]

The report is organised as follows. Section 2 defines concepts relevant for the discussion of the geographical organisation of bank funding and liquidity management. Section 3 characterises the structure of banks' global operations across home and host countries, and the associated geographical funding patterns. Section 4 discusses industry and regulatory developments in response to the crisis and their impact on bank funding patterns and liquidity management. Section 5 presents preliminary implications for the efficiency and resilience of financial systems, and sketches the likely macroeconomic impact, and Section 6 concludes.

2. Concepts and approaches

The management of risks at internationally active banks is more complex than that at local banks. Several interrelated risks are important. Since assets and liabilities are denominated in several currencies, direct and indirect currency mismatches are generated. These are often covered by short-duration hedges which must be rolled over frequently. Differences in the

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1 Examples of the liquidity strains experienced in domestic funding markets and foreign exchange markets in emerging market economies are documented in CGFS (2009).

2 See CGFS (2004, 2005).

3 See Annex 2 for the list of Study Group members and Annex 3 for banking industry participation.

duration of assets and liabilities in each currency also create distinct interest rate exposures for each currency. Moreover, banks' international operations across jurisdictions and time zones entail a broad range of legal and operational risks. In view of the differences in the usage of terms and definitions, even among banks, it is useful to begin with a short clarification of concepts. This section defines what is understood by the terms "funding", "liquidity management", "(de-)centralisation" and "diversification" which are used in this report.

2.1. Funding and liquidity management

Funding can be defined as the sourcing of liabilities. Funding decisions are usually, but not exclusively, taken in view of actual or planned changes in a financial institution's assets. The funding strategy sets out how a bank intends to remain fully funded at the minimum cost consistent with its risk appetite. Such a strategy must balance cost efficiency and stability. A strategy which targets a broader funding base may entail higher operating and funding costs, but through diversity provides more stable, reliable funding. One which focuses efforts on generating home currency funding may prove more reliable in adverse times but entail higher costs in normal markets. The balance of cost and benefit will reflect a range of factors (see Section 3). Accordingly, ***funding risk*** essentially refers to a bank's (in-)ability to raise funds in the desired currencies on an ongoing basis.

Liquidity management is the management of cash flows across an institution's balance sheet (and possibly across counterparties and locations). It involves the control of maturity/currency mismatches and the management of liquid asset holdings. A bank's liquidity management strategy sets out limits on such mismatches and the level of liquid assets to be retained to ensure that the bank remains able to meet funding obligations with immediacy across currencies and locations, while still reflecting the bank's preferred balance of costs (eg of acquiring term liabilities or holding low-yielding liquid assets) and risks (associated with running large maturity or currency mismatches). Accordingly, ***liquidity risk*** refers to a bank's (in-)ability to raise sufficient funds in the right currency and location to finance cash outflows at any given point in time.

Funding and liquidity management are interrelated. Virtually every transaction has implications for a bank's funding needs and, more immediately, for its liquidity management. The maturity transformation role of banks renders them intrinsically vulnerable to both institution-specific and market-related cash flow risks. The likelihood of an unexpected cash-flow shock occurring, and a bank's ability to cope with it, will reflect not only the adequacy of its funding and liquidity management strategies, but also their coherence under stressed conditions.

A bank's funding strategy will condition liquidity management needs. Hence, the risks embedded in the chosen funding strategy will translate into risks that liquidity management will have to address. Failure to properly manage funding risk may suddenly manifest itself as a liquidity problem, should those sources withdraw funding at short notice. Conversely, inadequate liquidity risk management may place unmanageable strains on a bank's funding strategy by requiring very large amounts of funding to be raised at short notice.

2.2. Centralisation, decentralisation and diversification

Decentralisation refers to the degree of financial autonomy of a bank's branches and subsidiaries relative to the central treasury of the banking group. The fully decentralised model devolves the responsibility of funding and liquidity management to the individual local entities which, in the extreme, act as a collection of autonomous banks under common ownership. A decentralised approach sees local entities plan and raise funding for their activities and manage the associated liquidity risks. They source funding in host countries and meet any shortfalls autonomously by accessing local sources in the host country; very little surplus funding is redistributed within the group, and the central treasury has only a very limited role. In practice, this model tends to be implemented through locally incorporated subsidiaries which are

independently capitalised under an own legal entity, as is often required for deposit insurance coverage. The model also tends to be associated with a strong local presence and the sourcing of funds from residents. As a consequence, there is no structural reliance on intragroup funding.

At the other end of the spectrum, the fully ***centralised*** model concentrates funding and liquidity management at the central treasury on the group level. The central treasury distributes funding around the organisation, monitors compliance with strict centrally mandated mismatch limits and manages pools of liquid assets. The bank's foreign operations are not expected to fund their own balance sheets independently of the rest of the group. The centralised model is associated with extensive intragroup transfers (internal markets).

In principle, the concept of (de-)centralisation can be applied separately to funding and liquidity management. A model of centralised funding but decentralised liquidity management would see local entities obtaining funding from the central treasury (with any surpluses redistributed or invested via the treasury), perhaps at a predetermined rate, as a means of managing the funding of assets according to ***locally determined*** limits on maturity and currency mismatches and liquid asset requirements. Conversely, local responsibility for determining and executing the funding strategy could coexist with *centrally* mandated mismatch limits and with the central treasury managing liquid assets.

Decentralisation is distinct from ***diversification*** of funding. Decentralisation relates to the internal organisation of a banking group, whereas diversification refers to diversity in funding sources. It is possible that a bank moving towards a decentralised model might thereby diversify its funding sources, especially when relying on local funding across many host countries and ultimate lenders. But the two need not move together. Decentralisation might reduce diversification if financially autonomous subsidiaries were to tap the same source in international markets (eg when financing large projects). Conversely, diversification can also be increased in other ways, especially across currencies, sectors, instruments and maturities.

3. Industry practice and determinants

This section provides evidence on international bank funding models. It first describes the structure of banks' foreign operations from an aggregate global perspective, as observed in the BIS international banking statistics, and covers some of the underlying macroeconomic determinants. The focus then shifts to the individual bank level, to examine the range of models and their microeconomic determinants.

3.1. Broad global patterns

To capture the geographical funding patterns of a banking group, data on the consolidated entity has to be broken down into "local" balance sheets of bank offices (branches or subsidiaries) in each country or jurisdiction. Using the BIS international banking statistics, this breakdown can be constructed for individual banking systems, ie the set of banks headquartered in a particular country.[4]

Graph 1 illustrates how such information can help identify different bank funding models. The left-hand panel shows which banking systems fund their foreign claims primarily at home (rather than abroad), and whether they tend to source funds from residents (local) or from non-

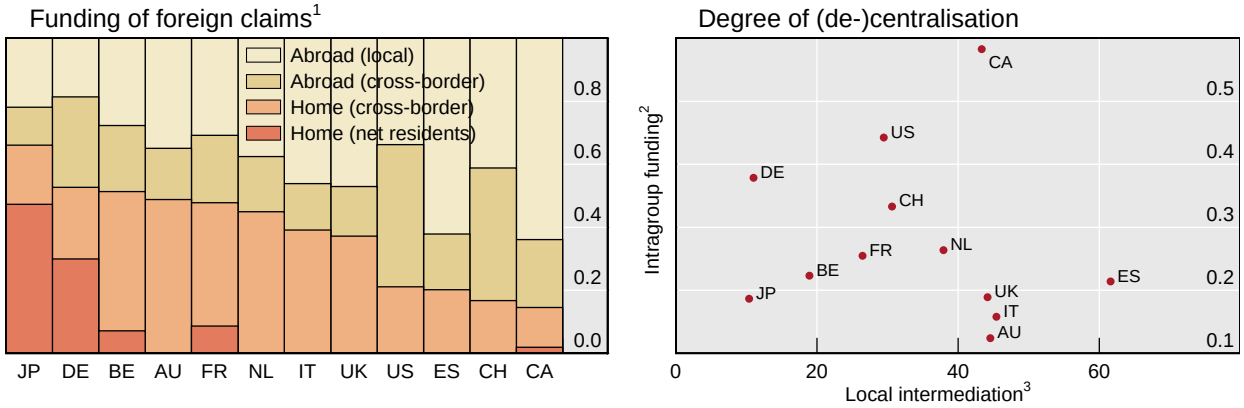
[4] The dataset employed here matches banks' assets and liabilities in the BIS locational banking statistics (reported on a residency basis) with the consolidated banking statistics, to obtain the geographical office information separately for each banking system. See McGuire and von Peter (2009) and McCauley et al (2010) for details.

residents (cross-border). Even these aggregate patterns point to the existence of a broad range of funding models. For instance, Japanese and, to a lesser extent, French and German banks stand out in that they fund most of their foreign activity from their home offices (left-hand panel).[5] Indeed, two thirds of Japanese banks' foreign claims are funded in Japan, mostly by the large domestic deposit base. Accordingly, Japanese banks also book most (80%) of their foreign assets as cross-border transactions out of their Tokyo offices.

Graph 1

Types of bank funding models

Positions at end-Q3 2009



AU = Australia; BE = Belgium; CA = Canada; CH = Switzerland; DE = Germany; ES = Spain; FR = France; JP = Japan; IT = Italy; NL = Netherlands; UK = United Kingdom; US = United States.

[1] For each banking system, the shares of total foreign claims that were funded at the *home* country offices and *abroad*; distinguishes between *local* and *cross-border* liabilities (sourced from non-residents). Abroad (local) = local liabilities, ie liabilities in all currencies vis-à-vis host country residents; abroad (cross-border) = cross-border liabilities booked at foreign branches and subsidiaries; home (cross-border) = cross-border liabilities booked by home country offices; home (net residents) = net liabilities vis-à-vis residents of the home country (in home currency) which equate total foreign assets and liabilities of the home office (positive for banking systems that borrow at home to lend abroad, eg Japanese and German banks). [2] Share of intragroup liabilities in total foreign liabilities; a higher score indicates centralisation. [3] The sum of the minima of local assets and local liabilities across host countries, as a share of total foreign claims; a higher score indicates decentralisation.

Sources: BIS consolidated banking statistics; BIS locational banking statistics by nationality.

At the other end of this spectrum are banking systems that obtain a substantial share of their funding outside their home country. Banks may operate such a *multinational* funding model by borrowing cross-border in various financial centres (light brown bars), as appears to be the case for Swiss and US banks, or through extensive local funding abroad (yellow bars), as in the case of Canadian and Spanish banks.[6] Spanish banks record the largest share of local funding among the major banking systems: at 60% of foreign assets and liabilities, their local operations are large and increasing, reflecting their expansion in Latin America (and in the United Kingdom).

Banks run these global funding operations with different degrees of *centralisation* in their internal organisation. A decentralised funding model is associated mainly with two observable

[5] This is visible in the two lower stacked bars (Graph 1, left-hand panel).

[6] Multinational banks operate substantial foreign branches and subsidiaries in multiple jurisdictions, while banks centred on the home country (or a financial centre) conducting mostly cross-border business can be regarded as international (Jones (1992) and references therein). Using as an indicator the share of funding abroad (Graph 1, left-hand panel) identifies Japanese, German and French banks as international, and US, Spanish and Swiss banks as multinational (McCauley et al (2010)).

characteristics (Graph 1, right-hand panel). First, a limited role of the central treasury in allocating and distributing funds is associated with a *low share of intragroup funding* throughout the banking group. This feature can be observed (on the y-axis) for Australian, Italian, Japanese,[7] Spanish and UK banks. A second characteristic of the decentralised model is that local assets are to a large extent funded locally, rather than through cross-border borrowing (including intragroup funding). The extent of such *local intermediation* is computed here by summing across office locations the minimum of local claims and local liabilities (as a share of foreign claims).[8] By this measure (on the x-axis), Spanish banks are most decentralised, followed by Italian, Australian and UK banks.

The two measures identify different degrees of centralisation across banking systems. A high score on local intermediation sets Spanish banks apart from their Swiss and US counterparts, which also tap funds in multiple locations, but might use those deposits to fund assets held in other jurisdictions. Spanish banks are decentralised in that their foreign subsidiaries raise funds autonomously in each host country to fund local assets; such local intermediation activity accounts for over 60% of Spanish banks' total foreign claims (see also Box 2).[9] By comparison, Swiss banks are more centralised, using offices in Switzerland and in financial centres to source liabilities (eg global wealth management) and redistribute the funds across the group; accordingly, their subsidiaries rely more on cross-border intragroup funding.[10] Extensive intragroup funding also points to a considerable degree of centralisation among German, Canadian and US banks.

3.2. Macroeconomic determinants

The economic environment of host countries influences the way foreign banks operate. The macroeconomic determinants relevant for banks' model of funding and liquidity management include international trade, the presence of multinational firms, financial regulation, the depth of financial markets, external imbalances, currency regimes and capital controls. The importance of these factors is illustrated by two case studies with quite opposite bank funding models (Boxes 1 and 2).

Although banks themselves do not view their models as being driven substantially by macroeconomic factors, such factors help explain some commonalities observed across banks active in a particular country (see also Annex 1). Analysis of the BIS international banking statistics suggests a distinction between four types of host countries:

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[7] The low reliance on intragroup funding among Japanese banks should not be taken as an indication of their decentralisation. International banks, by their nature, tend to be centralised, while multinational banks may be on either side of the spectrum. Japanese banks follow the international model, as they book most of their foreign claims out of Tokyo as cross-border claims directly on unaffiliated entities (without extensive use of foreign subsidiaries).

[8] The measure remains close to zero for banks that source liabilities in one country for use in another (McCauley et al (2010)).

