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Cross-border loan portfolio diversification, capital requirements, and the European Banking Union

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Abstract

We provide preliminary evidence of potential risk reduction benefits from banks' loan portfolio diversification cross-border within the Euro area. Using aggregate data on banking sector corporate loan losses for each Euro area member-state, our estimates suggest that the static diversification benefit could be substantial. The minimum capital needed to withstand the maximum annual loss from a hypothetical fully diversified Euro area bank loan portfolio over the period 2001-2017 would have been only 40 % of the total capital needed to withstand the maximum losses on a country by country basis. We also calibrate the country-specific loan loss distributions and the Euro area portfolio's loss distribution to the Vasicek (2002) model, which underlies the Basel framework's Internal Ratings Based Approach. We find that the implied asset correlation parameter of a median country portfolio is about twice as large as that of the fully diversified Euro area portfolio.

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1. Introduction

An integrated European banking market can be seen as an ultimate goal of the Europe's banking union project. This would help ease the dependency of credit supply in a certain country from the state of public finances and the overall economy of that country. For example, the initiative to reduce single-country biases in banks' sovereign debt exposures with the help of capital requirements aims to support these goals. By a similar logic, one might argue that bank lending to the real sector could also be steered towards more cross-border diversification within the banking union. This could happen both by reducing obstacles to cross-border diversification as well as by strengthening incentives to cross-border diversification of corporate and retail lending.

In this paper we provide preliminary evidence of potential risk reduction benefits of banks' loan portfolio diversification cross-border within the Euro area, using aggregate data on banking sector loan losses per Euro area member-state. Our preliminary results suggest that the "stressed" capital need of a fully diversified Euro area bank loan portfolio over the period 2001-2017 would have been substantially less than the sum of stressed capital needs of the current country portfolios.

Second, we discuss the possibility to recognize the risk reduction benefits from cross-border loan portfolio diversification (or, alternatively, the risks from concentrations of loans in single countries) in bank capital requirements and thereby to use capital requirements to provide incentives to further cross-border lending diversification[1]. We also provide an illustrative calibration of the asset correlation parameter in the Basel framework's Internal Ratings Based Approach model for capital requirements, taking into account the further diversification potential in the Euro area.

The paper is structured as follows. In section 2 we discuss the rationale for deeper banking integration in the Euro area. Section 3 discusses how bank capital requirements might be used to spur further integration. Finally, in section 4 we present preliminary evidence of potential risk reduction benefits from further cross-border loan portfolio diversification within the Euro area. Section 5 concludes. An appendix provides more details of the calibration exercise in section 4.

2. Rationale for a deeper banking integration

The pillars of the European banking union – common banking supervision, common bank recovery and resolution framework, and common deposit insurance, the first two of which have already been implemented – facilitate the development towards a truly integrated European banking market. Together they can be expected to enhance the financial stability of the area.

An integrated banking market entails well diversified cross-border banking services. This would improve financial stability because the supply of bank credit in a certain country would no longer crucially depend on the state of public finances nor the state of the economy of that country (cf. e.g. Draghi 2018).

The monetary union of the United States provides an example: although single states have occasionally experienced economic or financial distress the supply of credit in these states can be

[1] Jokivuolle (2018) has previously discussed this idea. More recently, a similar idea has been presented by Villeroy de Galhau (2019); see also Financial Times, 6 April 2019: "French bank chief seeks capital change to spur cross-border deals".

maintained thanks to regionally diversified banking institutions and federally organized public institutions overseeing and stabilizing commercial banking. Evidence from the United States indicates that integration of bank ownership across states has led to diminished and synchronized state business cycles (Morgan et al 2004).

Therefore banking integration can be a forceful way to tackle the so called bank-sovereign loop that threatened financial stability during the sovereign debt crisis in Europe. So far, cross-border lending of banks within Euro area has remained at a moderate level and seems to have gone in reverse after the financial crises (see e.g. Hoffmann et al 2018). [2] Using calibrated macro models both Hoffmann et al (2018) and Martinez et al (2019) demonstrate macroeconomic benefits from further private sector risk-sharing in Euro area.

