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The Impact of Cross–Border Banking on Financial Stability

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The Impact of Cross-Border Banking on Financial Stability

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Abstract

This paper focuses on the stability aspects of cross-border banking. We first argue that cross-border banking brings about various benefits and costs for financial stability. Based on this, we draw conclusions for the desirability of cross-border banking in the EU, and derive implications for its optimal form. Next, we derive metrics that allow quantifying whether cross-border banking in a country (or region) takes a desirable form and apply these metrics to the EU countries. Our results suggest that the countries with the largest banking centers, UK and Germany, are well diversified. By contrast, the New Member States (NMS) are highly dependent on a few West-European banks and thus vulnerable to contagion effects. The Nordic and Baltic regions are also much interwoven without much diversification. At the system-wide level, the EU banking system is weakly diversified, with an overexposure to the US and an underexposure to Japan and China. This explains why the recent US originated financial crisis had such a large impact on European banks.

JEL classification: G21, G28.

Keywords: International Banking, Portfolio Diversification, Financial Stability.

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1. Introduction

The recent financial crisis highlights the role of cross-border banks in transmitting a financial shock from one country to other countries. At the same time, cross-border banking may dampen the impact of a financial shock due to diversification effects. The net effect is not clear.

When trying to understand the overall impact of cross-border banking on financial stability, it is useful to disentangle the various costs and benefits of cross-border banking. A key benefit of cross-border banking arises due to diversification (Markowitz, 1957). By spreading its activities over different countries, banks are less exposed to a single domestic or foreign shock. This may in turn reduce the volatility of lending. More broadly, cross-border banking facilitates international risk sharing (e.g. Lewis, 1999). One strand of the literature on the nexus between competition and stability indicates that competition is beneficial for stability (e.g. Boyd and De Nicoló, 2005).

On the cost side, cross-border banking may transmit shocks across countries. Contagion may spread through direct exposures (e.g. Allen and Gale, 2000b) or through assets prices (e.g. Brunnermeijer et. al., 2009). Contagion-like effects can also arise due to coordination problems (e.g. Huang and Ratnovski, 2009). Global “contagion” through coordination problems played a significant role in the crisis (e.g. the breakdown of cross-border interbank markets). The negative effects from contagion only have the potential to outweigh the positive stabilizing effects in the presences of mechanisms that propagate the shock.

What is the overall impact of cross-border banking on financial stability? Theoretical research modeling various aspects of the costs and benefits of cross-border banking (e.g. Goldstein and Pauzner (2004), Dasgupta (2004) and Wagner (2010)) concludes that some degree of integration is beneficial but an excessive degree is not. They find an interior solution for the optimal degree of integration where the marginal costs equal the marginal benefits.

On the empirical side, several studies (e.g. Goldberg et. al. (2000), Navaretti et. al. (2010) and de Haas and van Lelyveld (2010)) examine the impact of foreign banks on domestic lending. These studies indicate that credit granted by foreign banks is more stable than credit granted by locally-owned banks, following a shock to domestic banks. But these empirical studies are measuring the stability aspects ex post.

This paper takes a different approach. We develop forward looking metrics to identify the optimal form of cross-border banking. First, indices for the in- and outward integration are constructed. Next, indices for the inward as well as outward diversification are developed. Finally, we develop a measure for the overall balance of integration and diversification. The aim of these metrics is to measure the resilience of a country’s banking system in the face of a domestic or foreign shock. Our metrics help to identify the dimension(s) along which the country’s (or region’s) cross-border banking can be improved.

We apply our metrics to the EU countries. We identify the group of countries that seem to have the “best” cross-border banking: countries which have balanced in- and outflows that are also

well diversified. We find that in particular Germany, the Netherlands and the UK are well diversified. Other Western-European countries, such as Spain, Italy and France, have a fairly balanced banking system. By contrast, Finland and Sweden have very unbalanced banking systems. The Nordic-Baltic region is dominated by a few large banks (e.g. Nordea) which lead to very poor diversification. Finally, the New Member States are dependent on a few Western-European banks, while there are no outward banking flows.

We also apply our metrics to the European financial system as a whole. There is only weak diversification, with an overexposure to the US and an underexposure to China and Japan. That explains why the recent financial crisis, which originated in the US, had a large impact on European banks.

The remainder of the paper is organized as follows. The next section reviews the literature on costs and benefits of cross-border banking from a stability perspective. The following section presents our metrics that allow quantifying whether cross-border banking in a country (or region) takes a desirable form. Section 4 applies these metrics to the EU, both at the country level and the system level. The final section concludes.

2. Costs and Benefits of Cross-Border Banking

This section reviews the costs and benefits of cross-border banking from a financial stability perspective. We discuss whether any general lessons can be drawn about whether cross-border banking is stability enhancing. In addition, we explore implications for the extent of cross-border banking, as well its optimal form. It should be noted that there is potentially a trade-off between stability and efficiency.

2.1. Benefits of Cross-Border Banking

A key benefit of cross-border banking arises due to diversification effects. It is widely known from portfolio theory (Markovitz, 1957) that an investor can reduce the risk in his portfolio by holding a combination of assets instead of investing in a single one only. Cross-border banking allows for similar diversification gains. When a domestic bank invests abroad (for example, by extending credit to borrowers in other countries or by acquiring foreign banks), it overall becomes less exposed to domestic shocks.¹ This reduces the variance of its asset portfolio. Lower asset volatility, in turn, should reduce the likelihood of bank failures in the domestic economy.

Setting aside banking failures, diversification effects from cross-border banking can also reduce the volatility of domestic lending. This is because a lower risk exposure of domestic banks reduces the likelihood that these banks come into situations in which they have to cut back lending. In addition, in the same way as banks can reap cross-border diversification benefits on

¹ At the same time, it of course also becomes more exposed to foreign shocks, an issue to which we will return later.

the asset side, they can reap benefits on the liability side. For example, a bank that has established significant depositor bases in other countries will be less affected by a domestic depositor panic.

While the benefits discussed so far arise from the cross-border activities of domestic banks, activities of foreign banks in the domestic economy bring about diversification effects as well. First of all, the presence of foreign banks allows domestic firms to have multiple lending relationships with domestic and foreign banks. When domestic banks are lending-constrained, firms can substitute domestic lending with finance from foreign banks. And in case they do not already have a relationship with a foreign bank, they may switch to a foreign bank that is present in the domestic market following a shock to the credit capacity of domestic banks.² In addition, even if individual firms cannot obtain more financing from foreign banks following a domestic shock, there are still benefits. This is because lending to domestic firms overall will be less volatile as only the domestically financed firms are affected.

On top of diversification gains that arise because cross-border banking reduces the risk of bank failures and stabilizes lending, there are also large benefits because cross-border banking can contribute to a better sharing of an economy's risks with other countries. In principle, such risk sharing could also be achieved by investors, at least with respect to tradable securities. However, it is a surprising feature of international finance that even though nowadays there are apparently few important impediments to international risk sharing, there is a significant lack of such risk-sharing. For example, it is well known that investors' portfolios exhibit a large bias towards holding domestic securities (French and Poterba, 1991).³ The gains that are foregone by this lack of risk-sharing are typically estimated to be large. These gains arise, first, because lower consumption variability benefits households due to risk-aversion (van Wincoop, 1999, for example, estimates these gains to be in the range of 1.1 – 3.5% of permanent consumption). Second, they also arise because lower risk exposure allows for specialization in higher return activities (e.g., Obstfeld, 1994).⁴

Another potentially important stability benefit of cross-border banking is due to the interaction of competition and stability. Foreign entry in the domestic market will tend to increase competition in the domestic banking market. This effect will be particularly pronounced if the domestic market was previously highly concentrated or if domestic banks were operating inefficiently (as often the case in developing countries). One strand of the extant literature on the nexus between competition and stability⁵ maintains that competition is beneficial for stability by

² Goldberg et al (2000) show that credit granted by foreign banks in Argentina and Mexico during the 1990s was more stable than credit granted by locally-owned banks. De Haas and van Lelyveld (2005) find that during crises domestic banks contract their credit base, while foreign Greenfield banks do not. Navaretti et al (2010) find that retail and corporate lending of banks' foreign affiliates has been stable and even increasing in Europe between 2007 and 2009. At the global level, de Haas and van Lelyveld (2010) show that foreign multinational banks, in contrast to domestic banks, may not have to reduce lending because they have access to the internal capital market.