[9] This is also reflected in the close match between the local assets and local liabilities booked by Spanish banks in various Latin American countries (Graph 2.1, Box 2).

[10] Even if a bank's foreign subsidiaries combined raise enough funding for the group as a whole, "deficit subsidiaries" relying on intragroup funding are, by definition, not financially autonomous. The share of intragroup funding among Swiss banks was 40% at end-2007.

Capital-exporting countries send their surplus savings abroad.[11] A large share of these cross-border flows is intermediated through the global banking system, especially in countries where banks traditionally play a major role. For example, banks' cross-border claims accounted for 40–50% of the gross external claims of Japan, Germany, Switzerland and Belgium by end-2007. Banks play an analogous role for ***capital-importing countries*** (eg Spain, Italy, Korea and the Baltic states). In less mature markets, banks often fund local credit with cross-border intragroup transfers from the parent bank (see Box 1). In countries with highly developed capital markets, the role of banks can be less prominent; for example, banks' cross-border liabilities account for only 18% of US external liabilities.

Offshore financial centres (eg the Cayman Islands, Luxembourg and Singapore) constitute a third type of host country/jurisdiction. The volumes of cross-border flows that banks channel through offshore centres stand in no relation to real economic activity (see eg Zoromé (2007)). Any positions vis-à-vis non-banks in offshore centres typically involve non-bank *financial* entities. The opposite profile is observed in countries where banking activity is ***predominantly local*** (eg Mexico, Brazil) for reasons ranging from foreign acquisitions and regulation to the local nature of currencies.

The role of macroeconomic determinants in international bank funding and liquidity management has not been studied in depth. While few articles address bank funding approaches directly, two strands of literature explore the relationship between macroeconomic factors and bank funding approaches. One set of studies shows a relationship between macroeconomic and institutional factors and the form of foreign bank entry. Foreign banks often participate through foreign direct investment in countries with high expected growth in local bank intermediation (CGFS (2005)).[12] Consistent with previous research, Focarelli and Pozzolo (2005) and Turner (2009) find that profit opportunities arising from high expected economic growth and the prospect of competing with relatively less efficient banks appear to drive foreign expansion. This finding is in line with models of foreign bank entry (eg Lehner (2009)). The institutional characteristics of host countries affect the choice between branches and subsidiaries: in Focarelli and Pozzolo's dataset, financial centres attract more branches of foreign banks, while subsidiaries tend to be located where regulatory restrictions on banking activities are lower. Institutional factors also affect the volume of bilateral cross-border flows via the banking system.[13]

A related strand of the literature examines credit expansion among multinational banks and the role of internal markets. De Haas and van Lelyveld (2010) analyse the determinants of credit growth of subsidiaries of multinational banks.[14] Among the macroeconomic determinants, GDP

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[11] This is the logic behind the global saving glut described by Bernanke (2005), who stressed that funds from economies with current account surpluses were attracted to centres with well developed financial markets. Ito and Chinn (2009) study the role of financial development, among other determinants, in the evolution of global imbalances. They show that credit to the private sector and stock market capitalisation appear to be important determinants of current account behaviour. Also, while the size of financial markets induces a decline in the current account balance in industrial countries, the reverse is more often the case for developing countries. Finally, they confirm that a greater degree of financial openness is generally associated with a smaller current account balance in developing countries.

[12] The authors use a database of 260 large banks' foreign branches and subsidiaries in OECD countries.

[13] Using the BIS locational banking statistics, Papaioannou (2009) shows that well functioning institutions are a key driving force for international bank flows, after conditioning on standard gravity factors (distance, GDP, population). The European integration process has also spurred cross-border banking activities between member states (Kalemli-Ozcan et al 2010).

[14] They use a panel dataset on the intragroup ownership structure and the balance sheets of 45 of the largest multinational bank holdings in the world from 18 home countries, with 194 subsidiaries in 46 transition countries for the period 1991–2004. In their estimations, they regress the growth of subsidiary credit against characteristics of the subsidiary and macroeconomic factors in the host and parent countries and the rest of the world.

growth (+), the unemployment rate (–) and inflation (–) were found to be important (the external position of host countries was not examined). The authors also find evidence for the existence of internal capital markets: subsidiaries with financially strong parent banks were able to expand their lending faster and reduced credit less under financial distress.[15] Even though the parental support hypothesis is affirmed only by association (without direct evidence from equity or intragroup flows), this finding suggests that the internal markets characteristic for the centralised multinational banking model can play an essential role (see Box 1).[16] However, when subsidiaries are not standalone operations, they may be affected by adverse developments in other parts of group operating elsewhere.[17]

3.3. Industry evidence and microeconomic determinants[18]

Individual banks show even greater diversity in their approaches to international funding and liquidity management than aggregate data for banking systems suggest. Banks often regard the geographical funding structure not as a choice variable, but as a consequence of their institution's history, which determines the overall business model, which in turn instils a corporate culture and risk attitudes that ultimately translate into the funding approach. For the same reasons, a bank's resilience to funding disruptions may owe more to an inherited conservatism in risk management than to the pursuit of a more or less decentralised model.[19]

At the roundtable and interviews held by the Group, banks indicated that the fully centralised model is rare in practice, as the daily operation of a group's branches and subsidiaries necessitates a minimal degree of independence to manage local cash flows. The same can be said of the fully decentralised model, as there would be little sense in referring to banks under such an approach as a group. Banks mostly adopt intermediate approaches, including what one might call the "coordinated model". This model combines – to different degrees – centralised decision-making and group-wide guidelines on the limits within which local subsidiaries are to access markets and manage liquidity.[20]

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[15] This result contrasts with the finding of Detragiache et al (2008) that credit to the private sector might be lower in countries with higher foreign bank penetration.

[16] In a related paper on internal markets, Cetorelli and Goldberg (2009) show that globalised US banks activate internal capital markets with their overseas affiliates to insulate themselves partially from changes in US liquidity conditions, as measured by various monetary policy indicators (including federal funds and money market rates). By using quarterly information from all US banks filing call reports between 1980 and 2006, this dataset does include intragroup transactions (both equity and debt) of domestic offices with foreign branches and consolidated foreign subsidiaries.

[17] McGuire and Tarashev (2008) find that deterioration in bank health at the group level is associated with a decline in the growth of credit to emerging markets.

[18] This section draws on bilateral interviews with international banks and the industry roundtables organised by the Group (see Annex 3).

[19] The broader lessons of the crisis for risk management are described by the Senior Supervisors Group (2009).

[20] A decentralised funding model therefore does not preclude that a banking group develops a common language and culture with regard to its clients and the market, a point practitioners emphasised in the interviews.

Box 1

Swedish banks in the Baltic states[1]

The banking systems in the Baltic states are dominated by foreign, predominantly Swedish, banks. Up until the recent economic downturn, Swedish banks' expansion in the Baltic countries was underpinned by a highly centralised approach to funding and liquidity management. This box reviews why the Swedish banks opted for this "corner solution" in their operations in the Baltic states, and how this model fared in the wake of the global financial crisis.

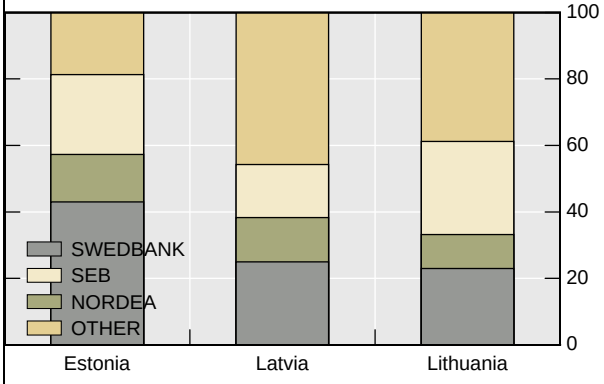
When the three Baltic states (Estonia, Latvia and Lithuania) regained independence, financial markets were opened up, enterprises that had previously been state-owned were privatised and government institutions were rebuilt. The EU entry of the Baltic states in 2004 was followed by consumption and investment booms coupled with rapidly increasing property prices and gross external debt.

A large portion of the credit sustaining the boom was provided by subsidiaries of Swedish banks operating in the Baltic states.[2] In the late 1990s, Swedbank and SEB were among the first foreign banks to enter the Baltic states by buying stakes in local banks with already significant market shares. Through the gradual acquisition of Baltic banks, the Swedish banks became majority shareholders by 2005, making the Baltic banks fully incorporated subsidiaries under the respective parent bank name. Today, the banking sector in the Baltic countries is to a large extent Swedish-owned (Graph 1.1). The funding of the subsidiaries relies heavily on intragroup loans from the parent bank, which constitute the only material source of funding next to local deposits. This is reflected in the high loan-to-deposit ratios of the Baltic banking systems (Graph 1.2).

Graph 1.1

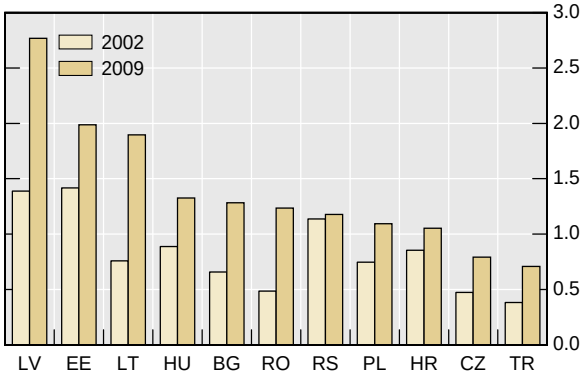
Market shares in domestic lending

In per cent



Graph 1.2

Loan-to-deposit ratios[1]



BG = Bulgaria; CZ = Czech Republic; EE = Estonia; HR = Croatia; HU = Hungary; LT = Lithuania; LV = Latvia; PL = Poland; RO = Romania; RS = Serbia; TR = Turkey.

[1] Private sector loans divided by total deposits in the domestic banking system (short- and long-term); end of period.

Sources: Sveriges Riksbank; IMF, *International Financial Statistics*; bank reports.

Three factors help explain why the Swedish banks opted for a centralised approach to funding and liquidity management in their Baltic operations. The first relates to the macroeconomic preconditions. The rapid economic development in the Baltic states after EU accession followed the pattern of transitional economies catching up with older EU member states. The expectation of permanent income exceeding current income provides a rationale for foreign borrowing and high loan-to-deposit ratios. The development was also encouraged by a modern financial system (inter alia, e-services) and banks' willingness and ability to lend on the back of accommodative global capital markets. The historical ties and geographical closeness made it natural for Swedish banks to expand into the Baltic countries, aided by EU membership.

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[1] This box has been prepared by Martin Johansson of the Sveriges Riksbank.

[2] Three Swedish banks are active in the Baltic states: SEB, Swedbank and Nordea. However, Nordea's operations are carried out through branches rather than subsidiaries, and the bank's presence is smaller than that of the other two. Hence, this note concentrates on SEB and Swedbank.

Moreover, as this region forms part of the economic supply chain, Swedish banks were quick to define the Baltic states as home markets. As the banks entered the Baltic markets as long-run strategic investors, financing them through intragroup lending was seen as the best option.

The second, microeconomic, factor concerns economies of scale and cost efficiency. All three Baltic states are small in terms of both population and GDP. Consequently, the subsidiaries in the Baltic nations are also considered small in international comparisons. There are thus tangible economies of scale in favour of centralising liquidity management and funding. Moreover, standard arguments in favour of centralising liquidity management (eg avoiding trapped pools of liquidity) apply.

Finally, currency stability also played an essential role. All three countries participate in the ERM II in anticipation of introducing the euro and have unilaterally tied their currencies to the euro via either a hard peg (Latvia) or outright currency boards (Estonia and Lithuania). These exchange rate regimes may have encouraged the private sector to borrow in euros, and tilted banks' funding structure towards a centralised model. This allowed the parent banks to pass euros raised in the international capital market on to their subsidiaries without exposing the group to direct currency risk.

Yet these regimes also limit central banks' ability to provide liquidity support. In the absence of deep local markets, any substantial liquidity provision must come from the parent bank. When the Baltic states were exposed to the collapse in domestic demand following the bursting of the property bubble and the global financial crisis, market expectations shifted towards a full-blown crisis. However, even in that extremely adverse environment, parent bank funding remained robust overall.

The high rollover rates can largely be attributed to three factors. First was the Swedish banks' market share and the awareness that cutting credit would exacerbate macroeconomic outcomes and raise bank losses. Internalising the effects of their credit policies helped banks produce a better outcome than a fragmented banking system would have. Second, the outstanding intragroup exposure, in addition to the equity stake, committed the parent banks to supporting their subsidiaries instead of calling loans. Third, the reputational cost of disorderly exit from what was defined as a home market also weighed in favour of maintaining credit supply.

However, intragroup funding, combined with large market shares and strategic ownership, is not a bullet-proof approach to funding subsidiaries. While there are clear advantages, it also carries the risk of contagion between the financial system of the home and host countries; this was particularly the case as the Baltic states entered a severe recession amidst the global financial crisis in late 2008. At that juncture, the Swedish banks' exposures to the Baltic countries quickly became an issue for systemic stability in Sweden (among other factors). Uncertainty regarding potential loan losses in their Baltic operations, coupled with the fear of exchange rate realignments, meant more expensive and scarcer funding for the parent banks. Due to the concentrated and interconnected nature of the Swedish banking system, this effect was felt well beyond the banks with material Baltic exposures (SEB and Swedbank). The banks' exposures to the Baltic states were one of the factors that prompted the Swedish authorities to introduce a series of measures to support the Swedish banking system. These measures, by alleviating funding pressures on the parent banks, were vital for maintaining the supply of credit in the Baltic states.