3. Additional measures to encourage further banking integration

The initiative to reduce home bias in European banks' sovereign debt exposures aims to support these goals (Véron 2017). It would work via higher capital requirements on banks with high sovereign debt concentrations.

By a similar logic, bank lending to corporates and households could be steered towards more cross-border diversification within the banking union. This could be encouraged within the current system of banks' capital requirements.

In technical terms, the most obvious way would be to use the so called asset correlation parameter embedded in the Internal Ratings Based Approach (IRBA) of the Basel framework. IRBA is the system that mainly large banks use, subject to supervisory approval, to determine their capital requirements. A more diversified cross-border loan portfolio could entitle a bank to apply a lower asset correlation parameter and hence have a lower capital requirement, assuming other risk elements stay constant.

It is important to bear in mind at least the following aspects when considering bank capital requirements that take into account the degree of bank loan portfolio diversification cross-border.

First, the IRBA is designed to measure only the standalone risk of a bank's credit portfolio. It does not take into account systemic risk. Systemic risk of a bank may well increase if greater cross-border lending diversification leads to an increase in bank size, e.g. due to cross-border mergers.

Second, diversification of bank loan portfolios cross-border could compromise banks' knowledge of their customers. This could lead to a deterioration in the average quality of loans. This is a true concern, even if in the age of digitalization securing sufficient customer information may no longer require physical presence such as a branch network.

Third, the IRBA model is a single systematic risk factor model where the risk factor may well be interpreted as the business cycle of a country. Although the business cycle is usually inter-

[2] Integration of bank ownership, such as through bank holding company structure, is not the only way banking integration may evolve. For instance, banks might use more syndicated loans to achieve better diversification. However, as these mainly concern lending to large corporations, mergers might be a way to benefit from further cross-border diversification into SME loans. At least anecdotal evidence from the US experience with interstate banking proliferation suggests that mergers rather than new branches or subsidiaries have been the more common way to market extension.

preted in terms of output movements it has several other dimensions as well, including movements in asset prices, productivity and competitiveness. Already the assumption of common output growth cycles becomes increasingly problematic in the Euro area context which, despite the very aim of economic and hence business cycle convergence within the Euro area, is yet hardly driven by a single cycle. As Gordy (2003) shows, there is no simple way for setting approximately portfolio invariant capital requirements in a multi-risk factor case.

More broadly, new incentives via capital requirements could change the whole landscape of banks' lending operations. There could be implications for the size distribution of banks, the legal and institutional framework of bank lending and risk assessment, as well as the menu of financial products that banks provide. Development of a well-functioning cross-border lending market would probably put pressure on such things as harmonization of bankruptcy laws and production of comparable information of factors which affect banks' lending risk.[3]

4. Potential risk reduction from further loan portfolio diversification within the Euro area

In this section we provide preliminary empirical evidence of the potential risk reduction effect of banks' further loan portfolio diversification cross-border within the Euro area. We use aggregate monthly data on banking sector corporate loan losses from each member country (henceforth, "country") and annual data on loan stocks per country. The loan loss data are from the period 01/2001 – 03/2018 from most countries and come from the ECB. We treat the data confidentially so that we do not report individual country results by name.[4,5,6]

We compare loan loss rate distributions of individual countries with that of a hypothetical Euro area (EA) portfolio. The loss rate of a portfolio in month t is simply the amount of loan losses from the portfolio in month t divided by the outstanding stock of loans in the beginning of that month. The loan loss rate of the EA portfolio is the weighted-average of the individual countries' loan loss rates, weighted by the shares of individual country loan stock of the aggregate Euro area loan stock. As we have annual loan stock data, we effectively assume that the country shares in the EA portfolio stay constant over the months of a given year.[7]

