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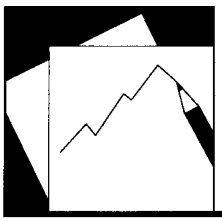

IMF Working Paper

International Diversification Gains and Home Bias in Banking

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Abstract

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This paper assembles a bank-level dataset covering the operations of 38 international banks from eight industrial countries and their subsidiaries overseas during 1995–2004, and studies the extent of diversification gains from their local operations abroad. The paper finds that international banks with a larger share of assets allocated to foreign subsidiaries, particularly to those located in emerging market countries, are able to attain higher risk-adjusted returns. These gains are somewhat reduced—but by no means depleted—when international banks concentrate their subsidiaries in specific geographical regions. The paper also finds a substantial home bias in the international allocation of bank assets, relative to the results of a mean-variance portfolio optimization model. Overall, international diversification gains in banking appear to be substantial, albeit largely unexploited by current bank expansion strategies. These results suggest that international diversification gains could usefully be considered in the second pillar of Basel II as the first pillar is based only on the idiosyncratic risk of recipient countries.

JEL Classification Numbers: G11, G21, E44, F40

Keywords: international banking; home bias; portfolio diversification, Basel II

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I. INTRODUCTION

Financial globalization since the mid-1990s has been characterized by a massive expansion of bank activities overseas. Following banking sector liberalization in emerging market countries and a large increase in cross-border merger and acquisitions worldwide, the foreign claims of BIS-reporting banks (which include both local and cross-border claims), doubled from 1.3 trillion dollars in 1990 to 2.7 trillion dollars in2006.

To the extent that business cycles are imperfectly correlated across countries, a bank with broad global exposures—particularly in its lending portfolio—should, in principle, be better able to diversify away country-specific risks.[1] International diversification in banking, however, is barely understood, as shown by the fact that it was neglected by the single factor model under Basel II.

Following the pioneering work of Markovitz (1952, 1959) on portfolio optimization, and subsequent extensions to the international context by Grubel (1968), Levy and Sarnat (1970), and Lessard (1973), a large body of literature in finance has studied the effects of international diversification in securities portfolios. Not surprisingly, since portfolio diversification depends on the correlations between return distributions of individual securities, which tend to be lower between- than within-countries, the gains from international diversification have been found to be large. However, there is also robust evidence that international diversification gains have not been fully exploited by investors due to the so-called "home bias"—or an excessive investment in domestic securities relative to the efficient portfolios.[2]

A parallel literature addressing the benefits of geographical diversification in banking is only incipient. A few studies have focused on the benefits of diversification between regions in individual countries (local geographical diversification), yielding inconclusive results. Using data for Italian banks during 1993–1999, Acharya, Hasan, and Saunders (2002) found that local geographical diversification did not necessarily improve the risk-return trade-off of banks. For the U.S., Morgan and Samolyk (2003) found that broader geographical presence of banks within the U.S. has not been associated with higher returns or lower risk. These findings suggest that the benefits of local geographical diversification may be limited, which is likely due to the strong co-movement of economic variables within individual countries.

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[1] While separation theorems in finance imply that banks operating in a frictionless world should focus exclusively on profit maximization leaving portfolio diversification to their shareholders, the existence of prudential regulations, taxes, bankruptcy costs, and informational asymmetries, justify an active management of risks by banks (see for, example, Diamond, 1988).

[2] The evidence indicates that unexploited diversification gains between industrial countries' securities have been decreasing over time.

As regards international geographical diversification, Griffith-Jones, Segoviano, and Spratt, 2002, showed that business cycles tend to be more synchronized between industrial countries than between emerging market countries. They also showed that the synchronization of economic activity between these two groups of countries was generally low. On that basis, and the fact that banks carry a considerable degree of country-specific risks in their lending portfolios, they argued that the benefits of international diversification in banking could potentially be large.

Our paper assesses the extent of diversification gains generated by the operations of international banks overseas. It assembles a bank-level dataset covering the operations of 38 international banks incorporated in eight industrial countries and their subsidiaries overseas during 1995-2004. Linking each international bank with its subsidiaries, and classifying the latter by their location, the paper finds that larger asset allocation to foreign subsidiaries improves the risk-adjusted returns of the consolidated financial group. The paper also finds that these gains are partially eroded by the concentration of foreign subsidiaries in specific geographical regions implied by the observed patterns of international bank expansion. All in all, and even after controlling for concentration risk, our results show much broader international diversification gains than those obtained by Hayden, Porath and Westernhagen (2006). This may reflect the fact that their study is based on bank-level data for the population of German banks, which includes many institutions with little or no exposure to foreign risks.

We also find that the actual allocation of international bank assets across borders displays a substantial home bias, using the mean-variance portfolio model as a normative benchmark. This finding is qualitatively consistent with Buch, Discroll, and Ostrgaard (2005), who also apply the mean-variance portfolio model to study international diversification gains in banking. Their work, however, uses aggregate data on cross-border claims of banks in four industrial countries during 1995-1999, and is therefore not well suited to address portfolio effects at the level of individual banks. In contrast, by exploiting information from the financial statements of international banks and their subsidiaries overseas, we obtain profitability measures and portfolio diversification effects at the bank level, which is the relevant unit of analysis.