Box 2

Spanish banks in Latin America[1]

The expansion of Spanish banks in Latin America (and in the EU) has been prominent since the second half of the 1990s, and intensified further in the early 2000s. It proceeded by acquisitions of local banks through the structure of subsidiaries with their own legal status. These subsidiaries work with a high degree of financial autonomy within the guidelines of the group.

In Spain, financial liberalisation culminated with the complete liberalisation of capital flows in February 1992. As a result, competition increased and contributed to a reduction in net interest margins. Later on, the road to the adoption of the euro constituted a new low interest rate environment which further compressed margins. In addition, domestic markets matured (giving rise to overcapacity), and prospects for increasing returns in local business waned. All these factors promoted Spanish banks' international expansion to enlarge their client base and to geographically diversify their business. Latin America turned out to be an attractive destination, owing to: (i) differences in macroeconomic performance, providing diversification benefits (due to negatively correlated economic cycles); (ii) deregulation, permitting entry of foreign banks in local markets; (iii) new business opportunities arising from the privatisation of some public credit institutions; (iv) high potential returns in view of the initial inefficiencies of the domestic banking system; and (v) cultural factors.

Spanish subsidiaries in Latin America initially focused on retail banking business, but shortly afterwards expanded their activities to other areas, notably the management of pension funds. Spanish banks basically replicated the universal banking model adopted in their home country in specific countries in Latin America (Sebastián and Hernansanz (2000)). Thus, they were interested in obtaining effective control of domestic banks that would give them a critical mass in the market (Graph 2.1). This model requires a significant physical presence in order to be competitive in local markets. Private banks chose a subsidiary structure characterised by a high degree of financial autonomy, partly because it fits well with the above-mentioned business model, and partly because it was encouraged by the Bank of Spain and, in some cases, by host regulators.

In the early 2000s, and taking into account the experience gained from the Argentine crisis, the Bank of Spain issued a framework of good practices for the organisation and supervision of Spanish banking groups that had expanded significantly in the international arena. This framework was based on guiding principles in terms of group culture and information management, prudent accounting principles, group solvency and solvency on an individual basis, transparency and clarity with regard to the structure of the group, financial autonomy and control of liquidity. The principle of financial autonomy is currently interpreted broadly to include funding, liquidity and market access. The framework stipulates, within the guidelines and culture of Spanish banking groups, that each subsidiary must be financially independent from the parent and from other institutions in the group, and should implement its own funding and liquidity management autonomously with appropriate mechanisms to meet ordinary needs and with contingency plans for extraordinary circumstances. Any hedging set up to cover the subsidiaries' risks must be obtained in the market, excluding the parent or any other entity in the group as counterparty. In this vein, unless they have a commercial basis, intragroup operations should be limited to exceptional situations, and the prices applied in those cases must be market prices.

Latin American economies weathered the global financial turmoil relatively well until mid-September 2008. When the crisis intensified following the failure of Lehman Brothers, investor confidence with regard to emerging markets dashed the hope of any decoupling of economic developments (Gallego et al (2010)). Conditions remained tense until March 2009 when, driven by highly accommodative monetary policies and large-scale coordinated support measures, global investor sentiment improved and financial markets in the region recovered markedly. However, the need to be cautious and avoid complacency remains, as second-round effects from the crisis (effects on activity and employment) may be still to come.

[1] This box has been prepared by Emiliano González Mota of the Bank of Spain.

Against this background, Spanish banks in the region were not immune from local developments, though they proved to be highly resilient due to their limited exposure to subprime or subprime-related assets and their low reliance on short-term financing and wholesale markets, which were severely impaired by the crisis. The high degree of diversification in funding sources by instrument, market, tenor and issuing entity also contributed to this resilience. The fact that Latin American subsidiaries of Spanish groups were in a surplus position meant that there was no need for intragroup transfers.

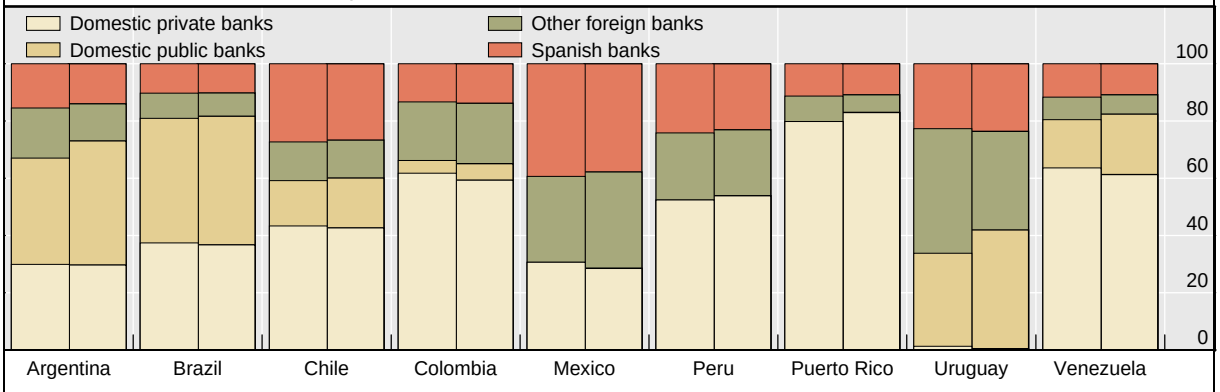
The large Spanish banking groups have not made use of the support measures the Spanish authorities have set up for the banking system in response to the global financial crisis. In fact, their exposure to Latin American countries played no role in the design and implementation of any of these programmes.

Graph 2.1

Spanish banks in Latin America

In per cent

Domestic bank credit and deposits[1]



[1] The stacked bars represent the percentage shares of domestic bank credit (left-hand bars) and domestic deposits (right-hand bars) of the different types of banks shown in the legend.

Individual banks place different emphasis on a core set of factors. Although the banks interviewed by the Study Group were not prepared to quantify or rank them, the most important factors contributing to greater ***centralisation*** were said to be the following:

- ***Coherence:*** Funding and liquidity management can be implemented in a coherent way more easily if both are closely aligned, and for the group as a whole this is more effective if done at the highest level. The banks having adopted the most centralised model also highlight the value of being seen as operating in a consistent manner with pricing and wholesale market activity, as well as of presenting a single brand to the marketplace.[21]

- ***Funding costs and diversification:*** Centralised funding enables a banking group to minimise interest costs by channelling funds from the cheapest source to different parts of the group. Centralisation also helps minimise net funding needs and reduce idle liquid asset holdings across jurisdictions. The ability to redeploy liquid assets across jurisdictions economises on liquidity holdings at the group level, especially if certain flows of liquidity are negatively correlated. Centralisation may also allow banks to diversify their funding sources more effectively as institutions have a comprehensive

[21] The presence of several subsidiaries raising funds on different terms concurrently, for instance, may be perceived by the market as less transparent or as incoherent, especially if it allows participants to identify arbitrage opportunities across the same banking group.

view of the liquidity position and may adopt an optimal funding allocation, in particular in terms of maturity mismatch or instruments.

- ***Economies of scale:*** Global wholesale funding is less costly once a given benchmark size is reached. The centralisation of funding can also avoid duplication of funding programmes. It increases the market value of a bank's name and increases the attractiveness of its desk.
- ***Overhead costs:*** Centralising liquidity and funding management may reduce the global overhead costs of a group – including (local) staff needs – as treasury functions do not need to be established at all foreign branches and subsidiaries. Setting up treasury functions involves both transitional and permanent costs (eg IT systems, premises and the hiring of local staff).

Likewise, private sector participants indicated that they regard the following factors as important reasons for ***decentralisation***:

- ***Diversification of funding sources:*** Decentralised funding tends to increase diversification in funding sources, and subsequently lessens the dependence of the group as a whole on a small set of fund providers. The higher costs that local presence and liquidity holdings might entail were explicitly recognised and accepted by management as a cost worth bearing in order to raise funding resilience.
- ***The value of a local presence:*** A substantial local presence lowers the cost of raising retail funds and eases access to central bank facilities in the host country. A degree of decentralisation may be a prerequisite for developing the local knowledge necessary for dealing with local customs and meeting local legal requirements. This setup allows banks to exploit local expertise while drawing on international management resources.
- ***Transparency and market discipline:*** Autonomous subsidiaries access financing sources under their own name and risk profile. This contributes to a clearer delimitation of risks within the banking group and to greater transparency as risk premia are individually added to funding costs, all of which can make market discipline more effective.
- ***Contagion prevention:*** A high degree of autonomy of subsidiaries helps reduce the likelihood and the consequences of contagion through the establishment of firewalls.

Beyond these general observations, several commonalities can be identified:

1. There is a strong link between the degree of (de-)centralisation of funding and liquidity management and the extent to which they are jointly (de-)centralised. However, liquidity management exhibits a higher degree of centralisation throughout. Even the banks with the most decentralised funding approach reported having centralised the group framework and limits within which subsidiaries are to operate (see below). It is therefore more common for banks to combine group-wide liquidity management with a decentralised funding model than the reverse. The interviews suggest that banking groups with extensive global reach often organise much of their foreign operations around a global liquidity centre (or several regional hubs covering different time zones), whereas groups with a narrower regional focus might run a coordinated or decentralised model across the countries in which they are active.

2. (De-)centralisation in funding and liquidity management is reflected both in financial flows and in decision-making and control over the actions of local entities. The centralisation of liquidity and funding operations may allow a financial group to develop a better view on its risk-taking at a consolidated level. It therefore would facilitate the definition and monitoring of the risk appetite at the group level, as well as the development of a common language and risk methodology throughout the organisation. On the other hand, the shared vision and empowerment of local management that come with decentralisation may raise risk awareness, so that the cost and risks of funding and liquidity are duly taken into account and

integrated into decision-making at each level of the group. Table 1 illustrates common observations from the interviews.

Table 1

Geographical aspects of bank funding

	Headquarters	Local subsidiaries
Centralised model	Framework, definition and control of limits, funding instructions	Implement as instructed[1]
	Guidelines, issuance	Implement with some flexibility
	Focus on wholesale markets (volume and pricing)	Focus on customer deposits (pricing and amounts)
Decentralised model	Group limits and policies defined by Group ALCO,[2] which also approves local ALCO decisions	Local ALCOs determine their local framework within the boundaries set by the group ALCO
Coordinated model	Framework, guidelines, limits, etc	Implement
	Funding plan, targets, pricing	Implement with flexibility
	Focus on main currencies, wholesale and long-term funding	Focus on other currencies, retail and short-term funding

[1] Local subsidiaries may or may not raise local funding. Some fully centralised banks report that subsidiaries raise no local (wholesale) funding, except where required by local regulation. [2] Asset and Liability Committee.

3. The degree of (de-)centralisation in funding varies by business line, currency and instrument. Wholesale funding activity tends to be concentrated in the global financial hubs, while retail funding is more dispersed by the very nature of the customer deposit base. Consequently, banks relying more on wholesale funding (such as broker-dealers) lean towards a more centralised model. Banks focusing on retail business (such as savings banks) generally lean towards the decentralised model.[22] For this reason, banks that have expanded through cross-border acquisitions tend to follow a more decentralised approach (at least until acquisitions are fully assimilated into the group).

The type of *instrument* used also matters. While secured funding can be raised at the local level, unsecured wholesale funding tends to be done at the parent company level, presumably for reasons of cost-efficiency (rating). Finally, some banks report that medium- and long-term funding is raised and distributed by headquarters, whereas short-term funding is raised by a number of local subsidiaries.

The degree of centralisation also differs by *currency*. Virtually all banks report that their approach to funding in international reserve currencies is more centralised – often around one or several liquidity centres – than their approach to local currencies, especially in emerging market operations. This is due to limitations in transferability and hedging possibilities. Where a currency cannot be sourced in international markets, it is sourced locally. However, in the

[22] However, even for retail banks there are examples (eg internet banks) where sourcing deposits in multiple jurisdictions need not imply a decentralised model, since these funds are often pooled at a treasury hub.

absence of a meaningful deposit base, banks operating in emerging markets might still fund cross-border.[23]

As a result, limits are often stipulated at the group level, and local subsidiaries are typically required to keep maturity gaps and currency mismatches within the prescribed limits. Maturity gaps are often monitored (and limited) by individual currency. In general, positions in local currencies tend to be hedged more closely (in both amounts and maturities). Most banks reportedly do not run significant open positions and hedge most of their currency risk using FX swaps. Using swaps as a daily liquidity management tool allows them to access the cheapest markets, convert from less liquid currencies and cover balances in foreign exchange positions. Excess funds in foreign currencies tend to be converted into the reference currency (eg the euro for euro area banks). Finally, some banks state that they make efforts to fund assets in the same currency and maturity in the first place. Some claim that they would rather not pursue business in a currency where funding is not available than take on the associated FX risk.

4. Industry and regulatory developments in response to the crisis

Severe bank funding stress and problems in managing international liquidity were key features of the global financial crisis.[24] After highlighting some aspects of the crisis, this section considers the private sector's responses to market pressures. It then turns to the various regulatory initiatives to improve the resilience of the financial system, focusing on those proposals most likely to affect banks' liquidity management and funding practices in the future.