³ Excellent surveys of the substantial literature on the international risk sharing puzzle (and the related home bias in portfolio investment) are contained in Stulz (1994) and Lewis (1999).

⁴ Consistent with the specialization argument, Kalemli-Ozcan et. al. (2010) show empirically that financial integration reduces business cycle synchronicity.

⁵ For an overview over this literature see the survey by Carletti and Hartmann (2002).

mitigating agency problems at the level of the borrower (e.g., Boyd and De Nicoló, 2005). The argument goes as follows. Higher competition among banks lowers lending rates and thus raises the profits for borrowers. This, in turn, reduces risk-shifting incentives for borrowers and lowers borrower risk.⁶ Borrower risk may also decline because a higher profitability directly lowers the likelihood of defaults.

While foreign entry affects competition through an increase in the number of banks in the market, additional effects may arise because foreign banks may also be more efficient (for example, foreign banks that enter developing markets may have more advanced risk management systems). Competition may then force domestic banks to become more efficient as well, hence further enhancing stability. Competition effects aside, the presence of foreign banks may also be beneficial once a crisis happens because it allows domestic depositors to do their “flight to quality” at home (see Clarke et. al, 2000). In addition, foreign banks can assist in the recovery from a crisis by purchasing assets (Tschoegl, 2004).

2.2. Costs of Cross-Border Banking

Cross-border banking undoubtedly brings about many important benefits for financial stability. However, there are also various potential dangers for financial stability arising from cross-border banking.

First of all, foreign capital is likely to be more mobile than domestic capital. Following a negative event that reduces the attractiveness of investment in the domestic economy, foreign banks may decide to “cut and run”. The ability of domestic banks to redeploy their capital quickly outside the country, by contrast, is limited. The extent to which foreign capital is more sensitive than domestic capital crucially depends on which form cross-border banking takes. In particular, foreign banks are less likely to cut and run if they have established their presence in the form of a subsidiary (due to the presence of significant fixed costs). This is confirmed by studies showing that lending by subsidiaries is more stable than direct cross-border lending (e.g., Peek et. al., 2000, de Haas and van Lelyveld, 2004, McCauley et. al., 2010).

Another important cost comes in the form of contagion: in the same way as cross-border banking insulates the domestic economy from domestic shocks, it also exposes it to foreign shocks. For example, the presence of foreign banks in emerging markets contributed to the transmission of the crisis of 2007-2009 to these markets, both through a reduction in direct lending and through internal capital markets (Cetorelli and Goldberg, 2009). Contagion can arise through various channels.⁷ In its simplest forms it arises from direct exposures.⁸ Domestic banks may encounter losses on their foreign operations, which may then have negative implications for their (domestic) lending. An example of this is the German Landesbanken:

⁶ Boyd, De Nicoló and Jalal (2007) provide evidence consistent with this channel.

⁷ There is some debate in the academic literature on how contagion should be defined. For the purpose of this report we adopt a broad view on contagion. For a survey of various channels of contagion, see Allen, Babus, and Carletti (2009).

⁸ Various studies have modeled contagion from direct exposures (usually interbank); see, for example, Allen and Gale (2000b) and Freixas, Parigi and Rochet (2000).

during the crisis of 2007-2009 Landesbanken with subprime exposures cut back lending more than their peers (Puri et. al. 2009).

Another form of contagion, one which significantly contributed to the global spread of the subprime crisis, arises through asset prices. Following a negative shock in their country, banks may have to sell assets. This depresses prices and negatively affects banks from other countries that have invested in these assets. In fact, asset price contagion has become a powerful mechanism through which initially local shocks can be transmitted in an internationally integrated financial system to a worldwide level.

Contagion may also be of informational nature. The failure of institutions in a country typically carries news about the performance of the country's assets. This, in turn, will cause debtors at other banks that have invested in this country to update their beliefs about the health of their banks and may result in runs at these banks as well (e.g., Chari and Jagannathan, 1988, Flannery, 1996, Aghion, Bolton, Dewatripont, 2000, and Dasgupta, 2004).

Contagion-like effects can also arise due to coordination problems. As the crisis of 2007-2009 has highlighted, the financial system is plagued by various coordination problems. The textbook-case of coordination failures is the one faced by depositors and can lead to a run on an otherwise solvent bank (e.g., Diamond and Dybvig, 1983).⁹ Similar coordination failures arise in wholesale financing (Huang and Ratnovski, 2009), interbank markets (see, e.g., Freixas, Parigi and Rochet, 2000, or Rochet and Vives, 2004) and cross-border banking (e.g. Schoenmaker and Oosterloo, 2005). Global "contagion" through coordination problems played a significant role in the crisis. For example, the breakdown of cross-border interbank markets is often attributed to coordination problems. Globally active banks were hurt by this breakdown even when the source of the breakdown was unrelated to the fundamentals of these banks. Similar contagion occurred due to the breakdown of global securitization markets.

It is important to note that the existence of contagion or spillovers from cross-border banking itself does not undermine the rationale for integration. It is true that it exposes the domestic financial system to shocks from abroad. However, at the same time it also insulates it from domestic shocks. Standard portfolio diversification considerations suggest that the net effect is positive and hence, overall, fluctuations are reduced. To see this more clearly consider the case of a domestic bank investing a share of its assets abroad. This case can be likened to the one of an investor who diversifies his portfolio. Surely, an internationally diversified asset portfolio will be exposed to foreign risks but its overall volatility will be lower than the one of a purely domestic portfolio.

Contagion effects themselves thus should not invalidate the rationale for cross-border banking. This is an insight that is often ignored in the policy debate. It is quite common to interpret the existence of negative spill-overs (such as observed in the crisis) as to imply that cross-border banking is undesirable. This clearly ignores the positive stabilizing effect of cross-border banking that are less visible than (negative) contagion: when foreign banks hold a part of the

⁹ Because a bank may not be able to liquidate its portfolio at the full value, a run itself can make the bank insolvent, which in turn may make it individually rational for depositors to run on the bank.

domestic loan portfolio, domestic banks will be less affected following domestic shocks, hence stabilizing the domestic economy. To put this into perspective with the recent crisis, the effect of US subprime defaults on the US economy were surely large. However, they would have probably been much larger if not a significant part of the subprime exposures were held outside the US. Diversification ensured that the effects were more evenly felt in various countries around the world, rather than concentrated in the US.¹⁰

The negative effects from contagion only have the potential to outweigh the positive stabilizing effects in the presence of some mechanisms that propagate either the magnitude or the costs of spillovers (as otherwise the considerations of standard portfolio theory apply). Such propagation mechanisms can be due to coordination problems (such as suggested by the global games literature, e.g., Goldstein and Pauzner, 2004, Dasgupta, 2004, and Goodhart and Schoenmaker, 2009), because of cross-border resolution (e.g. Claessens, Herring and Schoenmaker, 2010), spillbacks from risk transfer (Allen and Carletti, 2006) and higher costs of systemic crisis (Wagner, 2010). However, the results of the literature are still inconclusive and derived in rather specific contexts. It is hence less clear how important these mechanisms are and whether they can overturn the general desirability of cross-border banking and integration due to diversification gains. More research in this area is needed.

While we have previously pointed out that cross-border banking can have positive effects for stability by fostering competition in the lending market, the channel going through competition can also go the other way around. A key argument in that respect is the franchise value hypothesis (see, among others, Keeley, 1990, Allen and Gale, 2000a, Hellman, Murdock and Stiglitz, 2000, and Repullo, 2004). Its basic idea is that when banks compete more intensely for deposits, deposit rates rise and lending rates fall. This leads to an erosion of their franchise value. Banks have then less to lose from a default and their incentives to take on risk increase. Thus, essentially the same mechanism that operates at the level of firm and is stability enhancing, also operates at the level of the bank and is detrimental to stability.

Cross-border banking affects the resolution of financial crises (Schoenmaker, 2011). While crisis resolution is important for ex-post efficiency, it also has stability implications ex-ante. For example, an uncertain and opaque resolution mechanism for international banks may increase uncertainty ex-ante, which can exacerbate coordination problems and increase banking fragility (see, e.g. Claessens, Herring and Schoenmaker, 2010). In addition, there are also arguments that a cross-border bank may be treated more leniently by regulation and supervision.¹¹ This can undermine bank stability by intensifying risk-taking problems at banks. Cross-border banks are also harder to supervise as for efficient supervision supervisors need to have access to information on banks' foreign operations.