[3] See Financial Times 9 May 2019: "Société Générale chief says banking mergers make sense in Europe".
[4] The more detailed definition of the loan loss data is provided in the ECB's Manual on MFI balance sheet statistics, April 2012, in section 1.6.3.3 on Loan write-offs/write-downs. It should be noted that despite the Single Supervisory Mechanism's efforts for harmonization, considerable differences between member-countries may still exist in loan write-off/write-down standards and practices.
[5] A bank holding company subsidiary in a certain member country reports its losses as part of that country's banking sector. Hence the data potentially lead us to ignore diversification benefits that are materialized within cross-border bank holding companies.
[6] Note that the country-specific banking sector loan losses are generated from the current bank portfolios in each country and hence reflect the current degrees of cross-border diversification in those portfolios. In this regard, it is somewhat misleading to use the term "country portfolios" although for brevity we do that.
[7] We also abstract from the more detailed loan stock dynamics (loan losses and paybacks reduce the loan stock while new loans increase it). We should also point out that our empirical measure of loan losses may include not only losses from bank loans but from other financial assets as well. At his point, we do not have information on banks' balance sheet and income statement in a more detailed level.

Formally,

$$loan\ loss\ rate_{EA,t} = \sum_{j=1}^{k} \left(\frac{loan\ stock_{j,t}}{\sum_{j=1}^{k} loan\ stock_{j,t}} \right) * loan\ loss\ rate_{j,t} \quad (1)$$

where *j* is the country-index and *k* is the number of countries, i.e., j=1,…,*k*.

We make two kinds of comparisons. First, we take a "non-parametric approach" by calculating the average loss rate and the maximum loss rate as a simple measure of dispersion for each country portfolio and for the EA portfolio. Using the maximum loss rate is reminiscent of a "stress test" view of loss rates. For this analysis we aggregate the monthly losses to annual level.

Second, we calibrate the asset correlation parameter for each country portfolio and the EA portfolio by fitting the Vasicek (2002) model underlying the IRBA model to the respective empirical loss rate distributions. A lower calibrated asset correlation parameter for a given portfolio indicates a higher degree of risk diversification within that portfolio.

In the Vasicek (2002) model, the asset correlation parameter measures the loading of a loan obligor's assets to a single systematic risk factor. The single risk factor may be a fair assumption in the case of individual country portfolios but in the case of EA portfolio it would imply that all Euro area countries are subject to the same systematic risk factor that could be interpreted as a common Euro area business cycle. In this regard, our results should be taken with care and regarded as tentative at best.[8,9] In the Appendix we explain in more detail how we calibrate the asset correlation parameter from the loss rate data for a given portfolio with the help of the Vasicek (2002) model which underlies the Basel capital adequacy framework's Internal Ratings Based Approach, i.e., the IRBA model.

The outcome from the two approaches are presented in Figures 1 and 2. In Figure 1 we have looked at the actual loan loss data per country and the EA portfolio in a very simple manner. To account for the relatively high variability of and potential systematic patterns in write offs (or write downs) of loans, which underlie the monthly loan loss data, we have first aggregated the data to annual level. We then take the difference between the maximum annual loss rate observation and the time-series average loss rate over the sample period 2001-2017 for each country and the EA portfolio.

This measure provides the "stressed" minimum capital need of a portfolio as a percentage of the loan stock, net of the expected loss rate (measured by the average loss rate), that it would have taken to withstand the maximum annual loss rate over the sample period. Figure 1 shows that the range of the stressed capital need is very wide across countries, between 0.37 % and 22.08 %. For the EA portfolio the stressed capital need is 0.6 %.

Clearly, some country banking sectors have less risky aggregate loan portfolios than the aggregated EA portfolio, which is a weighted average of them, but this does not mean that there would not be potential benefits from cross-country loan portfolio diversification for Euro area

[8] Note also that the Vasicek (2002) model assumes the loan portfolio to be fully diversified: each loan in the portfolio is infinitesimally small so that all idiosyncratic risk is "washed away" and the single risk factor is the only driver of loan loss rate variation in the portfolio.