4.1. Observations on the global financial crisis

The financial crisis put banks' international funding models and liquidity management to the test. The contraction in global banking activity can be gauged from the BIS international banking statistics (Graph 2). The drying-up of the international interbank market is evident in the sharp contraction of claims on unaffiliated banks (left-hand panel). Intragroup positions did not fall as sharply as claims on unaffiliated counterparties. Similarly, local claims in local currencies (centre panel) dropped less sharply than cross-border claims and locally booked foreign currency claims (often funded cross-border). The same pattern on the liability side suggests that local funding in aggregate proved more resilient during the crisis.[25]

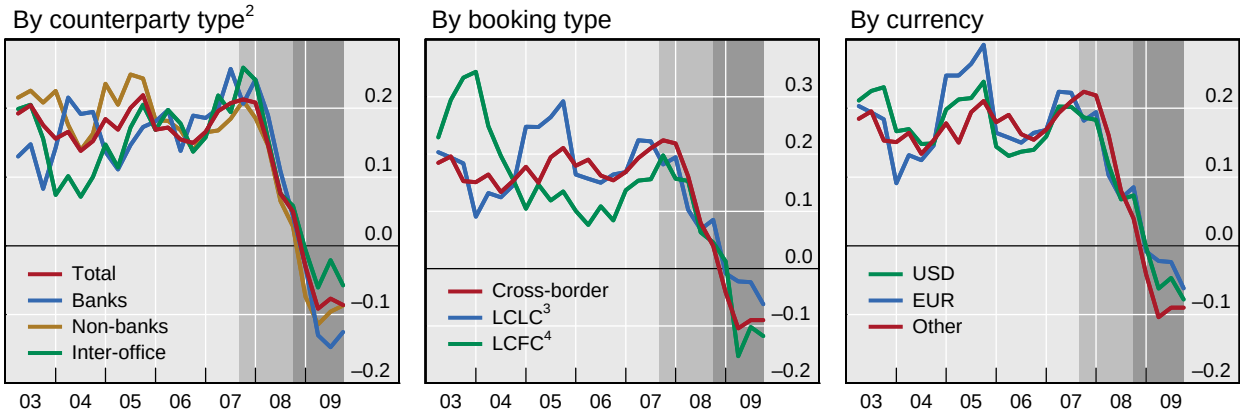
[23] These findings are consistent with prior observations from the literature on the determinants of centralisation in liquidity management. In a recent theoretical study, Pokutta and Schmaltz (2009) study the choice of setting up local treasuries (at fixed cost) to raise funds in local interbank markets *below* the rate charged at the central bank's liquidity facility. Casting the issue in terms of an optimal facility location problem, they identify uncertainty, time zones and currencies as the key determinants of decentralisation: in a deterministic setting, liquidity should be managed centrally in the most cost-effective location; however, under stochastic liquidity demand across different time zones, currency zones and jurisdictions, liquidity is preferably managed in a decentralised fashion.

[24] See CGFS (2010).

[25] Developments by currency (right-hand panel) differed little, notwithstanding the greater dislocation in dollar funding markets and the high cost of dollars in foreign exchange swap markets (Baba and Packer (2009)).

Graph 2

Year-on-year growth in banks' foreign assets[1]



[1] Year-on-year growth rates in outstanding stocks expressed at constant end-Q3 2009 exchange rates. Shaded areas start from end-Q2 2007 and end-Q3 2008. [2] Banks = unaffiliated entities; inter-office = intragroup funding. [3] Local claims in local currency. [4] Local claims in foreign currency.

Sources: BIS consolidated banking statistics; BIS locational banking statistics by nationality.

These patterns are most clearly visible in the banks' emerging market portfolios. It is mainly vis-à-vis emerging markets that local claims showed greater resilience than cross-border claims (Graphs 3a and 3b). The year-on-year growth in cross-border lending to emerging markets (excluding intragroup) plunged in each emerging region from 40% to about –20% in the wake of the collapse of Lehman Brothers. In contrast, growth in banks' *local* positions, particularly their local currency positions, slowed much less, with growth actually remaining positive in Latin America and central and eastern Europe.

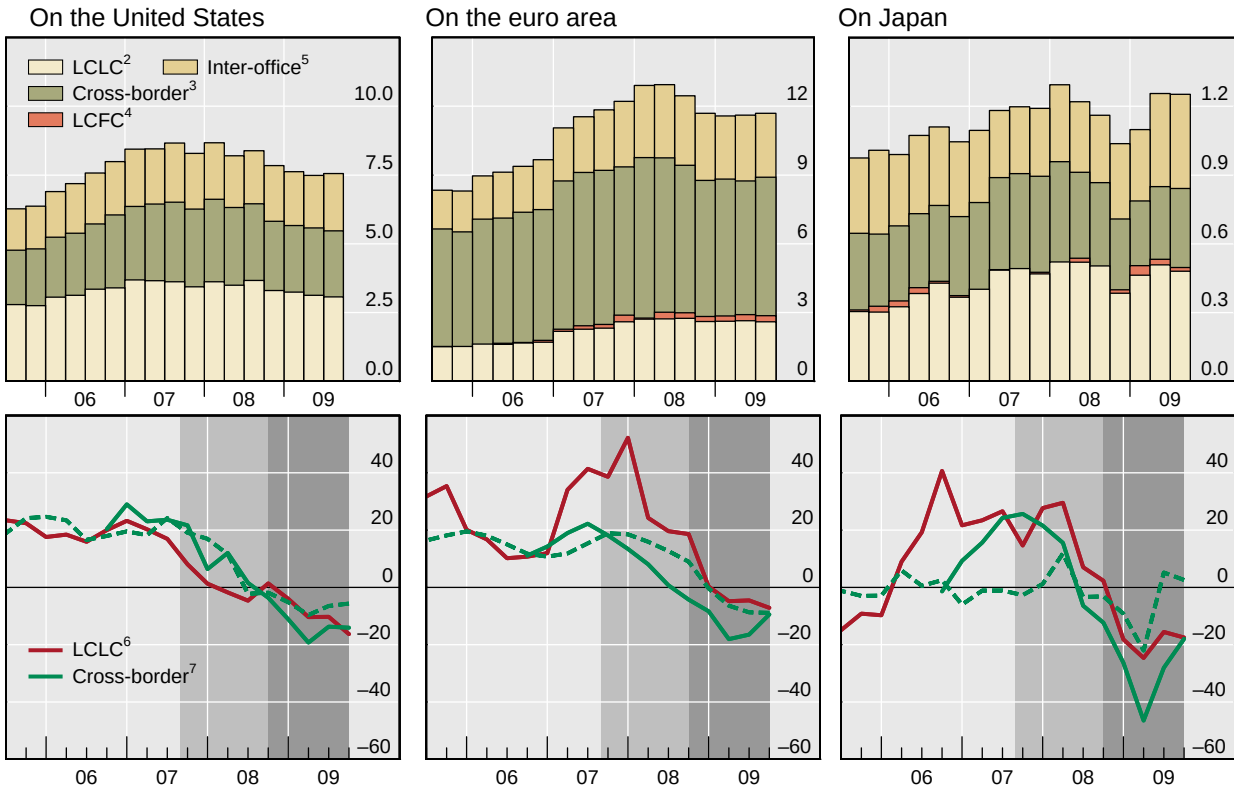
It is not evident, a priori, how the different funding models map into vulnerability to funding market disruptions. This depends on many factors, and diversification by currencies, maturities and instruments will matter as much as geographical diversification (Senior Supervisors Group (2009)). That said, evidence from the global financial crisis is consistent with the view that large international banks pursuing a more *decentralised* multinational model were somewhat less affected by funding problems than those operating a more centralised funding model, although other factors, such as tenor and source (wholesale vs retail) of funding were at play as well. The recent crisis had a disproportionate impact on international wholesale markets. Decentralised banks by their nature relied somewhat less on cross-currency funding and were less exposed to the disruptions in international wholesale funding and swap markets.[26] Also, decentralised banks are more closely associated with local positions that proved to be more stable than cross-border positions, especially outside the major currency areas. This may be because banks' local currency operations in emerging markets contain more retail and corporate lending on the asset side, funded by deposits on the liability side, than would typically be the case in advanced economies, and also because of the relative macroeconomic resilience of many emerging market countries.[27]

[26] See Baba and Packer (2009) and McGuire and von Peter (2009). These developments led to the international policy responses discussed in CGFS (2010).

[27] See CGFS (2009), Box 2, and McCauley et al (2010).

Graph 3a

Foreign claims on advanced economies[1]



[1] In the top panels, the stacked bars are BIS reporting banks' total outstanding foreign claims (plus intragroup claims) on residents of the country/region in the panel title, expressed at constant end-Q3 2009 exchange rates. Stocks and growth rates are corrected, where possible, for valuation effects and changes in reporting population (see McCauley et al (2010) for details). Shaded areas start from end-Q2 2007 and end-Q3 2008. [2] Local claims in local currency. [3] Cross-border claims (ultimate risk basis) on unaffiliated entities. [4] Local claims in foreign currency, estimated. [5] Intragroup (cross-border) funding by branches and subsidiaries located in the country/region. [6] Year-on-year growth in local claims in local currency. [7] Year-on-year growth in cross-border positions (solid line: excluding intragroup; dashed line: including intragroup).

Sources: BIS consolidated banking statistics; BIS locational banking statistics by residency.

Even so, the crisis also demonstrated the flexibility of the centralised model. Centralised liquidity management helped many banks keep control of their international operations in an extremely volatile environment. On the funding side, the value of internal markets became apparent in this context.[28] In response to the shortage in US dollar funding, European banks with an established US presence were able to borrow from Federal Reserve facilities and send funds intragroup to their head offices, replacing dollar funding previously obtained from the market.[29] Intragroup funding also helped foreign operations of Japanese banks meet elevated credit demand from corporate customers, especially in autumn 2008 when their wholesale funding sources (deposits and CDs) fell off sharply (Graph 4). Another case in point is the role of parent funding in helping Swedish subsidiaries maintain credit supply in the Baltic states (Box 1). Each of these examples

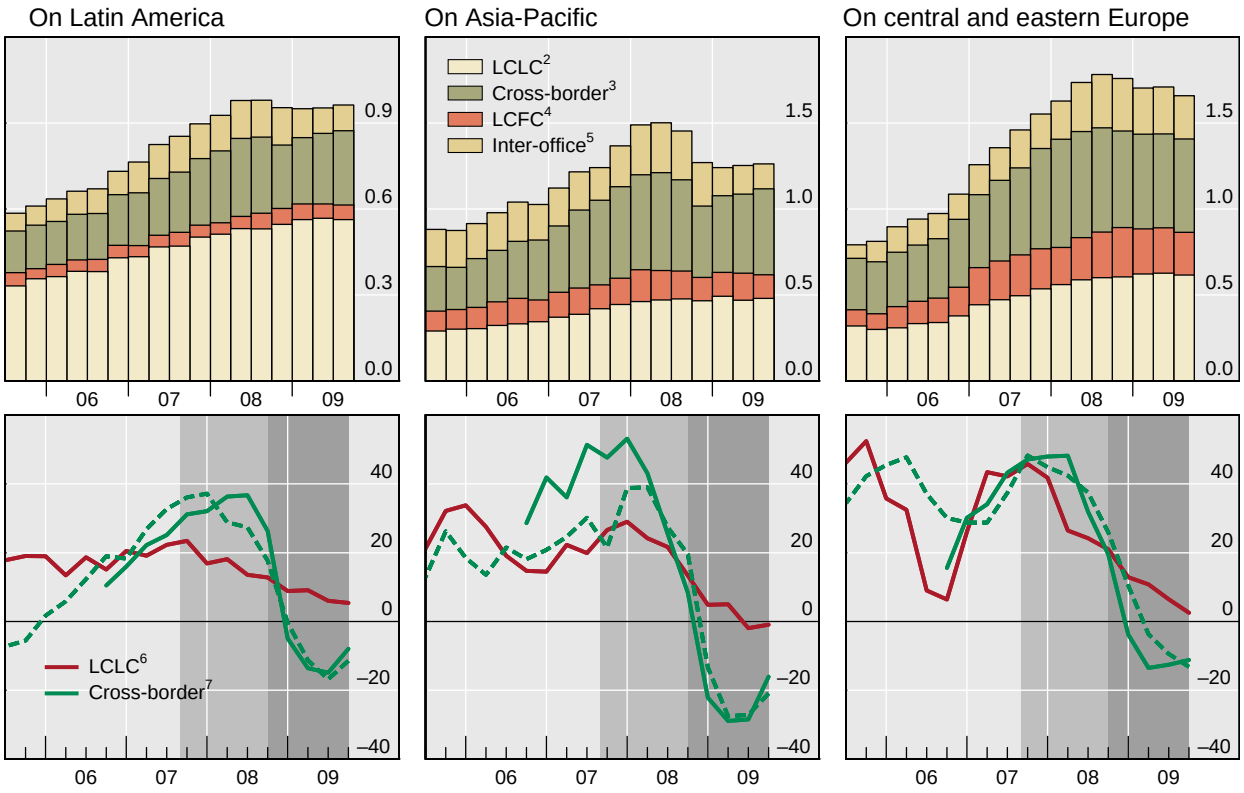
[28] The sheer size of intragroup positions is visible in Graph 3a (top panels) and in Graph 1 (right-hand panel).

[29] The associated surge in intragroup positions subsided once the international swap lines provided unlimited US dollar supply within Europe (McGuire and von Peter (2009), Figure 6).

illustrates that the ability to activate internal markets helps shift liquidity to regions experiencing relative scarcity.[30]

Graph 3b

Foreign claims on emerging markets[1]



Latin America = Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Peru, Uruguay and Venezuela; Asia-Pacific = China, Chinese Taipei, India, Indonesia, Korea, Malaysia, the Philippines and Thailand; central and eastern Europe = Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia, Slovenia and Turkey.