¹⁰ The diversification effects arising due to cross-border banking, however, can be detrimental if banks lose focus. Acharya et. al. (2006) provide evidence that banks that diversify their loan portfolio (not specifically on the international level) lose focus in the operations. This reduces the return on their portfolio but can also increase their risk.

¹¹ For example, Beck, Todorov and Wagner (2010) show theoretically that cross-border asset and deposit holdings increase regulatory leniency, while cross-border equity ownership reduces it.

The formation of cross-border banks will also tend to increase the complexity, the interconnectedness and the size of institutions. This means that cross-border banks are more likely to be systemically relevant banks. Their failure may thus impose significantly higher costs on economies than the failure of a purely domestic bank. Cross-border banks may also increase systemic risk by increasing similarities among institutions. This is because international diversification exposes banks in different countries to the same shocks. Even though in an internationalized banking system there may be less individual bank failures (since banks will be better diversified), this may result in more joint failures of banks (Wagner, 2010).

2.3. Implications for Stability-Enhancing Cross-Border Banking

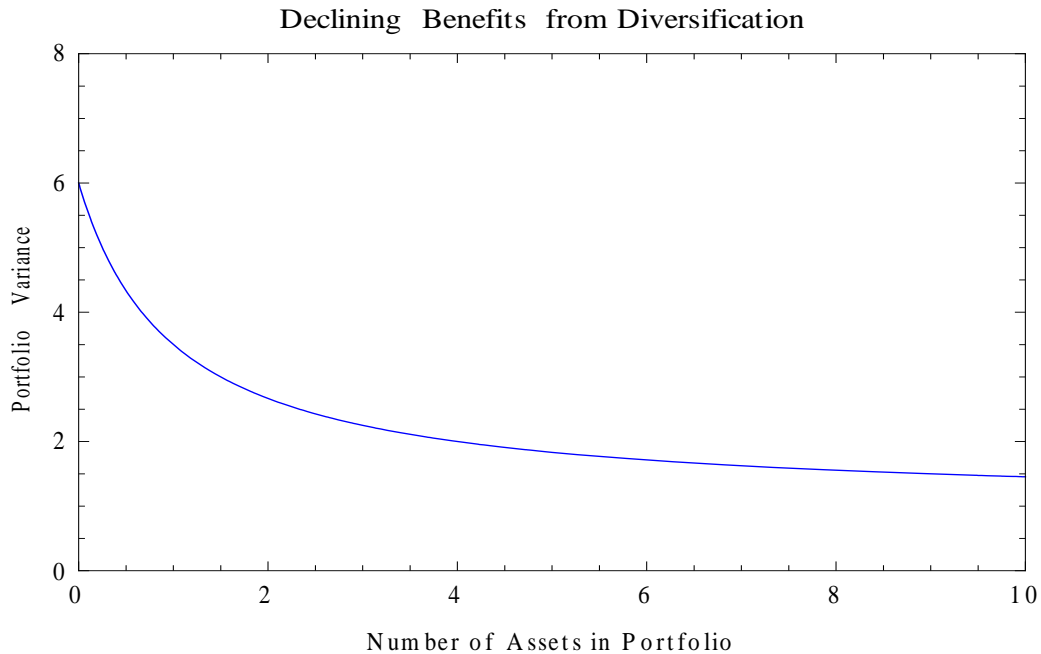
In this sub-section we discuss whether any general lessons can be drawn about whether cross-border banking is stability enhancing. In addition, we also explore implications for the extent of cross-border banking, as well its optimal form. In doing so, we focus on the stability-perspective arising from cross-border banking. It should be noted that there is potentially a trade-off between stability and efficiency. For example, while diversification due to cross-border activities may be stability enhancing, it may also mean a loss of specialization for banks. This may reduce focus (and lead to less efficient monitoring and screening) but also increase the costs of banks' activities, for example if there are additional costs of operating in various regions.

We have argued that cross-border banking brings about important stability benefits, perhaps most prominently in the form of diversification for banks and risk sharing in the economy, but also has potential costs. The benefits from cross-border banking probably outweigh the costs, as long as cross-border banking does not become excessive. This is for various reasons. First, diversification benefits are undoubtedly large. The presence of contagion effects by themselves, which are usually seen as perhaps the most important disadvantage of cross-border banking, seems unlikely to outweigh these gains: standard portfolio theory suggests that even though diversification into new assets gives rise to new exposures, overall risk is reduced. The policy debate has probably unduly focused on the negative spillovers from cross-border banking rather than on its stabilizing effects, which are naturally less visible.

There is also evidence which points us in the direction of beneficial effects of cross-border banking that are dominating. Demirgüç-Kunt et. al. (1998) present data which suggests that an increased participation of foreign banks tends to lower the probability of a banking crisis. Levine (1999) finds that there is a negative correlation between the foreign share of bank assets and the probability of crisis. Morgan and Strahan (2003) show that deregulation has lowered the volatility of lending in the US (however, the international evidence in their paper is mixed). Claessens (2006) finds that, by enhancing risk-sharing, foreign bank activities in a particular country reduce the likelihood of a financial crisis and lead to less procyclical lending in this country.

Second, the (marginal) benefits of cross-border banking are likely to be large for low levels of cross-border banking, while the costs are probably small. Figure 1 shows the effect of diversification on portfolio variance.

Figure 1



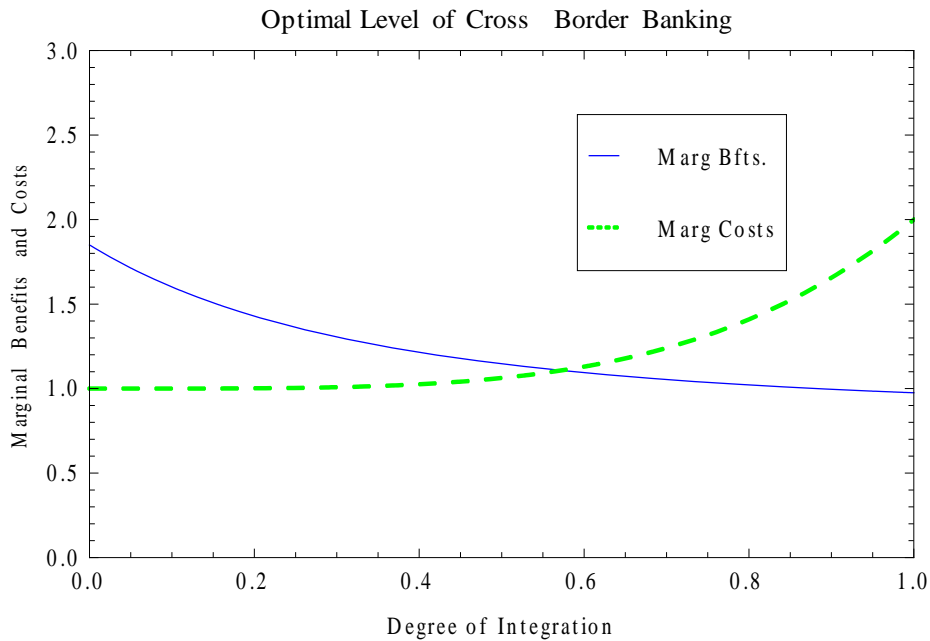
We can see that for low levels of diversification, its marginal gains (in terms of reducing portfolio variance) are the largest. As the extent of diversification increases, the additional gains become smaller and smaller. Close to full diversification, the variance reduction achieved by diversification becomes vanishingly small. At the same time, low levels of cross-border banking are likely to cause little costs such as from contagion or systemic crisis. For example, a small exposure to foreign shocks is unlikely to cause failures in the domestic economy. Rather it is likely that the costs from the latter are increasing (or at least non-decreasing) in the amount of integration. There may also be some threshold level at which marginal costs are increasing. This may be because a certain minimum exposure to foreign shocks may be needed to cause damage to the domestic banking system.