The rest of the paper is organized as follows. Section 2 provides an overview of the data, discusses stylized facts on the international allocation of bank assets and compares the behavior of bank returns across groups of countries. Section 3 uses regression analysis to assess the effects of foreign subsidiaries' operations on the risk-adjusted returns of international banks. Section 4 uses the mean-variance portfolio model as a benchmark to assess the optimality of the observed allocation of international bank assets overseas. Section 5 concludes.

II. DATA AND STYLIZED FACTS

In this paper, we try to assess the potential geographical diversification gains of banks which are already pursuing an internationalization strategy. We measure international

geographical diversification in terms of the assets held by subsidiaries abroad, relative to those maintained by their parent banks in their home countries. This comparison is based on unconsolidated financial data to avoid double counting of assets. There are, obviously, other means for a bank to achieve geographical internationalization, including cross-border operations and foreign branching, but data do not allow to disentangle these two types of operations from the regular parent banks' businesses in their home countries.[3] Furthermore, foreign transactions in the trading book or off-balance sheet can also serve diversification purposes, but information is not publicly available at the bank level.[4] Such data constraints introduce a potential bias. As shall be explained in the next section, we tackle this in the paper with a novel strategy.

The sample used in the paper entails bank-level data for the 38 largest international banks incorporated in the G-7 (Canada, France, Germany, Italy, Japan, U.K., U.S.) and Spain. Data were gathered from Bankscope, at the yearly frequency, for the period 1995–2004. For each parent bank, we obtained unconsolidated financial statements to capture their profitability on a stand-alone basis, as well as consolidated financial statements to measure the overall profitability of their financial group. In addition, we gathered the unconsolidated financial statements of 399 subsidiaries overseas of the sampled international banks.

The nationality of parent banks is based on their country of incorporation, regardless of the nationality of its shareholders, which matches the regulatory criteria of home and host supervisors under the Basel Accord. Foreign subsidiaries are restricted to those with at least 50 percent ownership by their parent banks. We also crosscheck Bankscope ownership information with the Zephyr dataset on mergers and acquisitions to track the time evolution of bank subsidiaries overseas.

Summary information on the distribution of international bank assets and subsidiaries across regions is presented in Table 1. The 38 parent banks maintained only a few more subsidiaries in industrial countries than in emerging ones over the sampled period (209 observations versus 190), but the share of assets allocated to subsidiaries in industrial countries are much larger. On average, the typical international bank maintained 82.4 percent of its assets at home during the sampled period, against 12.6 percent in subsidiaries located in other industrial countries and a mere 5 percent in subsidiaries operating in emerging countries. While this distribution varies widely across countries, there are some common characteristics. Parent banks have a significant share of their assets in their home countries and in subsidiaries located in other industrial countries. In fact, with the exceptions of British and Spanish banks, the average share of assets in

[3] In fact, when available, cross-border operations include intra-group lending. Branches, in turn, do not have their own balance sheets.

[4] Still, some bank subsidiaries also have their own branches. In those cases, international branches would correctly be treated as operations abroad.

emerging market countries tends to be very small, below 2 percent in most cases.[5] At the same time, international bank expansion into emerging market countries displays strong regional patterns that seem to reflect historic and cultural ties. Spanish and Canadian banks tend to concentrate in Latin America, French banks in Africa and the Middle East, U.S. banks in Latin America and emerging Asia, German and Italian banks in Eastern European countries, and British and Japanese banks in emerging Asia.

We now move to a few stylized facts on the a-priori of our empirical exercise. First, we expect that banks would benefit from international geographical diversification as long as the major systemic factors behind bank profitability (for example, GDP growth, interest rates, and other macroeconomic conditions) turn out to be less correlated between their home and host countries and, in particular, between industrial and emerging market countries. A second a-priori is that the concentration of bank exposures in specific emerging regions would limit such diversification gains.

Regarding international diversification, we build upon Griffith-Jones, Segoviano, and Sprat, 2002, comparing the correlations of selected macroeconomic variables across groups of countries. In particular, we examine the correlations of GDP growth, money market rates (expressed in US$), and long-term government bond yields. We restrict the exercise to the set of home and host countries associated with the banks in our sample, classifying them in industrial versus emerging, and further splitting the later by geographical regions. This partition reflects the presumption that the synchronization of macroeconomic conditions would tend to be higher within industrial countries. It also reflects the idea that macroeconomic conditions may be more synchronized within geographical regions (for example, within Latin America) due to similar economic fundamentals and exposure to common risk factors.

To test these conjectures, we compute the pair-wise correlations for each macroeconomic variable, and compare the cumulative distribution frequencies (CDF) of these correlations by country groups. The results for GDP growth are presented in Figure 2. The graph in the upper-left corner compares the CDF of the correlations industrial-industrial against industrial-emerging. Since the former is always below, it provides strong evidence in support of our first a-priori. In turn, the graph in the upper-middle position shows that economic activity between industrial countries is more synchronized than between emerging market countries. The other three graphs provide a richer partition of the sampled countries by geographical regions, showing that the co-movement of economic activity tends to be relatively more synchronized within regions, which is consistent with our second a-priori. Parallel exercises comparing the correlations of money market rates, and long-term yields on government bonds between countries, yielded similar results (not shown).