[9] Several strong assumptions are needed for the calibration given that we only observe the banking sector loan loss rates of each country but have no other information of the loan portfolios of any bank in any country. Such information would include loan sizes and maturities, and industry and credit quality distributions of loans. Specifically, we assume that each loan obligor in any given country has the same probability of default and that the loss given default rate (LGD) is fixed and the same for all loans. We estimate the common probability of default by the time-series average default rate of the given country. In the calibration of the asset correlation parameter of the EA portfolio we take into account the country-specific probabilities of default. The maturity of each loan is assumed to one year.

as a whole. In order to demonstrate this, we calculate the weighted average of the country-specific stressed capital needs, which we find to be 1.46 %.[10] In other words, this is the sum of the stand-alone country-specific stressed capital needs in the Euro area, as a ratio of the total Euro area corporate loan stock. It is almost 2.5 times the stressed capital need of the EA portfolio, 0.6 %. Hence, there are substantial potential benefits in risk reduction for the Euro area as a whole from further cross-border loan portfolio diversification within the Euro area.[11]

In Figure 2 we depict the calibration asset correlation parameters for various country portfolios and the EA portfolio in ascending order. The EA portfolio, indicated in the figure, has the fourth lowest asset correlation, approximately 6%. It is half of the median asset correlation, ca. 12%, among the country portfolios. This also clearly suggests that most Euro area countries' banking sectors could benefit in terms of risk reduction from Euro area wide cross-border diversification of loan portfolios. Even with the caveats of the approach taken in this paper, and discussed earlier, there would be room to recognize better cross-border diversification in Euro area banks' capital requirements through adjustments to the asset correlation parameter. However, as already pointed out, implementing such adjustments in a theoretically consistent manner in a single risk factor model such as the IRBA model, could be a challenge.

5. Conclusions

We have studied risk reduction gains from cross-border diversification of banks' loan portfolios across the Euro area and found them to be potentially substantial. Promoting that might be possible and even desirable with carefully designed and implemented regulatory incentives such as bank capital requirements which better recognize the degree of risk concentrations vs risk diversification. This could help realize the objectives of the banking union. An amendment to current bank capital regulations along these lines would be best considered as part of a broader package of reforms which are currently discussed. However, we want to emphasize that recognizing loan risk diversification in capital requirements in a coherent manner in a multi-country and hence multi-business cycle setting is theoretically not straightforward, as shown by earlier literature, so further analysis would be welcome.

[10] The weight of an individual country is the share of its loan stock of the whole Euro area loan stock, using sample time-series averages. We have used the average loan stock over the years 2010-2017 for each country because the loan stock data is available in full for each country only over that period. Note that for calculating the loss rates per country we have used the longer period 2001-2017 even though for some countries the data are shorter.

[11] Note that if there already were a full cross-border diversification in bank loan portfolios, each Euro area bank would effectively hold a share of a common "loan market" portfolio. As a result, country-specific loan loss rates would be equalized and so the capital need of the EA portfolio would be equal to the total capital need of country-specific banking sectors.

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Appendix: Calibration of the asset correlation parameter

The Vasicek (2002) model gives the i[th] quantile, q_i, of the loss rate distribution for a fully diversified loan portfolio, driven by a single systematic risk factor, as follows:

$$q_i = LGD * N\left[\frac{N^{-1}(PD)+N^{-1}(i)\sqrt{\rho}}{\sqrt{(1-\rho)}}\right] \quad \text{(A.1)}$$

where N is the cumulative standard normal distribution function (N^{-1} being its inverse function) and LGD and PD are the loss given default and the probability of default, respectively, of all obligors in the portfolio. ρ is the asset correlation parameter common to all obligors, measuring an obligor's exposure to the single systematic risk factor.

We calibrate the asset correlation parameter for a given portfolio with the following procedure:

$$Min_{\rho,PD} \sum_i^n [q_i^{Vasicek}(\rho, PD) - q_i^{Sample}]^2 \quad \text{(A.2)}$$

In other words, we find the values for PD and ρ that produce the best match between the sample quantiles ("*Sample*") and the quantiles from the Vasicek (2002) model ("*Vasicek*") as function of ρ and PD, by minimizing the sum of squared differences between the sample and the model-based quantile for a given set of quantiles. Given the length of the loan loss series and depending on the chosen time aggregation (the raw data is monthly), we used either nine quantiles (10%, 20%… 90%) or 19 quantiles (5%, 10%… 95%) such that in A.2, n=9,19.

Regarding the PD parameter, we used two approaches: i) we calibrated the PD along with the asset correlation ρ and, alternatively, ii) we pre-estimated and fixed the PD, using the time-series average of the loan loss rates divided by LGD of 45%, which is assumed constant for all obligors. The PD:s calibrated for different countries using i) turned out to be very similar to the time-series averages used in ii).