Figure 2 shows the marginal benefits and costs of cross-border banking. The optimal degree of integration is given by the point at which the marginal costs equal the marginal benefits. Due to the fact that we have declining marginal benefits but constant or increasing marginal costs, this degree is likely to be interior. In other words, some degree of integration is beneficial but an excessive degree is not.^{12 13}

¹² Theoretical research modeling various aspects of the costs and benefits comes to similar conclusions; see Goldstein and Pauzner (2004), Dasgupta (2004) and Wagner (2010).

¹³ The case for an interior degree is less clear for small countries and in asymmetric settings. For example, when there are fixed costs of setting up a sophisticated (domestic) banking system, it may be worthwhile (in particular from an efficiency perspective) for a small economy to be largely financed by foreign banks (consider, for example, New Zealand which mainly has foreign-owned banks). However,

Figure 2



Third, a large part of the potential costs from cross-border banking can be avoided, or at least mitigated. For example, for a given level of cross-border activities, the influence of foreign shocks can be minimized by having diversified foreign activities. Of course, if a country's banking system invests mainly in a single other country, problems in this other country can have large effects on the domestic economy. However, if the foreign activities are well diversified, foreign shocks will be less important.¹⁴ In addition, the net benefits from the presence of foreign banks can be maximized when foreign banking takes the form of subsidiaries. As discussed earlier, lending through subsidiaries is generally more stable in times of crises than direct cross-border lending (through branches).

Fourth, various costs of cross-border banking are not specific to the cross-border dimension. For example, cross-border banking may bring about stability costs by increasing size, complexity and interconnectedness of institutions. However, an institution that expands domestically may cause similar stability problems arising, for instance, from its greater size than if it expands abroad. The problems are thus not cross-border activities per se. In fact, for a given size (complexity, interconnectedness) it may be preferable to have a higher degree of cross-border activities due to the diversification benefits this brings about.¹⁵

such a country will be very exposed to foreign shocks and hence probably not optimally diversified from a stability-perspective.

¹⁴ Consistent with this, Allen and Gale (2000b) show that contagion effects are minimized in an interconnected network structure, which can be interpreted as a diversified cross-border exposure.

¹⁵ A bank's expansion within a country can also result in contagion as economic conditions within a country are more correlated than between countries (e.g. Slijkerman, 2007). Interestingly (and in contrast to cross-border banking), one rarely hears policy-makers lamenting contagion within a country.

We thus believe that a healthy amount of cross-border banking is likely to be beneficial for stability. However, it is important that cross-border banking takes forms that minimize its costs while reaping maximum benefits (later in this chapter we develop metrics that allow quantifying whether cross-border integration in a certain country or region takes place in way to maximize effectiveness). In addition, cross-border banking may become undesirable if it exceeds a certain degree. This degree may depend on various factors. For example, a country that has a business cycle that is less synchronized with the ones of other countries has a larger diversification potential. Its optimal degree of integration is hence likely to be larger.¹⁶

Among others, this would suggest that optimal cross-border banking integration inside Europe should be smaller as the European countries are a relatively homogenous group of countries compared to the rest of the world. However, this ignores the important fact that within the Eurozone the exchange rate is missing as a shock absorber. Shocks that are not EMU-wide create disparities among countries that can only be absorbed by price adjustments in the respective countries. This is a process that takes time and is generally considered to be relatively costly. This suggests that the optimal level of integration within EU might well be higher. Within the EU there is also a higher potential to coordinate actions in order to limit any adverse issues arising from cross-border banking (such as the more complicated resolution of cross-border bank failures and regulatory "races to the bottom"). Again, this suggests lower costs of integration in the EU and hence also a higher optimal degree of integration.

3. Measuring the Balance of Cross-Border Banking

We have previously discussed the costs and benefits of cross-border banking from a financial stability perspective. We have in particular argued that cross-border banking which attempts to reap maximum gains from cross-border banking but minimizes its costs is probably beneficial for financial stability. In this section we propose various ways for how one can measure whether cross-border banking takes place in such a way, which we will (for reasons that will become obvious later) call balanced cross-border banking. Afterwards, we apply these measures to EU-countries.

It is important to realize that there are two levels at which one can judge whether cross-border banking is balanced: at the level of an individual country or at the level of the EU (or the world).¹⁷ The following simple example demonstrates the differences between both. Suppose various banks from different countries start to invest in country A. From the viewpoint of each individual bank this may amount to beneficial diversification (if initial exposure to A is not large). However, if many banks invests in A, the set of countries may collectively become vulnerable to

¹⁶ From Figure 2 it is easy to see that an increase in the marginal benefits (a shift of MB upwards) increases the optimal degree of integration.

¹⁷ There is a third level, the level of balancedness/diversification within a country, which is, however not the focus of our analysis.

shocks from A (another issue is, that at the same time A will also become dependent on other countries).¹⁸

3.1. Balanced Cross-Border Banking From the Viewpoint of Individual Countries

From the viewpoint of an individual country, cross-border banking maximizes its net stability benefits if it achieves high diversification gains without creating undue systemic risk or regulatory distortions (such as from a race-to-the-bottom that results in overly lenient regulation, see Acharya, 2008). For an individual country, cross-border banking can take place in two directions. First, banks of the country may (directly or indirectly) hold claims to the assets of other countries. Second, banks from other countries may invest in assets of the country in question. We call the first type of cross-border banking outward (cross-border) banking and the second type inward cross-border banking.

As we have argued earlier, each direction of cross-border banking can deliver potential diversification benefits for a country. Outward investment means that domestic banks will not only be exposed to domestic shocks but also to foreign shocks through their foreign asset claims. Inward investment, if it takes the form of lending, implies that some domestic firms will be financed by foreign banks. This suggests that domestic lending will be less sensitive to shocks that affect domestic banks.

Each direction of integration in isolation thus can bring about benefits. What about the combination of inward and outward integration? Are the benefits from one form of integration depending on the extent of integration in the other form? On some level, one may expect both directions to be substitutes. For example, if the banks of a country are heavily invested abroad, domestic lending will become less dependent on domestic shocks. This, in turn, will alleviate the need for further risk sharing, such as coming from inward integration. However, outward (asset) investment only insulates domestic banks against shocks that come from the asset side. All other shocks, such as funding shocks, will still affect them to the full extent. Thus, the degree of substitution may effectively be limited among both forms of integration.

To the contrary, there are also plausible arguments why both forms of integration may be complements, or, in other words, that a mismatch between the two forms of integration may induce costs. Either form of integration potentially brings about diversification benefits of different sorts. For example, while inward diversification also insulates against funding shocks, outward diversification mainly relates to asset shocks. And since the marginal gains from diversification are declining, it is better to have a bit of both sorts of diversification rather than a larger amount of one sort of diversification. A mismatch of inward and outward investment may also exacerbate the influence of exchange rates movements on the country's consolidated banking system. In addition, a mismatch of both types of investment is likely to bring about greater political costs. A country that mainly faces outward integration, for example, may have an interest in a more lenient banking regulation as the costs of banking instability will to a large part be felt outside the country. In addition to developing indices for each dimension of

¹⁸ For more extensive discussions on differences between individual and systemic risk, see Acharya (2001), Acharya and Yorulmazer (2004, 2005), Wagner (2010a), Brunnermeier et al (2009, page 25).

integration we will thus also propose an index for whether integration is harmonized along both dimensions.

We introduce the following notation. We denote with a_i the total (domestic plus foreign) assets of the consolidated domestically-owned banking sector of country i . In addition, we denote with $f_{i,j}$ the total assets banks from country i have in country j . In order to save on notation in what follows, we define $f_{i,i}$ to be zero.

Our first two indices are measures of the total level of cross-border banking of a country. As previously discussed, diversification benefits are rapidly declining while the costs of integration are constant or even increasing. Thus there may be an optimal interior degree of integration that balances the costs and benefits of integration. The first measure is a simple measure of outward integration of a country. This measure simply scales total outward assets of a country by the total assets of its banking system. In particular, we define an *index of outward integration* of country i as follows:

$$Out_i = \frac{\sum_{k,k \neq i} f_{i,k}}{a_i} \quad (1)$$

This index is between zero and one and is increasing in the extent of integration. Similarly, we can define an index of inward integration. For this it is natural to scale again by total assets of the country. We obtain for the *index of inward integration* of country i :

$$In_i = \frac{\sum_{k \neq i} f_{k,i}}{a_i} \quad (2)$$

Note that this index can now be larger than one.