[1] In the top panels, the stacked bars are BIS reporting banks' total outstanding foreign claims (plus intragroup claims) on residents of the country/region in the panel title, expressed at constant end-Q3 2009 exchange rates. Stocks and growth rates are corrected, where possible, for valuation effects and changes in reporting population (see McCauley et al (2010) for details). Shaded areas start from end-Q2 2007 and end-Q3 2008. [2] Local claims in local currency. [3] Cross-border claims (on an ultimate risk basis) on unaffiliated entities. [4] Local claims in foreign currency, estimated. [5] Intragroup (cross-border) claims on branches and subsidiaries located in the region, estimated as the difference between cross-border claims from the consolidated statistics (ultimate risk basis) and cross-border claims from the locational statistics (and adjusted for currency movements). [6] Year-on-year growth in local claims in local currency. [7] Year-on-year growth in cross-border positions (solid line: excluding intragroup; dashed line: including intragroup).

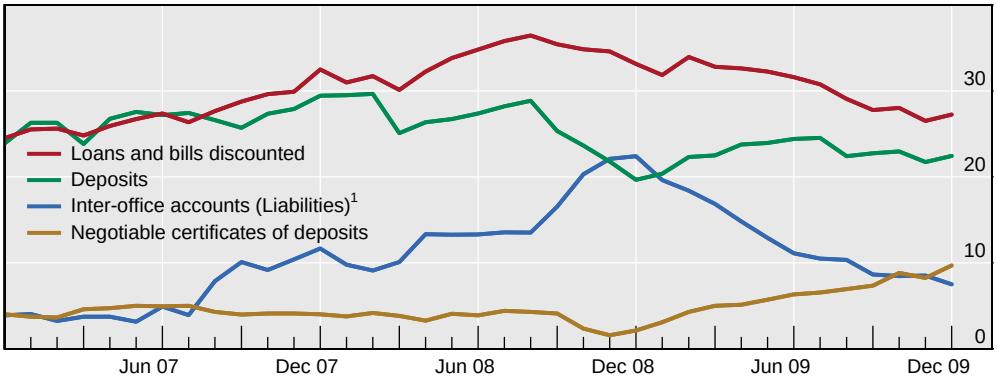
Sources: BIS consolidated banking statistics; BIS locational banking statistics by residency.

[30] The possible trade-off between local intermediation and intragroup transfers of liquidity is analysed in a model by Dietrich and Vollmer (2010).

Graph 4

Loans and funding sources of Japanese banks' foreign branches

In trillions of yen



[1] Net liabilities of overseas branches of Japanese domestically licensed banks (intragroup funding).

Source: Bank of Japan.

4.2. Industry developments in response to the crisis[31]

The crisis led to a host of unprecedented policy responses and adjustments in the banking industry. Most institutions acknowledge the severity of the crisis and the long-lasting damage it inflicted on funding markets. In response, banks reviewed their risk management practices and reported important changes. Whereas several banks have reviewed funds transfer pricing practices or tightened limits on office-level imbalances, changes to their funding approach have been at most incremental, as far as the degree of decentralisation is concerned. The reported adjustments have been mostly to the funding composition and the way liquidity management is conducted at the group level. Regulatory change may become the most important driver of modifications to funding and liquidity management in the near future.

Most banks defended their pre-crisis approach to funding and liquidity management. They continue to consider their own model as cost-effective and resilient, whether centralised or decentralised.[32] Thus, with very few exceptions, banks did not anticipate comprehensive changes to their pre-crisis strategies. Nevertheless, some reaction patterns seem to be emerging, which may have implications for future developments in the global financial system. Such patterns, although noticeable, are not uniform across all banks in all jurisdictions, and suggest that both centrifugal and centripetal forces may be at work in shaping funding choices and liquidity management.

A key development is the intention to *increase reliance on retail funding* as opposed to wholesale funding, with a view to achieving more diversity of sources. In particular, the crisis highlighted the fact that wholesale funding raises concentration risk, which could be moderated

[31] This section reflects bilateral interviews with international banks and the industry roundtables organised by the Group (see Annex 3).

[32] Decentralised banks claim that local funding is more stable, while centralised banks view their ability (eg through their investment arms) to raise wholesale funding across jurisdictions as stabilising to the entire group. There were some exceptions stating that the move from decentralised to centralised funding helped them survive the crisis.

by retail-based funding. Thus, the intention to shift towards a funding mix that relies more on retail deposits than on wholesale sources was mentioned as an important consequence of the crisis in many bank interviews undertaken by the Group. What banks seem to understand by increased diversification of sources is some rebalancing (rather than a complete reversal) of their funding strategies in a process that will be gradual, taking place over several quarters, and that will also reflect their evolving business models.

Moreover, banks noted that beyond the short end of the spectrum, the wholesale funding market is still dysfunctional; hence, in addition to relying more on retail funding, they will *tap capital markets* more aggressively and regularly, especially for long-term funding.

To the extent that wholesale funding was often the means whereby banks financed the acquisition of assets outside their home markets, increased reliance on retail funding should lead to *more decentralisation in funding* among international banks, as they would seek to increase, wherever feasible, local funding in the countries they operate. In fact, most private sector participants indicated that they intend to rely more on local funding of local assets. This was true even in the case of banks that during the crisis had centralised the control over funding and liquidity management.[33]

Moreover, difficulties in recognising and managing the risks posed by cross-currency funding could also lead to a bias towards local as opposed to global sourcing of asset portfolios. In view of the FX market dislocations during the crisis, some banks reported to have *reduced their reliance on cross-currency funding*, even in the major currencies. As described earlier, many banks used to rely on centralised funding for assets denominated in global currencies, ie fully fungible currencies of mature economies, and on decentralised funding for assets denominated in local currencies, mostly in emerging markets. Despite the resilience shown by foreign exchange market infrastructure during the crisis, the build-up of cross-currency *maturity* mismatches proved to be a key vulnerability. This typically reflected long-dated and/or less liquid US dollar-denominated assets held by European banks, funded by short-dated USD borrowing and FX swaps.[34] Going forward, one may see increasing reliance on local sourcing also in mature economies, with a smaller role played by cross-currency funding.[35]

Banks also generally reported that they plan, or have already taken action, to *overhaul internal transfer pricing* in order to better reflect the cost of liquidity. This suggests that even for banks that plan to continue relying on centralised funding, internal transfers will probably be undertaken at conditions that are closer to those prevailing in the markets. In some cases banks have indicated that the intended changes to internal pricing mechanisms aim at increasing incentives for local offices to raise stable funding and to become less dependent on intragroup funding – although some banks noted that selected subsidiaries/branches might no longer be viable in case of fully market-priced transfers.

While the trend in funding seems to be towards decentralisation on the margin, certain aspects of liquidity management move in the opposite direction. Some banks made adjustments translating into a *higher* degree of *centralisation in liquidity management*, for the head office to gain more information and better control over existing holdings of liquidity and collateral, as well as to coordinate access to central bank facilities at the group level. On a general level, monitoring of liquidity risk and funding conditions is likely to become more intense, frequent and thorough. Banks indicated that risk management committees have generally been given higher profiles within their respective organisations. Thus, while one may observe further

[33] Such a development would raise the measure of *local intermediation* introduced in Section 3.

[34] Swaps in other currency pairs, such as USD/JPY, were less disrupted during the crisis.

[35] This trend is visible for the major banking systems in aggregate (McGuire and von Peter 2009).

decentralisation in funding, the general trend seems to be one of increasing centralisation in monitoring activity at the group headquarters.

In this context, several banks indicated that improved monitoring requires *strengthening stress tests***,** which were found wanting in the crisis. It was consistently reported to the Group that new stress tests would be based on more severe assumptions, suggesting that actual crisis experience was worse than the stress scenarios previously envisaged. Moreover, tests are expected to focus on risks stemming from concentration of funding as well as short-term maturity and currency mismatches. According to the interviews, stress testing is also likely to become more frequent, and the results are to be circulated to, and analysed by, more senior management.[36]

Specifically, several banks indicated that centralisation of *management of collateral and of contingent liabilities* is a feature of the post-crisis approach that might become permanent. The same applies, in some cases, to access to *central bank facilities* – even though banks indicated that they do not count on routinely tapping these facilities. Several banks stated that during the most acute phases of the crisis, all flows were centralised via headquarters. One bank consolidated two internal liquidity centres into one, to streamline structure and processes. Another explained that management became centralised and systems were developed to provide the group with a view on (i) its consolidated eligible collateral for different time buckets; (ii) used and unused collateral (by currency and legal entity); and (iii) the amount of eligible collateral in a stress scenario. Finally, banks noted that more stringent *counterparty limits* are likely to prevail after the crisis.

Overall, the adjustments the banking industry has made to funding and liquidity management so far appear to reflect primarily market pressures, rather than prospective changes in regulation. These changes have a limited impact on the overall funding model in terms of increased decentralisation of funding, and tighter central control over liquidity management. On the whole, banks continue to champion their characteristic funding model – whether centralised or decentralised – and have made marginal changes to the composition of funding to raise diversification. Most banks indicate a strong preference for stable retail funding and their intention to fund more local assets with local sources going forward.

Any future trend towards decentralised funding is therefore likely to be driven by banks' greater emphasis on retail funding within their existing model, rather than by a generalised adoption of the decentralised funding model. If banks move towards local banking in the longer term, it is likely to be a more gradual process than one that could result from changes in regulation. Various ongoing regulatory initiatives will probably encourage more decentralised approaches to funding and liquidity management.

4.3. Regulatory developments

The global financial crisis alerted regulators and supervisors to the need to increase the resilience of the financial system. Various regulatory initiatives with the aim of strengthening liquidity requirements are under way (see Box 3).[37]

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[36] See also ECB, *EU banks' liquidity stress testing and contingency funding plans*, 2008.

[37] This is distinct from enhanced capital regulation, as well as from separate initiatives to simplify bank group structures through further subsidiarisation (involving the entire balance sheet). Incorporating foreign bank offices as standalone subsidiaries (rather than branches) regulated by host countries divides responsibility for the banking group among home and host country regulators, and may provide a basis for ring-fencing or cross-border burden-sharing arrangements (BCBS (2009b)). Subsidiarisation is likely to play a role in future recovery and resolution plans ("living wills") that regulators may request from significant firms in the future (FSA (2009b)).

The Basel Committee on Banking Supervision (BCBS) issued for consultation a new liquidity standard for internationally active banks (Box 3). The proposal is a global minimum standard designed to expand and harmonise existing approaches used by national supervisors and the banking industry (ie liquidity coverage ratios, net liquid asset and cash capital methodologies). As under the Basel Accord (for capital adequacy), home supervisors are free to adopt arrangements that set higher levels of minimum liquidity.

From the perspective of the geographical organisation of international bank funding, the scope of application of liquidity regulation is of great importance. If liquidity requirements were (only) applied at the level of the worldwide consolidated entity, the geographical organisation of a banking group (and thus the degree of centralisation) would be inconsequential. Although intended as a global standard for regulating the consolidated entity, the BCBS consultative paper nonetheless gives host jurisdictions the option of applying the standards on a legal entity basis as well.

Most existing liquidity regimes are nationally based according to the principle of host country responsibility (BCBS (2008)).[38] Such an approach is motivated by regulators' duty to help ensure the resilience of entities *within* their jurisdiction to protect local depositors and preserve the safety and soundness of each country's financial system.[39] Accordingly, the jurisdictions surveyed by the group already include the subsidiaries (and often also branches) of foreign banks under their regulatory umbrella. Most regimes require banks to set out the internal processes in place to measure, monitor and control liquidity risk, and to detail their stress tests and contingency funding plans. But regimes differ markedly as to the extent to which they prescribe quantitative limits or ratios (if any) to be satisfied by individual entities.

A few regulators have announced their intention to apply quantitative liquidity requirements to the subsidiaries and branches of foreign banks in their jurisdiction. The European Commission has recently proposed that BCBS liquidity standards be applied on the legal entity, or subsidiary, level in the context of possible changes to the Capital Requirements Directive. While details on local implementation remain unspecified at this time, one possibility is that host regulators will apply the BCBS minimum standard, perhaps with more stringent parameters or further requirements at the discretion of national authorities. A prominent example is the UK Financial Services Authority's new liquidity regime (Box 3). The default position is that all UK entities, including subsidiaries and branches of foreign banks, are required to be *self-sufficient* for liquidity purposes. As a result, a foreign entity will need to hold a local operational liquidity reserve, unless it has received a waiver or modification.

The main departure from current practice is that some host regulators will require quantitative liquidity ratios to be satisfied by all entities on a stand-alone basis, which may confront many foreign subsidiaries and branches active in those jurisdictions with binding constraints. The combination of consolidated (home) and host country regulation on a legal entity basis can prospectively force several changes in international bank funding and liquidity management.

The first is to *decentralise important aspects of liquidity management*. Compliance with local liquidity requirements may require setting up local treasury functions for the measurement of regulatory ratios and the management of liquid asset holdings. These changes are tantamount to more decentralised liquidity management.

A related change could be the *fragmentation of liquidity holdings*. While banking groups under consolidated regulation may hold liquid assets at the central treasury, local regulation could require each entity to hold liquid assets in the host country, possibly in local currency, to meet

[38] In some cases, the task (though not the responsibility) of supervision of branches is delegated to the home supervisor.

[39] Reinforcing experiences in this regard include the collapse of Kaupthing and Lehman Brothers, and the rescue of Fortis (BCBS (2009b))

local liquidity requirements without reliance on other parts of the group.[40] If all countries required local liquidity holdings, little or no excess might be transferrable within the group in a time of stress ("trapped pools"). Local liquidity buffers would, in principle, not have to be held twice, as the holdings of a foreign subsidiary could also count towards the fulfilment of the liquidity requirement of the consolidated entity in the home country. Yet this may be difficult to achieve in practice.[41] In addition, local liquid asset requirements are likely to be higher than those at the consolidated level because of the loss of diversification.[42] Fragmentation will thus probably imply an increase in group-wide required liquidity holdings, and/or could lead banking groups to shift liquidity risks to the balance sheets of entities that are not subject to local regulation.