Regarding the Euro area (EA) portfolio, we only use approach ii) with country-specific PD estimates for each country block of the EA portfolio. If we assume that each country portfolio is driven by the same single systematic risk factor, then the i^{th} loss rate quantile of the EA portfolio is the weighted average of the i^{th} loss rate quantiles of each country portfolio (cf. e.g. Repullo and Suarez 2004, equation 7)[12]:

$$q_i^{EA} = \sum_{j=1}^{k} w_j q_i^j$$

where j denotes a member-country ($j=1,...k$) and w_j is its weight in the Euro area portfolio.

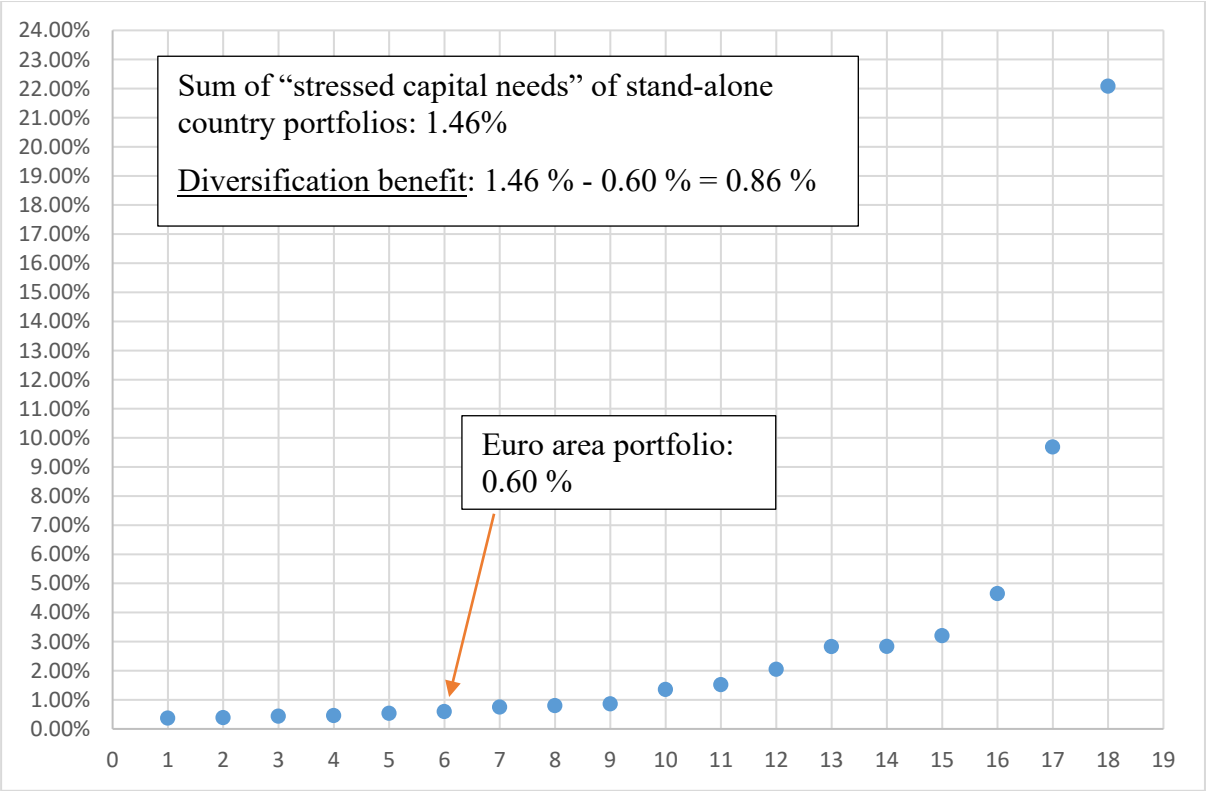
Further, we assume that the asset correlation parameter is now the same for all obligors in the EA portfolio regardless of their country. This may not seem entirely consistent because, when calibrating the asset correlation parameters for the country portfolios, we do acknowledge that

[12] For the theoretical background, see Gordy (2003).

they differ. However, the common asset correlation parameter in the EA portfolio may be best thought of as an “average” of the country-specific asset correlations, which is dampened by the cross-border diversification of loan risks in the EA portfolio.