From these indices we define in turn the *integration balance* of country i as follows:

$$Bal_i = 1 - \frac{|Out_i - In_i|}{Out_i + In_i}. \quad (3)$$

This index will be one if integration is perfectly balanced along its directions ($Out_i = In_i$) and will be zero if integration only takes place along one dimension (consider, for example, $In_i = 0$ and $Out_i > 0$).

While these measures concern the *extent* of cross-border banking, the next measures concern its effectiveness for a given extent. Naturally, integration will be more effective if it maximizes the benefits from diversification. For example, for a given level of outward investment, stability benefits are enhanced if this investment is appropriately spread among countries such as to minimize variance and contagion effects.

How should a country's investment optimally be allocated among other countries? While optimal portfolio allocation problems are obviously complex, portfolio theory suggests a simple approximation to the allocation problem. Recall that the CAPM stipulates that each investor

holds a share in the market portfolio, that is, a share in the universe of all assets. We can approximate a country's share in the market portfolio by the assets of its banking sector (this obviously ignores differences in correlations across countries). Thus, the ratio of outward investment of country i in country j to country i 's total outward investment should ideally be equal to the ratio of country j 's assets to the combined assets of all other countries than country i . An index of the effectiveness of diversification in outward integration can thus be constructed by looking at how close on average a country's outward investment portfolio share in another country is to the other country's weight in the world. An index of *diversification in outward investment* of country i is thus given by:

$$Div_i^{Out} = 1 - \frac{1}{2} \sum_{j, j \neq i} \left| \frac{f_{i,j}}{\sum_{k, k \neq i} f_{i,k}} - \frac{a_j}{\sum_{k, k \neq i} a_k} \right|. \quad (4)$$

Note that $\frac{f_{i,j}}{\sum_{k, k \neq i} f_{i,k}}$ is the share of the outward investment of country i that goes to country j and that $\frac{a_j}{\sum_{k, k \neq i} a_k}$ is the share of country j assets in world assets (excluding country i). The term $\left| \frac{f_{i,j}}{\sum_{k, k \neq i} f_{i,k}} - \frac{a_j}{\sum_{k, k \neq i} a_k} \right|$ thus gives us the deviation of the actual allocation of country i assets to country j from the ideal one. The index will thus be one if diversification is perfect and zero if investments are spread in the lumpiest fashion.¹⁹

A similar index can also be constructed for inward investment. Diversification in inward investment matters because domestic firms are then financed by banks from different countries. This makes it less likely that many of these firms experience credit supply shocks at the same time, thus stabilizing domestic lending. The index of *diversification in inward investment* of country i can thus be written as:

$$Div_i^{In} = 1 - \frac{1}{2} \sum_{j, j \neq i} \left| \frac{f_{j,i}}{\sum_{k, k \neq i} f_{k,i}} - \frac{a_j}{\sum_{k, k \neq i} a_k} \right| \quad (5)$$

So far, we have constructed three indices to assess the different dimensions of cross-border banking. It is also interesting to assess the overall quality of cross-border banking. For this we take the average of the indices (balance, outward and inward diversification). Thus, we calculate an *overall index of integration* of country i as:

¹⁹ The benchmark for our asset allocations are the country's asset weights. While this benchmark relates to the idea of optimal diversification, an alternative way to quantify integration is to study how close a country's asset holdings of another country are to the country's trade-weights. However, while trade-connections seem a natural benchmark for allocating assets, this will not necessarily measure whether a country's portfolio is well diversified. In fact, diversification gains might be lower when investing in countries with which one has a lot of trade. This is because trade itself already acts as a risk-sharing device.

$$Over_i = \frac{1}{3}(Bal_i + Div_i^{Out} + Div_i^{In}) \quad (6)$$

Again this index will be one if integration is perfect and zero if integration is very poor.

3.2 Systemic Balance of Integration

We now turn to the systemic aspect of integration. Even though individual and systemic integration are obviously connected, these concepts are not the same. We have previously already given an example for this. Another example is the following. Suppose that each EU country's outward investment is very undiversified (in the extreme: it only goes to only one other non-EU country). Each individual country's diversification will thus be very low. However, if each of these countries specializes in its investment in different countries (outside the EU), the EU as a whole may be well diversified. It is thus important to distinguish between both levels of integration.

Starting with outward integration, we consider cross-border banking of the EU to be balanced if the combined assets of EU countries are appropriately spread among all the other non-EU countries. For this *external* diversification we can simply apply the same argument that we previously considered at the level of the country on the EU level. This leads to the following index of *systemwide external outward diversification* in the EU:

$$Divex_{EU}^{Out} = 1 - \frac{1}{2} \sum_{j, j \notin \{EU\}} \left| \frac{f_{EU,j}}{\sum_{k, k \notin \{EU\}} f_{EU,k}} - \frac{a_j}{\sum_{k, k \notin \{EU\}} a_k} \right|, \quad (7)$$

where we have denoted with $f_{EU,j} = \sum_{k, k \in \{EU\}} f_{k,j}$ total outward investment of EU in country j . Note that equation (7) is identical to (4) if one replaces EU with country i . Analogously we can also define the index of *systemwide external inward diversification* in the EU:

$$Divex_{EU}^{In} = 1 - \frac{1}{2} \sum_{j, j \notin \{EU\}} \left| \frac{f_{j,EU}}{\sum_{k, k \notin \{EU\}} f_{k,EU}} - \frac{a_j}{\sum_{k, k \notin \{EU\}} a_k} \right|, \quad (8)$$

where $f_{j,EU} = \sum_{k, k \in \{EU\}} f_{j,k}$.

Index (7) and (8) address the question of how the EU is diversified vis-à-vis other, non-EU, countries. An equally interesting question is in addition of how the EU is diversified *internally* within its borders. For this we can consider the total foreign assets of the EU and look whether they are appropriately distributed within the EU. We obtain for the outward and inward indices of the EU:

$$Divin_{EU}^{Out} = 1 - \frac{1}{2} \sum_{j, j \in \{EU\}} \left| \frac{f_{EU,j}}{\sum_{k, k \in \{EU\}} f_{EU,k}} - \frac{a_j}{\sum_{k, k \in \{EU\}} a_k} \right| \quad (9)$$

$$Divin_{EU}^{In} = 1 - \frac{1}{2} \sum_{j, j \in \{EU\}} \left| \frac{f_{j,EU}}{\sum_{k, k \in \{EU\}} f_{k,EU}} - \frac{a_j}{\sum_{k, k \in \{EU\}} a_k} \right| \quad (10)$$

The first index will be the larger the closer on average the share of outward investment of an EU country in total outward EU investment is to the country's asset share in the EU. Similarly, the second index will be increasing in the proximity of the share of inward investment of an EU country (relative to total EU inward investment) to the country's EU asset share.

4. Empirical Results

In this section we characterize integration in the EU using the indices in the previous section. Finally, we address the policy implications of the results. If certain regions are less balanced, additional policy measures may be needed to foster financial stability.

4.1 Data

The data employed in this chapter are drawn from a number of public sources. Cross-border claims are taken from the consolidated banking statistics of the Bank for International Settlements (BIS). The consolidated banking statistics provide details of cross-border claims of 30 major international banking centers to more than 200 individual debtor countries. The EU is well covered with 13 countries. These are the EU15 countries excluding Finland and Luxembourg. The latter two as well as the New Member States (NMS12) do not have any large banks that do sizeable business abroad.²⁰ The outflows are thus set at zero for these countries. On the receiving side, all EU countries are included in the debtor countries. We thus have a full set of inflow data. The consolidated cross-border claims are available on a bilateral basis either on an immediate borrower, or an ultimate risk basis. Our choice fell on the former since they cover a significantly longer time horizon. That allows us to collect data for each pair of countries.²¹

Total assets of the consolidated banking sector of each EU country are taken from the European Central Bank (ECB). There are some missing data on total assets for the early 2000s for some of the NMS, prior to their accessions in 2004 and 2007. The missing data are filled in from national sources. The cross-border claims and total assets enable us to calculate the indices for individual countries. For the systemwide indices, we also need data from non-EU countries. The BIS cross-border claims are collected on a global scale. Total assets are taken from the International Financial Statistics (IFS), collected by the International Monetary Fund (IMF). The data are on a quarterly basis and cover the period from 2000 Q1 to 2010 Q1 in case of the ECB and 2001Q4 to 2009Q4 in case of the IFS database.