Moreover, it may be argued that the introduction of liquidity requirements on an individual basis, as opposed to a consolidated one, may *affect the supervisory monitoring* of the global liquidity situation at group level, as it might hinder regulatory access to information on all contingent liabilities.

For the same reasons, local liquidity regulation is likely to *limit maturity and currency mismatches* across the banking group. If currency and maturity mismatches offset each other to some extent when consolidated across jurisdictions, this form of diversification would no longer be recognised by host supervisors focused on the legal entity alone. Pressure to reduce mismatches at local entities may work towards lowering overall mismatches of the consolidated group as a whole.

Finally, the amount of *intragroup* transfers matters. At the consolidated level, intragroup transfers cancel out across the group (on a net basis). The regulatory segmentation of a banking group along national borders, however, exposes the internal market and raises the question of how to deal with intragroup exposures. The self-sufficiency requirement embodied in proposals on local liquidity regulation does *not* rule out intragroup funding, but rather treats it on equal terms with other sources of funding (see Box 3).[43] An entity funding long-term assets using short-term intragroup funding would have to extend the maturity of intragroup liabilities to limit the mismatch counting towards the regulatory ratios in a stress scenario.

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[40] The BCBS global liquidity standard itself does not require the liquidity ratios to be met separately in each currency (BCBS (2009a) §134).

[41] In order for the BCBS standards to be applied at a local level, the definition of liquid assets would, in principle, have to be the same. However, there may be national divergences in some stress scenario parameters, with a corresponding need to reconcile the differences and risks that the liquid assets are meant to address.

[42] The proposed standard incorporates stress scenarios that can be demanding in terms of liquidity management. The scenario underlying the liquidity coverage ratio includes a downgrade and a draw-down of unused credit/liquidity facilities, against the partial loss of unsecured wholesale funding, a reduction in secured term funding, and a partial run-off of retail deposits.

[43] Apart from prospective regulation, there are laws that already restrict certain intragroup transactions. National company and insolvency laws protecting the interests of creditors and shareholders embody certain restrictions on asset transferability, especially in the event of distress. The European Commission (2008b) sets out the nature of these restrictions within the EU.

Box 3

Regulatory initiatives[1]

The Basel Committee's proposed global liquidity standard

In December 2009, the Basel Committee on Banking Supervision (BCBS) announced consultative proposals to strengthen global capital and liquidity regulations with the goal of promoting a more resilient banking sector. The proposals include a minimum liquidity standard for internationally active banks (BCBS (2009a)), centred on two regulatory ratios:[2]

The ***Liquidity Coverage Ratio*** (LCR) requires that the ratio of the *stock of high-quality liquid assets* to *cumulative expected net cash outflows over a 30-day period* equal or exceed unity continuously. This metric seeks to ensure that a bank maintains an adequate level of unencumbered, high-quality assets that can be converted into cash to meet liquidity needs in a short-term liquidity stress scenario. (High-quality liquid assets are those that remain liquid under stressed market conditions and are central bank-eligible. Bonds issued by banks or investment or insurance firms are excluded.)

The ***Net Stable Funding Ratio*** (NSFR) requires that the *available stable funding* (capital, long-term liabilities and a share of stable deposits) equal or exceed the *required stable funding* in a stress scenario, calculated as a weighted sum across asset classes held by the institution. This ratio seeks to control aggregate maturity mismatch, covering off-balance sheet items and most aspects of the balance sheet over the medium and longer term. The intention is to create incentives for banks to fund their activities with more stable sources of funding on an ongoing structural basis.

On the scope of application, the consultative paper states: "The proposed standards and monitoring tools should be applied to all internationally active banks on a consolidated basis, but may be used for other banks and on any subset of entities of internationally active banks as well to ensure greater consistency and a level playing field between domestic and cross-border banks. The standards should be applied consistently wherever they are applied. When applied on a legal entity basis, affiliated entities should be treated no differently than unrelated third-party financial institutions." (BCBS (2009a), §133).

The UK Financial Services Authority's liquidity requirements

In October 2009, the UK Financial Services Authority (FSA) published its final rules on liquidity requirements (FSA (2009a)). They include the principles of ***self-sufficiency*** and ***adequacy of liquid resources*** for UK entities, including subsidiaries and branches of foreign banks. UK entities are expected to monitor and manage their liquidity on a standalone basis, and have to be self-sufficient for liquidity purposes, which means that they will not be permitted to rely on other parts of their group to satisfy the overall liquidity adequacy rule (FSA (2009a), Section 4).

The FSA anticipates that many firms will apply for, and receive, modifications of the self-sufficiency requirement, provided there are cross-border supervision arrangements in place that are non-discriminatory to the interest of UK creditors.

The liquidity requirements are based on the BCBS's *Principles for sound liquidity risk management and supervision* of June 2008. The FSA states that the new regime can be amended through time, subject to consultation, to reflect new international standards. With details left open in FSA policy statements, it is possible that future implementation would closely follow the proposed BCBS minimum liquidity standards, applied at the subsidiary or branch level.

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[1] John Ammer (Federal Reserve Board), Alistair Barr (Bank of England) and Goetz von Peter (BIS) contributed to this box.

[2] The two metrics are accompanied by a set of proposed monitoring tools, including contractual maturity mismatch and funding concentration.

The European Commission's changes to large exposure regime

The EU's Capital Requirements Directive (CRD), issued in 2006 to adopt the Basel II capital requirements framework and amended in October 2008, includes a rule that limits banks' exposure to a client or group of connected clients to no more than 25% of their own funds (capital). No significant changes were made to the CRD in the area of intragroup exposures. The European Commission proposes to limit all interbank exposures to 25% of own funds or an alternative threshold of EUR 150 million, whichever is higher; intragroup exposures are excluded if exempted under the solvency regime (European Commission (2008a)). Authorities are required to fully exempt intragroup exposures within the same member state when certain criteria have been met, and member states continue to have the ability to fully or partially exempt intragroup exposures that cross national boundaries. Some countries, including the United Kingdom, already have rules restricting intragroup exposures to overseas subsidiaries. The United Kingdom is proposing to lower the total level of intragroup exposures that UK firms are allowed to extend to their overseas group entities to 100% of a firm's capital base.[3]

The US Security and Exchange Commission's money market fund reform

The US Securities and Exchange Commission recently implemented rule changes for money market mutual funds that took effect 5 May 2010. A key feature of the reform is a reduction in the ceiling for a fund's weighted average maturity (WAM) from 90 days to 60 days. The amendments also create a new requirement that funds keep at least 30% of assets in cash, short-term US government securities or securities that convert into cash within one week. To the extent that the 60-day WAM limit is binding on funds, funding for the banks (mostly foreign) in which the funds have been investing (through term deposits, commercial paper and short-term notes) may need to be shortened in average maturity.

[3] See FSA, *CP09/29: Strengthening capital standards 3,* December 2009, pp 51–4. Intragroup exposures in the trading book are exempt from this limit.

Intragroup exposures are limited explicitly in the EU's Capital Requirements Directive (CRD, Box 3). This form of regulation can have a material impact on internal markets in the normal course of business. For investment firms that are part of a banking group, intragroup funding plays a key role. Specialised branches or subsidiaries collecting funds for remittance to the central treasury could henceforth do so on an unsecured basis for only up to 25% of their eligible capital. The strict form of self-sufficiency with intragroup limits could make certain specialised types of foreign operations more costly or unviable (see also Box 4):

- ***A fundraising operation*:** for instance, an entity located in New York raising wholesale dollars from money market mutual funds (or an internet banking branch raising retail deposits abroad) and sending the funds back to the home office overseas. For every $100 in short-term claims on the home office, this entity would have issued a mix of time deposits of various maturities. When supervised on a standalone basis, this entity would violate intragroup exposure limits and the BCBS LCR on account of holding no high-quality liquid assets against expected net outflows under the stress scenario (Box 3). The required liquidity buffer appears large enough to deter funding flows from US money market mutual funds to foreign banking groups.[44] The pure fundraising operation would therefore either see its intermediation role reduced (eg by holding sufficient US Treasuries) or become unviable.

[44] A similar problem might be faced by a *specialised service operation* (eg providing custody services in a financial centre) when remitting revenues to the head office.

- ***A hub operation*:** for example, an entity located in London, channelling cross-border deposits placed in the London interbank market to affiliated offices in other regions. For every $100 in intragroup claims on affiliates, this entity books cross-border liabilities of short maturity. It appears that it would be impractical to operate such an operation when subject to intragroup limits and the LCR on a standalone basis, for the reasons discussed.

- ***An investor operation*:** an entity receiving intragroup funding from its retail commercial banking arm (possibly in a deposit-rich home country such as Japan, Germany or Hong Kong SAR), in order to invest the funds in corporate/consumer loans or in investment vehicles. For every $100 in assets, the entity rolls over intragroup liabilities vis-à-vis the home office, a profile that violates both the LCR and the NSFR.

Since US branches of foreign banks are often involved in these types of operations, US data can be used to assess the potential consequences of applying the proposed BCBS standards on a legal entity basis. Preliminary calculations suggest that the US branches of foreign banks would face a substantial aggregate shortfall in the buffer of liquid assets required for meeting the LCR (Box 4).[45] Likewise, the NSFR shortfalls also indicate that compliance with the proposed liquidity standards might entail significant adjustments to branch balance sheets, possibly including major reductions in some activities. Furthermore, as a result of tighter restrictions on US money market mutual fund portfolios that recently took effect (Box 3), these funds may require shorter tenors on their investments in bank obligations. Shorter maturities in wholesale funding may induce international banking groups to choose to rely less on funding flows from their US branches (especially banks constrained by the LCR standard), possibly leading toward a slightly more decentralised funding structure.

To summarise, the impact of liquidity regulation on (de-)centralisation will hinge on the extent to which host regulators will require quantitative liquidity ratios to be satisfied by all entities on a standalone basis and without recourse to intragroup funding. On balance, it is likely that global banks would have to decentralise liquidity management, restructure specialised operations and hold more reserves for the consolidated entity as a whole, both because not all local liquidity holdings may count towards local and global requirements, and because local regulators might impose requirements exceeding the global standard, such as a strict form of self-sufficiency restricting intragroup transfers.

[45] These calculations are performed for the purpose of illustration. There are no plans, at this time, for introducing additional liquidity standards for US branches of foreign banks operating in the United States.

Box 4

Foreign bank branches in the United States and the proposed Basel liquidity standards[1]

The United States is home to a few large financial firms with extensive international reach, but it plays an even larger role in the global banking system as a host country. As of 30 September 2009, the total deposits at 67 foreign-owned banking subsidiaries exceeded $800 billion. US subsidiaries of foreign banking firms also include securities broker-dealers, securitisation conduits, insurance companies and asset management firms, as well as special purpose funding corporations created to undertake unsecured borrowing in US capital markets (particularly in the commercial paper market) on behalf of their foreign parents.

US financial regulation also permits foreign banks to establish branches and agencies in the United States that are not separately capitalised. These foreign branches generally are not permitted to offer FDIC deposit insurance, which essentially precludes them from competing for retail funding. Figures from 30 September 2009 for 226 US branches of 161 foreign banks show that these are large operations in aggregate, holding more than 10% of the assets of the US banking system (even with the branches' large intragroup claims excluded) and accounting for even larger shares of commercial and industrial loans (not shown separately in Table 4.1) and of total liabilities.

Table 4.1

Foreign bank branches and agencies in the United States (Q3 2009)

In billions of US dollars

Aggregate balance sheet of US branches	All foreign banks with US branches	By net intragroup position	
		Funding sources	Funding users
Assets (excluding intragroup claims)	1,282	746	536
Loans	514	286	229
Other assets	767	460	307
Liabilities (excluding intragroup claims)	1,750	1,391	359
Deposit funding	1,023	852	171
Other funding	727	540	188
Memo:			
Off-balance sheet commitments	*744*	*513*	*231*
Net intragroup claims	*468*	*645*	*–177*
Number of foreign-home banks	*161*	*58*	*103*

The off-balance sheet activities of these branches are also large, with trillions of dollars of gross notional positions in credit, interest rate and foreign exchange derivatives, billions of dollars in standby letters of credit, and more than $700 billion in off-balance sheet commitments, including backup liquidity support to securitisation structures and ABCP conduits.

Although some US branches receive net funding from their foreign affiliates, as of last September, US branches in aggregate provided net inter-office funding of $468 billion (with net funding of $645 billion from US branches of 58 of the banks offset by net funding to the others), raised almost entirely from wholesale sources, such as money market mutual funds and other institutional investors. Net intragroup funding from US branches rose to even higher levels during the recent financial crisis, exceeding $600 billion in mid-2008, before increases in swap lines and other central bank measures began to ease the scarcity of dollar funding later that year. Much of this funding flowed from large New York branches to head offices in Europe.

[1] This box has been prepared by John Ammer and Ricardo Correa of the Federal Reserve Board.

As a result of persistent current account deficits, the United States has a negative net international investment position exceeding 20% of its annual GDP. Given this macroeconomic context, the role of US branches as a net source of cross-border funds is somewhat at odds with a net debtor country hosting these branches. However, it is worth noting that although it lies only a few hundred metres off the banks of the Hudson River, the island of Manhattan shares some of the characteristics of offshore financial centres, with deep markets in US dollar instruments and supporting infrastructure.