Figure 1. Stressed capital needs and diversification benefit

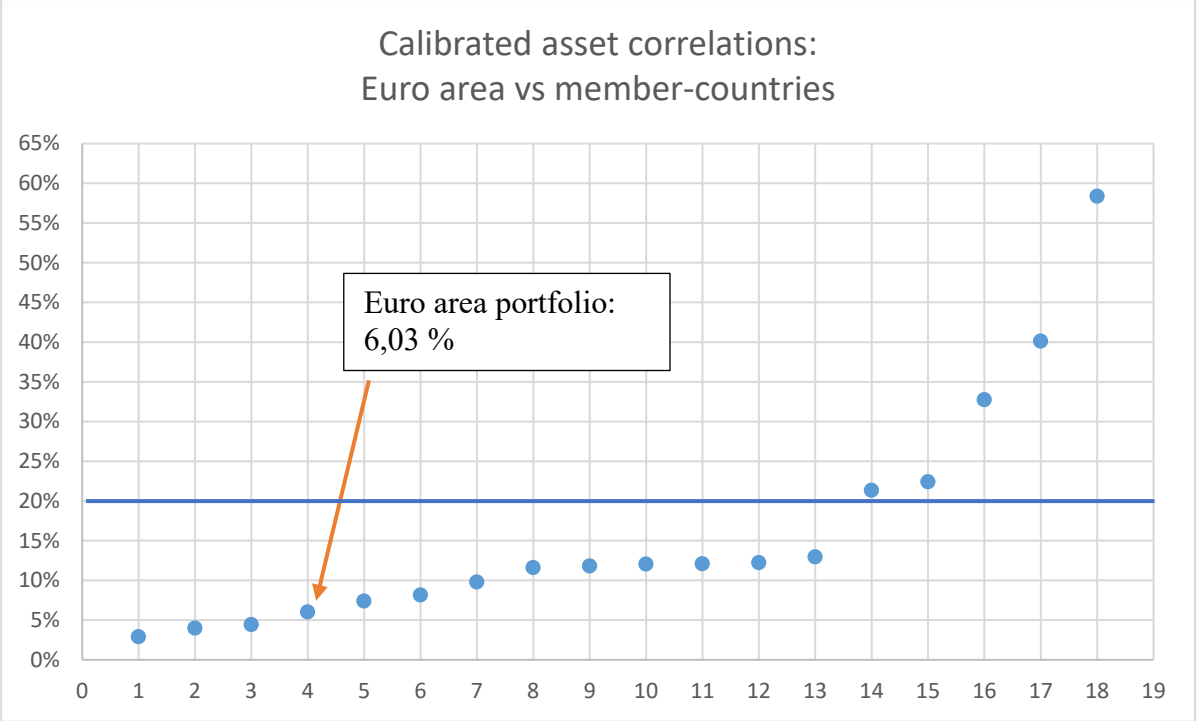
The difference between the maximum and the average annual loss rate ("stressed capital need") during 2001-2017 for the Euro area member-country portfolios and the hypothetical Euro area portfolio. The annual loss rate of a portfolio equals the annual loan losses over loan stock.



The country portfolios and the Euro area portfolio are ordered on the horizontal axis, numbered in ascending order by their stressed capital need. The stressed capital need is measured on the vertical axis. Two Euro area countries are excluded from the sample because of insufficient data.

Figure 2. Calibrated Asset Correlations

Asset correlations are calibrated with the Internal Ratings Based Approach (IRBA) model from monthly loan loss rates for Euro area member-country portfolios and the hypothetical Euro area portfolio.



The country portfolios and the Euro area portfolio are ordered on the horizontal axis, numbered in ascending order by their calibrated asset correlation parameter. The asset correlation is measured on the vertical axis in percentages. For example, for the Euro area portfolio (indicated by an arrow) the asset correlation is calibrated to be ca. 6%. The 20% asset correlation level that the Basel framework's IRBA model uses for corporate loan portfolios is highlighted in the chart. Two Euro area countries are excluded from the sample because of insufficient data.