²⁰ Finland dropped out in 2004, when the head office of its largest bank moved to Stockholm as part of the Nordea Group.

²¹ A disadvantage of the consolidated BIS data is that they also contain local claims that are denominated in a foreign currency. However, at least for the larger countries in the EU, this issue should be less important.

Table 1: Summary Statistics of Indices

<i>Indices</i>	Mean	Median	Standard deviation		Minimum	Maximum	Sample size
			Time-series	Cross-sectional			
<i>Out</i>	0.09	0.00	0.03	0.14	0.00	0.62	1,107
<i>In</i>	0.35	0.25	0.08	0.24	0.05	1.26	1,107
<i>Bal</i>	0.32	0.00	0.09	0.37	0.00	1.00	1,107
<i>Div^{Out}</i>	0.67	0.70	0.07	0.14	0.24	0.88	510
<i>Div^{In}</i>	0.54	0.56	0.06	0.17	0.09	0.85	1,107
<i>Over</i>	0.43	0.35	0.05	0.24	0.04	0.85	1,107

Table 1 provides the summary statistics of the indices of the individual EU countries. A detailed description of the indices is provided in the next sub-section. The mean of the outflows is lower than that of the inflows. Moreover, the median of the outflows is zero reflecting the fact that many countries, in particular the NMS12, do not have outflows. The integration balance for these countries is then also zero. The outward diversification appears to be stronger than the inward diversification. We also look at the standard deviation in the sample. It shows that the variation over time is far less than the variation in the cross-section of countries.

Turning to the development over time, we calculate the times series of each index for EU15 and NMS12. We apply a weighted average - with a country's total assets as weight - to reflect the economic impact of the group of countries as a whole. Figure 3 illustrates a decline in the outflows after the outburst of the financial crisis (2008 Q2), but the outflows remain above the pre-accession levels (2004). Figure 4 indicates that the inflows of the NMS12 are increasing over time and remain more or less flat during the financial crisis episode (2008-2009). For the EU15 the inflows are relatively low (10% to 20%) and stable over time. Interestingly, the balance of integration for the EU 15 improves from 0.6 to 0.7 (Figure 5) over the time period. The outward diversification is at a high level (about 0.7 in Figure 6), but shows a small decline over the sample period. Figure 7 indicates that the inward diversification remains flat over time both for the EU15 and NMS12. Finally, Figure 8 also suggests that the overall integration is not much changing over the ten year period.

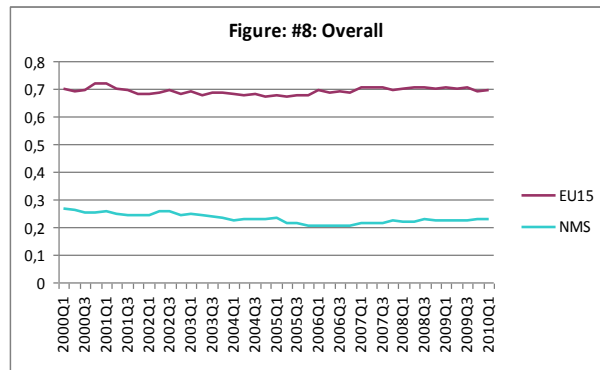
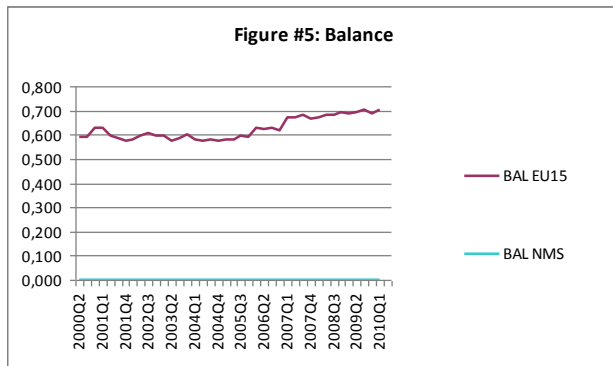
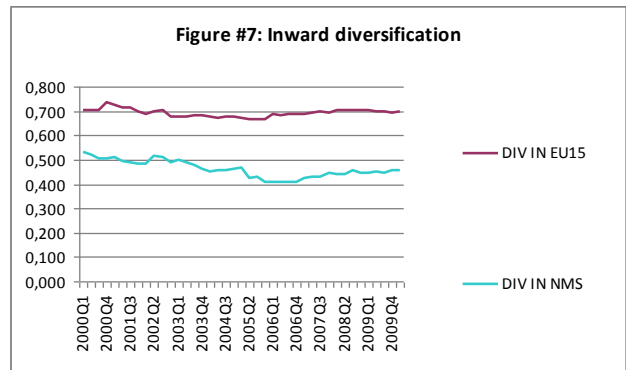
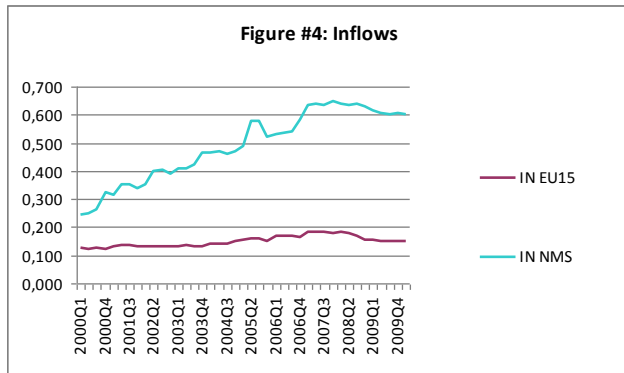
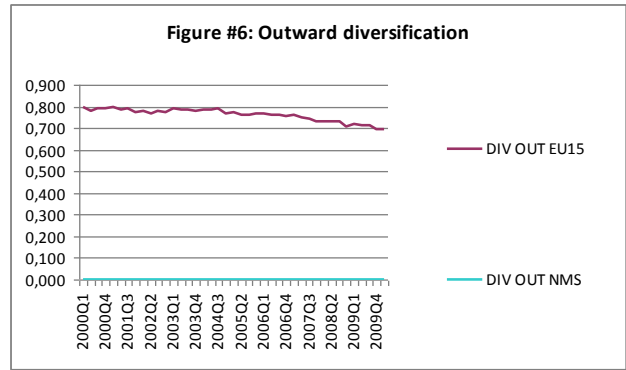
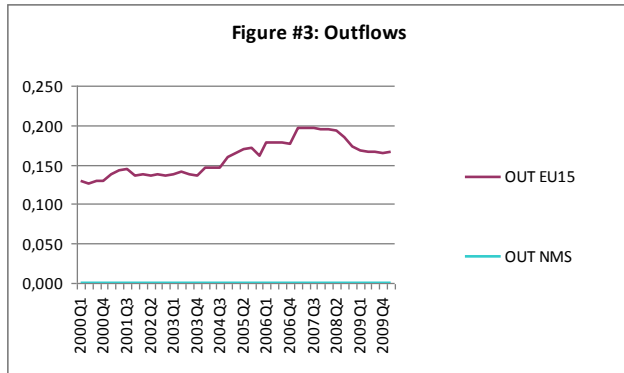