Mapping branch report data into estimates of the proposed liquidity standards

The BCBS proposed new standards on Liquidity Coverage (LC) and Net Stable Funding (NSF) that are explicitly intended to deter banks from holding insufficient liquid assets or relying excessively on unstable funding sources (see Box 3). The nature of these quantitative liquidity standards generally precludes accurate computation of a bank's (or even a branch's) LC or NSF position without comprehensive information about the maturity, type of counterparty and, in some cases, other contractual details of essentially every arrangement the bank has on (or off) its balance sheet. In particular, it is often crucial for the LC measure whether the maturity of an asset or liability is longer than 30 days, and for the NSF measure, whether the tenor exceeds 12 months. Thus, in practice, calculating these measures for a large complex banking organisation is likely to entail significant bank input. Nevertheless, branch reports on FFIEC form 002 contain enough of the relevant information to produce rough estimates of a branch's LC and NSF positions.

- Our LC estimates for all 226 branches in aggregate range from a shortfall of about $400 billion in liquid assets to a deficit of up to $2.1 trillion. The larger figure corresponds to relatively extreme assumptions that (i) virtually all of these branches' deposits ($1,022 billion) are in categories that would be presumed to be withdrawn in the context of the stress scenario underlying the proposed LC standard and (ii) that all credit and liquidity commitments ($744 billion) are in categories that would be drawn. Note that even the lowest estimate of the LC deficit is nearly as much as the net intragroup funding provided by these branches ($468 billion). The implication is that, to the extent that this intragroup funding were invested mainly in longer-term illiquid assets, a substantial shortfall would still remain in the requisite buffer of liquid assets, which would have to be offset by extra liquid assets held elsewhere in the group (under consolidated application of the LC standard).
- Our NSF estimates are lower, ranging from a total stable funding deficit of just $25 billion to a shortfall of over $700 billion. However, with US branches supplying substantial funding to foreign home offices through intragroup transfers, the banks' home offices would only be free to invest these funds in longer-term illiquid assets to the extent that they were accompanied by a commensurate NSF surplus – that is, if these branches were attracting stable funding, as defined under this standard.

US branches of foreign banks are involved disproportionately in practices (such as raising wholesale funding from money market mutual funds) that tend to strain the resilience of the group to funding stress and thus also strain group compliance with the recently proposed BCBS liquidity standards. Our estimates of LC and NSF positions for the US branches of foreign banks imply that compliance with the proposed liquidity standards might entail significant adjustments to branch balance sheets, possibly including significant reductions in some activities. To the extent that these adjustments reduced the capacity of international banking groups to intermediate funds from savers in one country to investments in another, one of the consequences might be greater decentralisation of funding patterns.

In discussions with the study group, industry participants showed a general resistance to further regulation, especially to those initiatives most likely to affect their business model and funding

approach.[46] With regard to the new liquidity regulations, banks were particularly concerned about whether:

- regulation will apply only to the consolidated entity or also at a legal entity level;
- treatment of intragroup positions will be symmetric or not;[47]
- the pool of retail deposits is large enough to fund lending;
- the definition of liquid assets will conform to that used by major central banks for liquidity provision purposes,[48] and be the same across jurisdictions;
- proposed regulations will push the industry towards a single model, thereby reducing the diversity and resilience of the industry, and whether regulations will adequately recognise the diversity of firms.

There is an additional level of uncertainty regarding the potential overlay between global and national regulation, compounded by tax issues such as the US Financial Crisis Responsibility Fee, which some banks see as a disincentive to wholesale funding. Banks are also concerned about other regulation, for instance on credit concentration (specifically on large intragroup exposures), that might hinder intragroup transfers, undermining their ability to shift funds across jurisdictions and potentially weakening their business models. Such barriers could lead banks to keep idle pools of liquidity in certain jurisdictions, and hence presumably contribute to a misallocation of funds.

The merits of these concerns will need to be weighed in the ultimate formulation of new regulation, as will the potential knock-on effects for credit and economic growth. But there is broad consensus that liquidity buffers and risk management practices were insufficient prior to the crisis and that new standards are necessary. Despite banks' objections and concerns, regulators will rightly strive to prevent a simple reversion to past practices, which proved to be unsound in the crisis. Thus, the above-mentioned bank concerns should be kept in perspective. The fact that regulatory changes may lead to increased costs of credit in markets that used to rely on cross-border inflows needs to be taken into account by central banks when they design exit strategies and monetary policy in general, but should not per se hinder needed reforms.

Thus, ongoing efforts by international banks to strengthen liquidity management practices, coupled with regulatory initiatives to raise overall liquidity and capital buffers, should go a long way towards promoting systemic resilience. Increased local funding by international banks may also bolster resilience, particularly to the extent that they might inhibit excessive risk-taking, albeit at the price of some increase in funding costs and potentially the cost of credit. On the other hand, regulatory initiatives taken at the local level that excessively restrict banks' funding flexibility and intragroup flows may have negative implications for systemic resilience. Changes in banks' approaches to liquidity management seem to be clearly favourable, as they should increase banks' ability to monitor and manage mismatches with limited impact on their cost structure – although it remains to be seen whether the current emphasis on risk control, especially on the liability side, will persist as memories of the crisis start to fade.

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[46] What follows draws on bilateral interviews with international banks and the industry roundtable organised by the Group (see Annex 3).

[47] Some banks are concerned that intragroup liabilities would enter into liquidity ratio calculations, whereas intragroup assets would be excluded.

[48] Regulators may reasonably adopt stricter criteria for liquidity ratios, based on market prices, in order to avoid automatic dependence on central bank funding.

5. Implications and policy considerations

5.1. Implications for bank and systemic resilience

Banks do not seem inclined to fundamentally change their funding models in response to the crisis. Rather, a marginal shift towards more retail funding and local sourcing of local assets within their existing models seems likely. Specifically, at the London roundtable organised by the Study Group, many international banks indicated that they plan to increase local funding of local assets. A few international groups, which already rely on local funding, do not envisage meaningful changes of current practices, whereas two of the major international banks more reliant on centralised funding expressed no intention to modify their funding model.

Increased reliance on retail funding should lead to more competition in some markets and hence to a higher cost of funding for individual banks. Establishing a significant physical presence to source larger amounts of retail deposits may involve surmounting barriers to entry and large fixed costs. Several banks acknowledged that the combination of greater reliance on retail deposits and more expensive wholesale funding is likely to limit balance sheet growth to a greater extent than was the case under the conditions prevailing prior to the crisis. While this may affect credit supply, it may also provide a check on excessive credit extension and short-term position-taking.

These changes in funding approaches may enhance bank resilience. To the extent that low wholesale market funding costs prior to the crisis had led banks to underestimate risks from maturity and currency mismatches and facilitated the rapid build-up of exposures, higher funding costs could result in more conservative asset side policies by international banks. Reduced dependence on cross-currency funding should help to curb international banks' exposure to currency mismatches and FX swap markets. However, their ability to cut back on cross-currency funding is limited by the business model, as well as strategic and macroeconomic factors. In particular, international banks headquartered in smaller domestic markets will have more difficulty reducing reliance on cross-currency funding than those based in larger financial markets.

Greater decentralisation of funding could in principle leave banks less exposed to intragroup contagion. This could be a source of resilience, as shown by the performance of some international banks with decentralised structures during the crisis. However, reputational concerns could limit the actual degree of insulation provided by decentralisation in a crisis – most banks indicated, in bilateral interviews and at the roundtable, that, for reasons of signalling, it would be difficult to let go of a troubled subsidiary in times of global stress.[49] The insulation benefits of decentralisation may be larger in country-specific crises (such as in Argentina in 2001–02)[50] than in periods of global turmoil. In part, the resilience of international banks' funding models thus depends on the nature of the shock. For instance, bank behaviour and performance during the recent crisis is partly attributable to the depth of the economic downturn in different regions. In particular, decentralised banks (regardless of their funding model) with exposure to Asian or Latin American economies, which were less affected by the global economic downturn, apparently fared better than their counterparts with greater exposure to some advanced economies.

Thus, the adoption of a more decentralised, less wholesale-oriented approach to funding could reduce the vulnerability of international banks to a shock to major funding markets. In particular, destabilising effects from contagion across jurisdictions, lack of clarity regarding lender of last

[49] Just as the failure of a relatively small bank may have severe systemic implications in times of stress, the failure of small subsidiary could, in an environment of fragile confidence, affect market perceptions of the soundness of the group as a whole.

[50] For a discussion of the response of international banks during the Argentine crisis, see CGFS (2004).

resort responsibilities, and some of the difficulties seen at the resolution stage might be less significant. Cross-border transfer barriers will be less of an issue when foreign subsidiaries develop their local deposit base to meet a greater share of their own funding needs, although this might entail higher funding costs. The size of overall foreign currency mismatches might also be better contained if built by individual subsidiaries provided that market discipline is more effective at the local level. Better local intelligence may reduce the risk of liquidity misallocation by headquarters arising from a lack of knowledge or timely information about host countries. But improved central coordination and monitoring of liquidity risks at headquarters will also be necessary, especially in crisis times. Finally, reduced reliance on intragroup funding would make bank risk-taking less sensitive to a mispricing of internal fund transfers (ECB (2009)). Nevertheless, in the crisis management phase, all banks, regardless of their strategic funding model, would seem to benefit from making tactical use of intragroup transfers. Moreover, reputation risks mean that, even in decentralised structures, headquarters may be compelled to rescue troubled subsidiaries in times of stress.

There are also limits to decentralisation. First, developing local deposit bases is probably not desirable or feasible for all international banks in all jurisdictions. Banks whose home markets are in economies with large surplus savings, such as Japan, will be less inclined to rely on local funding abroad, even for secondary sourcing, whereas those involved with smaller, shallower, markets, such as those in central and eastern Europe, may have difficulty increasing local funding to sustain credit expansion. Banks heavily positioned in smaller funding markets may be at a competitive disadvantage. While technical progress (such as internet banking) allows banks without extensive branch networks to tap wider depositor bases, not all banks are well positioned to make that transition, especially if they lack well established brand names or face barriers to entry. To the extent that the penetration into retail funding is impeded for some banks, the movement to retail deposits might thus conceivably lead to higher concentration in international banking over the medium term. Moreover, retail funding is also constrained by the size and growth rate of the deposit base. Increased competition in response to a broader-based shift towards retail deposits might at some point affect the stability of retail funding.

In addition to rebalancing their funding strategies, international banks have taken several measures to strengthen liquidity management that should, unambiguously, increase their resilience. One common trend in liquidity management seems to be towards strengthening monitoring, policies and standards at the group level. Indeed, regardless of their funding model, banks have already undertaken steps to improve liquidity management at the group level, strengthening monitoring, stress testing and analysis of risk factors, such as currency and/or tenor mismatches. Risk management in general, and liquidity risk in particular, seems to be attracting more attention from senior executives of international banks – although this focus on the liability side may weaken over time as conditions normalise.

Improvements in the management of cross-currency mismatches, more thorough and robust stress testing with particular emphasis on liquidity risks, and better coordination of intragroup liquidity pools, collateral and access to central bank facilities should all make banks more resilient to shocks similar to those faced in 2007–08.[51] Better alignment of internal fund transfer pricing with market conditions should also strengthen bank resilience. Subsidised internal transfers of funds may have contributed to excessive credit growth in some branches/subsidiaries of international banks, including some operations in emerging markets. Improved fund transfer pricing, possibly supplemented by internal quantitative self-sufficiency rules, may align the incentives of local subsidiaries with the broader group and encourage more prudent lending at local offices. In fact, as transfer pricing may be slow to influence local

[51] This relates to work by the Committee on Payment and Settlement Systems (CPSS) on expanding and enhancing operational arrangements for foreign-currency lending, inter-central bank FX swaps and cross-border delivery of securities.

behaviour, some banks indicated that they have augmented their pricing systems with quantitative targets for local funding. The net effect may be less centralisation in bank group funding.

Local liquidity regulation, in its narrow application, would probably trigger further adjustments in the geographical organisation of liquidity management. In particular, regulation or laws constraining the intragroup transfer of funds can be expected to have a significant impact.[52] For instance, netting and pooling liquid assets in regional hubs may no longer be feasible. Constraints on the circulation of cash and collateral within a banking group would increase the aggregate balance of liquid assets, as banks will tend to err on the side of caution given the difficulty in forecasting with precision local liquidity needs across jurisdictions and time zones.

Local liquidity requirements might bring certain benefits, as an element of greater self-sufficiency and an increased role of subsidiaries, and strengthen local resolution regimes. More decentralisation could help shield local creditors in case of bank failure, which is seen as an important benefit by some regulators. Increased self-sufficiency by local offices should also help reduce moral hazard and prevent the build-up of excessive risk. But these benefits should be weighed against the costs of holding more liquid assets and reduced financial flexibility with potentially negative effects on broader resilience.

Under crisis conditions, constraints on intragroup fund transfers may exacerbate problems. The ability to shift funds across jurisdictions was an important instrument of crisis management for many international banks. Contingency plans may be less effective if regulation or laws prevent banks from moving funds across jurisdictions in moments of stress. Such barriers could lead banks to keep idle pools of liquidity in certain jurisdictions, and hence presumably contribute to a misallocation of funds.[53] At the same time, however, increased holdings of liquid assets at the legal entity level would reduce the need for intragroup transfers in times of crisis.

Internal transfers proved important in a number of cases during the crisis, and obstacles to intragroup transfers could actually weaken individual banks and even systemic resilience. Thus, a more resilient funding regime would combine the discipline induced by more local funding during periods of expansion with flexible management of liquidity within the group during episodes of funding strains when the ability to move funds across jurisdictions in a timely way becomes critical.