Table 2: Indices of Individual Countries

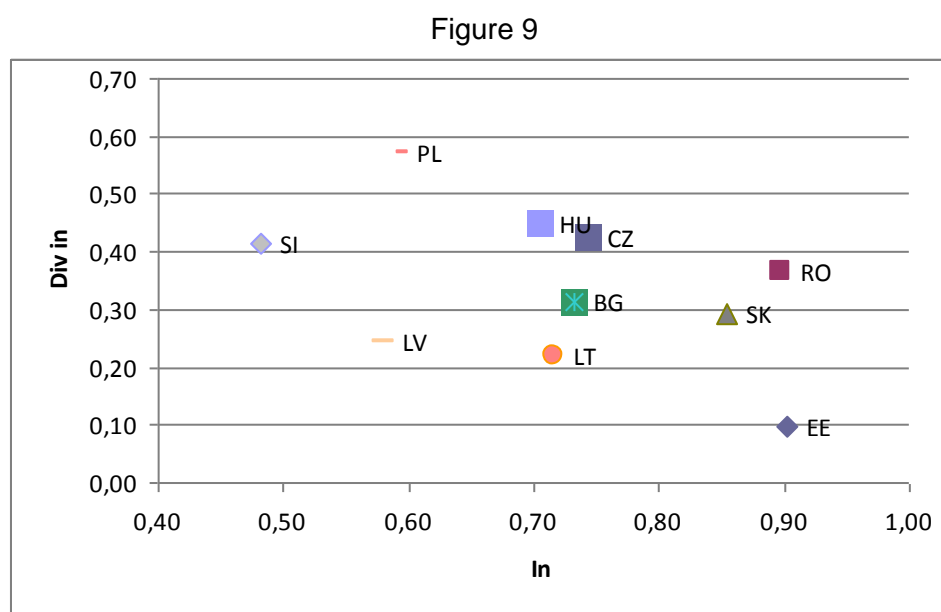
Country	Abbreviation	Out	In	Bal	Div ^{Out}	Div ^{In}	Over
Austria	AT	0.27	0.19	0.82	0.48	0.49	0.60
Belgium	BE	0.21	0.31	0.82	0.60	0.43	0.62
Bulgaria	BG	0.00	0.73	0.00	n.a.	0.31	0.16
Cyprus	CY	0.00	0.20	0.00	n.a.	0.57	0.28
Czech Republic	CZ	0.00	0.74	0.00	n.a.	0.42	0.21
Denmark	DK	0.14	0.17	0.89	0.49	0.45	0.61
Estonia	EE	0.00	0.90	0.00	n.a.	0.10	0.05
Finland	FI	0.00	0.32	0.00	n.a.	0.30	0.15
France	FR	0.21	0.07	0.51	0.73	0.74	0.66
Germany	DE	0.20	0.11	0.73	0.81	0.71	0.75
Greece	EL	0.15	0.25	0.76	0.36	0.62	0.58
Hungary	HU	0.00	0.70	0.00	n.a.	0.45	0.22
Ireland	IE	0.17	0.26	0.80	0.65	0.69	0.71
Italy	IT	0.14	0.18	0.88	0.52	0.66	0.69
Latvia	LV	0.00	0.58	0.00	n.a.	0.25	0.12
Lithuania	LT	0.00	0.72	0.00	n.a.	0.22	0.11
Luxembourg	LU	0.00	0.29	0.00	n.a.	0.69	0.34
Malta	MT	0.00	0.13	0.00	n.a.	0.50	0.25
Netherlands	NL	0.30	0.17	0.74	0.80	0.79	0.78
Poland	PL	0.00	0.59	0.00	n.a.	0.57	0.29
Portugal	PT	0.17	0.31	0.70	0.49	0.67	0.62
Romania	RO	0.00	0.90	0.00	n.a.	0.37	0.18
Slovakia	SK	0.00	0.85	0.00	n.a.	0.29	0.15
Slovenia	SI	0.00	0.48	0.00	n.a.	0.42	0.21
Spain	ES	0.14	0.16	0.94	0.55	0.73	0.74
Sweden	SE	0.33	0.11	0.50	0.38	0.58	0.48
United Kingdom	UK	0.09	0.14	0.75	0.80	0.75	0.76
Average EU		0.09	0.39	0.36	0.59	0.51	0.42
Average EU15		0.17	0.20	0.66	0.59	0.62	0.61
Average NMS12		0.00	0.63	0.00	n.a.	0.37	0.19

Note: The indices are calculated for the first quarter of 2010. The averages are unweighted.

4.2 Individual Country Indices of Integration

Table 2 shows the indices for the individual countries. The unweighted²² average outflow for the EU is 0.09, while the average inflow is 0.39. This can be explained by the fact that the countries with larger banking systems (EU15) have a higher outflow than the countries with smaller banking systems (NMS12). The picture for the inflow is exactly the opposite, with very high inflows for the NMS. The integration balance is at 0.36, well below its maximum level. The diversification indices are at 0.59 respectively 0.51, about half of their maximum level. The overall index of integration is also below its potential (0.42).

Figure 9 focuses on the group of countries with high inflows (index larger than 0.4). These are obviously the NMS. The inward diversification is low for the NMS (0.37). In particular, integration in the Baltics is very lumpy (countries in this region are at the bottom in Figure 9). This is due to their dependence on Scandinavian banks, in particular Swedish ones. The NMS are thus very vulnerable to foreign shocks.



Note: This figure plots the countries with high inflows (>0.4).

Moving to the old member states, Belgium, Finland and Portugal have relatively high inflows at about 0.3. Finland is most vulnerable due to its low inward diversification at 0.3 (the largest bank in Finland is headquartered in Sweden).

Low inflows make a country more susceptible to domestic shocks. With an index of 0.07, France is the only country with an inflow below 10%. That means that when the French banking system

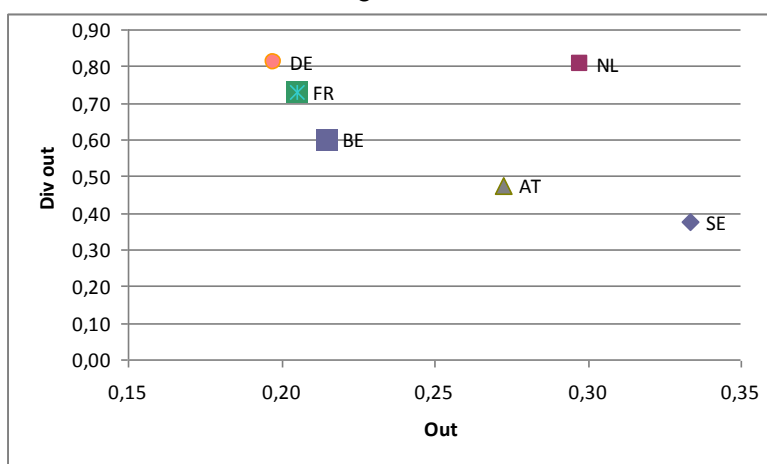
²² We now use unweighted averages across countries.

is hit by a domestic shock, foreign banks have very little capacity to replace a potential drop in lending to French business and consumers.

Next, we look at the countries with high outflows. If these outflows are well diversified, a country is less exposed to a foreign shock in a particular country or region. Figure 10 shows the countries with an outflow index of larger than 0.20. The figure indicates that Austria, the Netherlands and Sweden have particularly high outflows (well above 0.25), while Belgium, France and Germany have high, but more modest, outflows (between 0.20 and 0.25).

The Netherlands, France and Germany appear to have well-diversified outflows (above 0.70). Austria and Belgium are in the medium range (0.48 and 0.60). Sweden is a problem country with a high and undiversified outflow at 0.38. The Swedish banks have a strong regional focus in Scandinavia and the Baltics. Any shock in this region would have a big impact on the Swedish banking system. Another country with an even lower degree of outward diversification is Greece at 0.36. The Greek banks restrict their foreign operations mainly to Bulgaria, Romania, Turkey and Cyprus.

Figure 10



Note: This figure plots the countries with high outflows (>0.20).

Finally, we identify the group of countries that seem to have the “best” cross-border banking in terms of our indices: countries which have balanced in- and outflows that are also well diversified. Four categories are distinguished: 1) well balanced integration ranging from 0.75 to 1; 2) weakly balanced integration ranging from 0.50 to 0.74; 3) unbalanced integration ranging from 0.25 to 0.49; and 4) very unbalanced integration ranging from 0 to 0.24.

Table 3 indicates that Germany, the Netherlands and the United Kingdom are well integrated. The overall index of integration is at least 0.75. Moreover, all three underlying indices, Bal , Div^{Out} and Div^{In} , are above 0.7. Spain is close to this category, but has a lower outward diversification at 0.55 due to its relatively high presence in the UK (Santander). Most other Western-European countries are in the weakly balanced category. Two of the Scandinavian countries, Sweden and Finland, are in the lower categories of (very) unbalanced integration. As expected, the NMS are unbalanced, because of their dependence on inflows and lack of

outflows. The largest NMS (Poland) and the most advanced NMS (Cyprus and Malta) are in the unbalanced category. The other NMS are very unbalanced, with the Baltics forming the extreme end of the distribution.

Table 3: Categories of overall integration

Well balanced		Weakly balanced		Unbalanced		Very unbalanced	
Country	Overall	Country	Overall	Country	Overall	Country	Overall
Netherlands	0.78	Spain	0.74	Sweden	0.48	Hungary	0.22
United Kingdom	0.76	Ireland	0.71	Luxembourg	0.34	Czech Republic	0.21
Germany	0.75	Italy	0.69	Poland	0.29	Slovenia	0.21
		France	0.66	Cyprus	0.28	Romania	0.18
		Portugal	0.62	Malta	0.25	Bulgaria	0.16
		Belgium	0.62			Finland	0.15
		Denmark	0.61			Slovakia	0.15
		Austria	0.60			Latvia	0.12
		Greece	0.58			Lithuania	0.11
						Estonia	0.05

Note: The overall index is the arithmetic average of the balance, outward and inward diversification indices. Four categories are distinguished: well balanced 0.75-1; weakly balanced 0.50-0.74; unbalanced 0.25-0.49; and very unbalanced 0-0.24.

4.3 Systemic Indices of Integration

Figure 11 depicts the index of external diversification of the EU. For comparison, the figure also includes the calculated index for the US and the Japanese banking system.

The results are remarkable. The outward diversification of the EU banking system is low at 0.65. This is due to an overexposure to the US. This can be seen by looking at Figure 12, which contrasts the actual percentage of outflows of the EU vis-à-vis a non-EU country or region, relative to the naïve optimal portfolio allocation where assets are allocated proportional to the size of the country/region (denoted with “CAPM” in the figure). It can be seen that the allocation to the US is much larger than justified by the size of the US. This overexposure is partly because European banks favor a large presence in New York and Chicago. Moreover, some of the larger EU banks have acquired regional banks in the US. At the same time, European banks have very little cross-border claims on Japan and China. As a result, Japan and China are underweighted in the EU portfolio. The US and Japan show a more balanced picture of external diversification at about 0.7. Moving to inward diversification, Figure 11 shows that it is by and large a mirror image of the outward diversification. In particular, Europe has a better inward diversification than the US and Japan.

Figure 13 depicts the internal diversification of the EU over time. It can be seen that foreign claims are generally evenly spread among the banks from the different EU countries as the respective index is high. In addition, the presence of foreign banks in the EU is also evenly spread, that is, inward diversification is high. The time series behavior also shows that both dimensions of internal diversification have been increasing over time. This growth has only

halted (and in the case of outwards diversification it even has been reversed) in the years of the crisis.

Figure 11

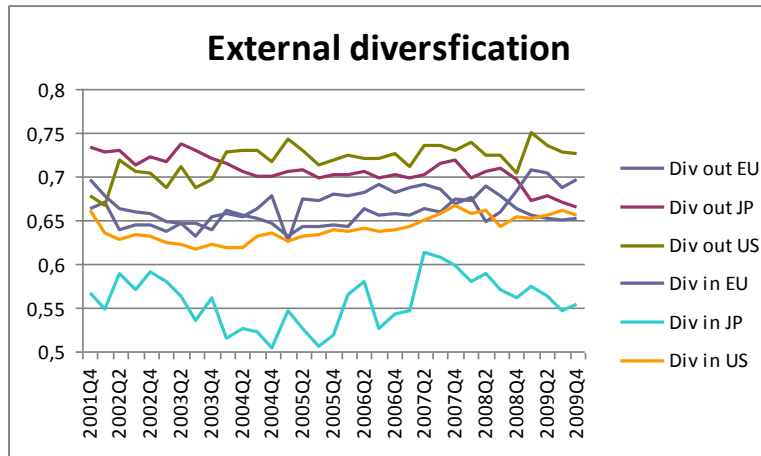


Figure 12

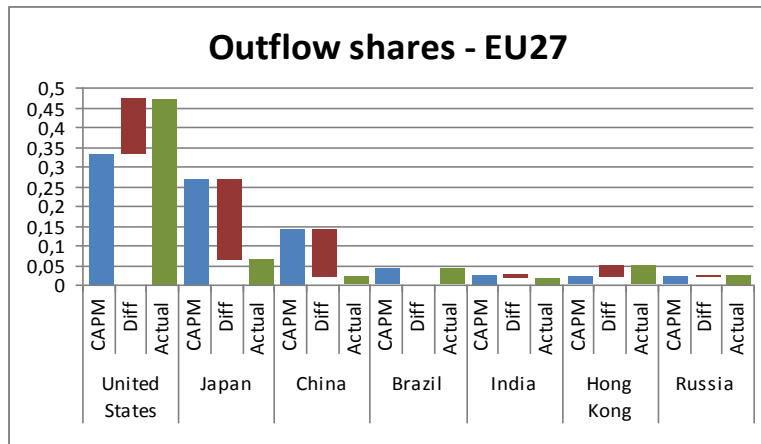
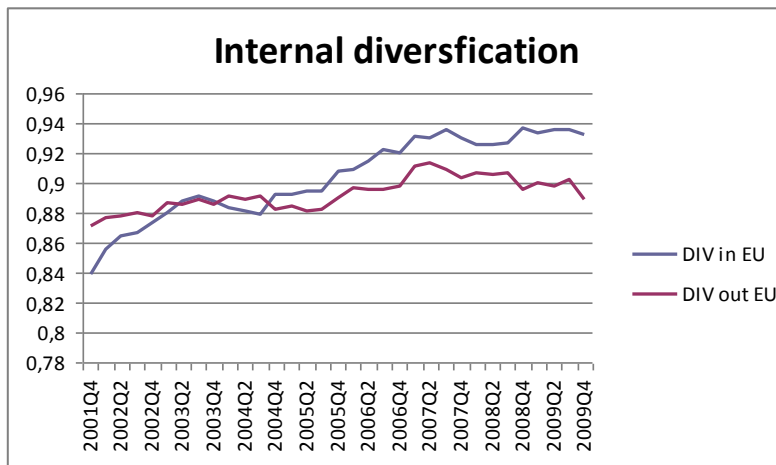


Figure 13



5. Conclusions

Cross-border banking brings about many important benefits, perhaps most prominently in the form of diversification for banks and risk sharing in the economy, but also has potential costs. We have argued that the benefits from cross-border banking probably outweigh the costs if cross-border banking takes place in an advantageous way and as long as cross-border banking does not become excessive. Many of the costs from cross-border banking can in fact be avoided. For example, diversification in a country's cross-border operations (both in the inward and outward dimension) can reduce the potential costs of spillovers from other countries. As another example, establishing foreign operations through subsidiaries, rather than direct cross-border lending, can reduce the volatility of foreign lending. We have also argued that contagion effects – often seen as a main argument against cross-border banking – alone are unlikely to outweigh the diversification gains that can be reaped through cross-border banking. Excessive levels of cross-border banking, however, may be detrimental. This is because at high levels of integration diversification gains from further cross-border banking are lowered. At the same time, the stability costs of integration are likely to be increasing.

We thus argue that, from the perspective of financial stability, it is not so much a question of whether cross-border banking is desirable or undesirable per se. It is more important to ensure that cross-border banking takes place in a way that maximizes its benefits while keeping the costs at bay. In this chapter we have developed various metrics that help evaluating whether integration in a country or region takes place in such a way. These metrics also help to identify the dimension(s) along which the country's (or region's) cross-border banking can be improved.

Applying these metrics to the EU countries we have found the following. The countries with the largest banking centers, UK and Germany, are well diversified. The other country with a large banking system, France, is coming close these countries. But France is ranking lower than UK and Germany because it has a relatively low inflow, indicating protectionist features. The New Member States (NMS) are highly dependent on a few West-European banks (low diversification) and thus vulnerable to contagion effects. Given the dependence on Western-Europe, it may be useful for the NMS to diversify their inflows. Finally, the Nordic and Baltic region is very interwoven without much diversification. A few large banks dominate this region. Their banking systems, and thus their economies, are fully linked. Acknowledging this strong interdependence, the Nordic and Baltic authorities have recently implemented a burden sharing scheme. In this way, the benefits and costs of an integrated banking system are fully shared by all countries in the Nordic Baltic region.

We have also studied aspects of system-wide integration in the EU. It appears that the EU banking system has a weak outward diversification with a strong bias to the US. This played an important role in the recent crisis, in which European banks incurred large losses from defaults originating in the US. The US and Japanese banking system have a better external diversification. We recommend that the overexposure of the European banks to the US should be on the agenda of the new European Systemic Risk Board.

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