Although regulators may wish to induce banks to establish more diversified, and hence more stable, funding sources, including retail deposits and increased local sourcing, there are, as discussed in this report, costs and limits to these changes. Regulatory barriers to a recovery of wholesale funding markets could pose additional limits to credit expansion and ultimately lead to disintermediation or a shift in the balance of capital market-based versus bank-based intermediation.

5.2. Macroeconomic implications

Expected changes in funding practices should lead, ceteris paribus, to increased cost and slower expansion of credit by international banks. To the extent that pre-crisis credit expansion may have been excessive, and credit risk underpriced, this would not necessarily be an undesirable outcome, although it would not favour rapid credit growth facilitating global recovery.[54] It would clearly be an exaggeration to claim that all or even most changes to credit

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[52] Indeed, as discussed above, the hypothetical application of BCBS liquidity proposals to the US operations of foreign banks may involve substantial local liquidity needs and have significant operational implications.

[53] In a *gone* concern situation, however, restrictions on intragroup transfers could have potential benefits in terms of facilitating orderly resolution and protecting local creditors.

[54] This report does not address capital adequacy regulation, which could work in the same direction.

behaviour are likely to stem from shifts in funding patterns, but the net effects, at the margin, would appear, at least in the near term, to be contractionary – even though they may lead to more sustainable patterns of credit growth in the future. All other factors remaining constant, a net contractionary effect would result from banks' increased market- or regulation-driven preference for liquid assets in an environment of reduced bank leverage. The effects of changes in bank funding on credit conditions would need to be taken into account in the setting of monetary policy.

The magnitude and distribution across borrowers of credit supply effects are hard to predict with precision. One possibility is that more selective and expensive lending to corporates more severely impacts small and medium-sized enterprises. Such firms, which tend to be more dependent on bank credit than larger ones, might face financing constraints as a consequence. Private households in both advanced and emerging markets, may also benefit less from favourable access to credit from international banks. It should be noted that these effects refer not only to quantity and price but also to the average tenor of credit by international banks, which could become shorter. That said, the proper pricing of risks would contribute to a more sustainable recovery in credit flows and to preventing the accumulation of potentially dangerous imbalances.

The impact on credit supply would probably also vary across jurisdictions. In particular, the effects on credit availability may well be stronger in economies that used to rely on intragroup transfers by international banks or wholesale funding to fund credit expansion. Among emerging markets, those in central and eastern Europe, particularly the smaller ones, seem more exposed to such changes than those in Asia and Latin America. As noted above, banks based in economies with large savings surpluses may well continue to rely on centralised funding, probably in a hub and spoke model, as their need for local sourcing is likely to be limited. Banks based in jurisdictions with large, deep financial markets should be able to cope relatively well with an increased degree of local sourcing, whereas those that rely more heavily on cross-border wholesale funding to supplement limited local sourcing would face more difficulties.

Changes in bank funding may also affect FX market liquidity and the composition of capital flows. Total FX turnover may decline, though perhaps not significantly as bank-related flows may be replaced by those from non-bank financial intermediaries, with capital markets taking up some of the intermediation role previously performed by banks. At the same time, the share of portfolio flows in capital flows may increase relative to cross-border bank flows as financial markets, at least partially, substitute for banks' internal markets and cross-border lending.

Banks' concerns about the functioning of foreign exchange swap markets, as well as self-sufficiency regulations, could limit intragroup transfers across advanced economies as well, probably not to the extent that international banking in these jurisdictions would become more similar to the predominantly decentralised model seen in emerging markets – or in emerging markets with non-convertible currencies – but possibly entailing, in case of excessive requirements on an individual basis, increased liquidity costs and trapped liquidity pools within financial groups.

Intragroup transfers performed the role of lender of last resort in some jurisdictions during the crisis, particularly where the monetary policy and exchange rate regimes prevented or limited the central bank's ability to play that role. Thus, in several countries monetary authorities would need to review their liquidity provision facilities, considering a scenario in which reduced intragroup flows would limit the ability of banks' headquarters to act as internal lenders of last resort.

Global and regional financial centres have traditionally performed a critical role within the hub and spoke model followed by many international banks. Given that the changes reported above regarding local sourcing refer to rebalancing within current models rather than complete overhauls, and that capital market activity is still likely to remain relatively concentrated in geographical terms, such centres will probably retain their prominence within the international

financial system, even if faced with more competition from rising centres in some emerging economies.

6. Conclusions

Banks' initiatives to strengthen liquidity management through improved and more frequent monitoring and analysis, including better stress tests, of tenor and currency mismatches are a welcome post-crisis development. Supervisory efforts to promote more robust liquidity buffers and risk management practices should reinforce and complement improvements at the bank level. Supervisory efforts should work towards ensuring that banks maintain robust liquidity management practices even as the memory of the crisis starts to fade. In other words, tighter liquidity regulation should be seen as complementary to, rather than as a substitute for, tighter risk management at the bank level.

The envisaged regulatory initiatives to promote greater liquidity and capital buffers combined with greater funding diversification, including more local funding of local assets and better risk control by banks, should enhance bank and systemic resilience, and help to curb excessive risk-taking and credit growth. Moves towards greater local liquidity regulation and self-sufficiency could help clarify lender of last resort responsibilities, protect local creditors in case of failure and mitigate contagion, but may also entail trapped liquidity and higher costs, with potentially negative effects on systemic resilience. In sum, the changes will not be without cost, and the ultimate effects will very much depend on implementation. Still, more appropriately priced and moderately paced credit expansion would strengthen banks' resilience to future shocks, so these developments would be welcome.

Regarding macroeconomic implications, the envisaged changes in funding and liquidity management on the whole seem likely to act in the short-term as brakes to credit expansion. This would probably affect countries with shallower funding markets and greater reliance on intragroup inflows more than those in which a greater degree of self-sufficiency is feasible. As indicated above, slower credit expansion, and more disciplined standards, would probably be more sustainable and thus perhaps desirable in steady state; however, the transition will probably not favour a credit-sustained economic recovery.

Overall, policymakers must be mindful that regulatory initiatives which are desirable on an individual basis might have a compounded effect with unintended consequences. Yet simple reversion to the status quo ante does not seem a likely or reasonable option, nor would it be consistent with the necessary enhancements to the resilience of the financial system.

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Annex 1:
Macroeconomic factors

This annex presents a simple regression to illustrate the role of macroeconomic factors in shaping banking activity in a particular location. For a panel of 29 countries, the purpose is to test which macroeconomic variables help explain the proportion of external (cross-border) funding of the banking system. Specifically,

$$Fund_{i,t} = b_0 + b\ Macro_{i,t} + b_2\ Dummy\ EME + e_{i,t}, \quad (1)$$

where the variable *Fund* stands for the ratio of banks' external liabilities to total bank liabilities (both external and domestic), while *Macro* is a vector of the macroeconomic fundamentals. Due to data restrictions, the following macroeconomic variables are employed, listed with the expected signs:

- *Trade* – measured by the degree of openness, defined as exports plus imports relative to GDP – positive sign
- *External imbalance* – current account result relative to GDP – negative
- *Interest rate differential* – domestic money market rates minus external money market rates (calculated using the simple average of US, Japanese and euro area rates) – positive
- *Financial depth* – total credit to the private sector as a percentage of GDP –ambiguous
- *Country size* – GDP based on purchasing power parity share in the world – negative
- *Country development* – a dummy variable for emerging markets (*Dummy EME*) – negative

A country with a higher degree of openness and thus a larger volume of trade is expected to host financial institutions with more inflows from abroad. The current account result gives an indication of the external financing needs, as larger deficits require more external funding. The interest rate differential, in turn, accounts for flows related to yield differentials.

Financial depth has an ambiguous sign a priori. Countries with more financial depth tend to be more integrated internationally, possibly with internationally traded currencies rather than local currencies, which should facilitate inflows. Such countries might need less external inflows than emerging markets, where local institutions might be unable to extend loans beyond a certain maturity. Emerging markets tend to have lower credit ratings, local currencies and limited access to international capital, so the EME dummy (with negative expected sign) controls for this type of heterogeneity in the data. Finally, country size may matter; larger economies tend to be less open and possibly more self-sufficient in terms of funding.

Using annual IMF(IFS) data for a panel of 29 countries from 2001 to 2008, the sample was determined by data availability.[55] For each country, the IMF data for the dependent variable (liabilities to non-residents as a proportion of total liabilities) refer to those depository institutions (including the offices of foreign banks) located in the country that issue liabilities that are part of the national definition of broad money. Table A1 shows the bivariate Spearman rank correlation between the ratio of banks' external liabilities to total bank liabilities and the listed variables, using the average over the period. The only variable that is statistically significant is the

[55] Australia, Austria, Belgium, Brazil, Bulgaria, Chile, China, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Indonesia, Ireland, Italy, Japan, Mexico, the Netherlands, Portugal, Russia, Spain, Sweden, Switzerland, Thailand, Turkey, the United Kingdom and the United States.

correlation with the EME dummy. However, the point estimates of the correlation suggest the expected signs. The estimation of the model is performed with ordinary least squares (OLS) and also with generalised method of moments (GMM), to account for possible endogeneity of the regressors. In the latter, we include lagged independent variables as instruments, and control for heteroscedasticity. We also estimate a GMM specification with two-way cluster-robust standard errors. A dynamic specification was not used because the lagged term of the dependent variable was not statistically significant.

The estimated coefficients all have the expected sign (Table A2). However, credit is not statistically significant in both GMM specifications, and current account is not significant in the second GMM specification (larger standard errors). We show the results only for the specifications where those variables are significant, although the point estimates are fairly robust across specifications. Therefore, the results indicate that the proportion of external funding of the banks located in a country is positively related to the degree of openness and to the interest rate, and negatively related to GDP size. The negative relationship with the current account balance is less robust. Furthermore, emerging market economies rely less on external funding. In the case of the Baltic states, two of the three macroeconomic factors often highlighted when explaining cross-border funding are consistent with the estimation results: current account deficits, related to their rapid economic growth and favourable economic prospects; and the small size of the economies (see Box 1 in the main text).

Overall, the results suggest that macroeconomic variables affect cross-border funding, even though they cannot be related directly to banks' funding models at this level of aggregation.

Table A1

Spearman rank correlations with proportion of external liabilities

Variable	Estimates
CURRENT ACCOUNT	–0.099 (0.51)
OPENNESS	0.273 (1.48)
GDP (share in the world)	–0.292 (1.58)
CREDIT	0.467 (2.75)
INTEREST RATE	–0.285 (1.54)
DUMMY EME	–0.71*** (5.17)

The t-statistics are given in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table A2

Regressions - dependent variable: external liabilities as a proportion of total liabilities

Regressor	OLS	GMM	
		I	II
Constant	20.10***	25.40***	24.32***
	(3.43)	(2.37)	(5.13)
Current Account	–0.29**	–0.29**	-
	(0.13)	(0.14)	-
Openness	0.12***	0.12***	0.13***
	(0.02)	(0.02)	(0.05)
GDP(share in the world)	–0.77***	–0.79***	–0.75***
	(0.20)	(0.10)	(0.23)
Credit	0.04**	-	-
	(0.02)	-	-
Interest rate	0.26**	0.29**	0.33*
	(0.11)	(0.13)	(0.18)
Dummy EME	–21.62***	–24.57***	–24.53***
	(2.21)	(4.29)	(3.93)
R2 Adjusted	0.53	0.53	0.52
F-test or Wald test	44.99	294.43	12.26
p-value	0.00	0.00	0.00

Standard errors are given in parentheses. *,** and *** stand for statistical significance at the 10%, 5% and 1% levels, respectively. GMM II refers to the specification with two-way cluster-robust standard errors.

Annex 2:
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Central Bank of Brazil	André Minella
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Bank of Mexico	Julio Santaella
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Sveriges Riksbank	Martin Johansson
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Observers: Mary Craig (Basel Committee on Banking Supervision); Nigel Jenkinson and Eva Huepkes (Financial Stability Board).

Annex 3:
Banking industry participation

Private sector bank	Roundtable	Bilateral interviews
ABN Amro		✓
Allied Irish Bank		✓
Argenta		✓
AXA Bank Europe		✓
Bank of America		✓
Bank of China Limited		✓
Bank of Montreal		✓
The Bank of Nova Scotia		✓
Barclays Bank	✓	✓
Banco Bilbao Vizcaya Argentaria (BBVA)	✓	✓
BNP Paribas		✓
Caja Madrid		✓
Calyon	✓	✓
Commerzbank		✓
Canadian Imperial Bank of Commerce		✓
Banco Santander	✓	✓
Citigroup	✓	✓
Crédit Suisse	✓	✓
Development Bank of Singapore		✓
Deutsche Bank AG	✓	✓
Dexia		✓
DZ Bank		✓
Fortis Bank		✓
Goldman Sachs		✓
HSBC	✓	✓
ING Bank		✓
KBC Bank NV	✓	✓
KBL Bank		✓
Landesbank Baden-Württemberg		✓
Bank of Tokyo-Mitsubishi UFJ	✓	✓
Mizuho Corporate Bank, Ltd		✓
Morgan Stanley		✓
Nordea		✓
Overseas Chinese Bank		✓
Rabobank	✓	✓
Royal Bank of Canada	✓	✓
Royal Bank of Scotland Group	✓	✓
Skandinaviska Enskilda Banken AB (SEB)	✓	✓
Société Générale		✓
Standard Chartered Plc		✓
Sumitomo Mitsui Banking Corporation		✓
Swedbank		✓
The Norinchukin Bank		✓
Toronto Dominion Bank		✓
UBS AG	✓	✓
UniCredit SpA	✓	✓
United Overseas Chinese Bank		✓