[5] The sample of British banks is heavily influenced by the large presence of HSBC in Asia.

As an additional reference, Table 2 displays summary statistics of the correlations of the three macroeconomic variables by country groups, plus the correlations of a composite series, based on their first principal component. Overall, the lower correlations obtained for the industrial-emerging pairs provides a very rough support for our first a-priori, namely, that banks exposed to emerging countries should be in a better position to diversify away country-specific risks. Furthermore, the results also show that these diversification gains tend to be more limited within specific geographic regions. However, while these results are suggestive, the fact that there are many other factors affecting bank profitability obviously call for a more specific analysis, which we undertake in the next section.

We now explore for differences in the risk-return results attained by parent banks in their countries of incorporation, vis-à-vis those of their subsidiaries overseas, splitting the later by their location. We measure returns by the after-tax return on assets (ROA), and risk by its standard deviation, using data from unconsolidated financial statements to measure the profitability of the institutions involved on a stand-alone basis.[6] As before, the population of subsidiaries was divided in two groups, separating those located in industrial from those in emerging market countries, on the conjecture that the latter may tend to be more profitable on average, but also riskier.

The results in the upper panel of Table 3 are based on the pooled dataset, that is, they refer to the entire distribution of yearly returns obtained by individual institutions. Not surprisingly, the figures show a clear trade-off between return and risk. Subsidiaries located in emerging countries seem to be more profitable on average but also substantially riskier, as shown by the standard deviation of their ROA (6.3 percent), which is roughly two-times higher than the standard deviation attained by parent in their home countries (2.9 percent). This result is partly driven by several episodes of economic and financial crisis in emerging market countries during the sampled period. On the other hand, the profitability attained by parent banks in their home countries roughly compares to the profitability of their subsidiaries in other industrial countries.

The results obtained from the pooled dataset, however, are very crude, because the observations of a given bank are not independent from each other throughout time, as implied. To present a more refined picture, we compute a second set of summary statistics using a two-stage approach. First, we obtain the average return and risk for each bank over the entire period (i.e., treating subsidiaries overseas as individual entities), and compute the risk-normalized returns for each bank. Second, we compute summary statistics of the resulting figures, grouping banks by their location (i.e., home, other industrial, and emerging market countries). The results, presented in the lower

[6] An alternative profitability measure based on the after-tax return on equity (ROE) would provide a closer indication of shareholders' return, but has the drawback of being potentially affected by cross-country differences in the treatment of net worth and other accounting definitions.

panel of Table 3, are similar to those discussed above in qualitative terms. The average returns of parent banks at home (1.4 percent are lower than the returns obtained by their foreign subsidiaries in emerging market countries (2.1 percent), but also significantly less volatile (1.0 percent at home versus 2.8 percent in emerging market countries. Interestingly, the risk-normalized returns obtained by parent banks in their home countries (4.4 percent) dominate those obtained by their foreign subsidiaries, particularly those located in emerging countries (2.6 percent). This result, however, does not imply a negative contribution of foreign subsidiaries to the performance of the consolidated portfolio of international banks, since the later depends on the entire correlations of profit distributions. This will be investigated below.

III. Bank Internationalization and Risk-Normalized Returns

In this section, we explore empirically whether major international banking groups benefit from international geographical diversification. To give the most accurate answer possible within data limitations (we can only measure geographical diversification in terms of subsidiaries' assets relative to those of their parent banks), we pursue the following strategy.

We first conduct a baseline exercise, estimating the contribution of foreign subsidiaries' assets to the risk-return performance of the consolidated banking group. As discussed below, this approach introduces a potential omitted variable bias to the results, since consolidated profits mix the operations of international banks in their home countries (which include cross-border transactions and other foreign risk exposures originated from home), with the operations of their subsidiaries overseas, which we are not able to disentangle. To correct for this, we carry out a parallel, but more restrictive exercise, focusing exclusively on the contribution of foreign subsidiaries to banks' financial performance. For such control, take the difference in risk-adjusted profitability between the consolidated and unconsolidated financial statements of parent banks, exploiting differences in the information content of these two consolidation levels.

For the baseline exercise we consider the following specification:

$$sharpe_{i,t} = \alpha_0 share^{H}_{i,t} + \alpha_1 share^{I}_{i,t} + \alpha_2 share^{E}_{i,t} + \beta_1 H^{I}_{i,t} + \beta_2 H^{E}_{i,t} + macro'_{c,t}\delta + \varepsilon_{i,t} \qquad (1)$$

Where the dependent variable, $sharpe_{i,t}$, is a measure of the risk-adjusted profitability obtained by the consolidated group of international bank *i*, during year *t*. The series are computed by dividing the yearly consolidated ROA of each international bank over its standard deviation, using data from consolidated financial statements. Thus, the resulting series reflect the entire operations of parent banks in their home countries and those of their subsidiaries overseas. The index *i* goes from 1 to 38 (i.e., the number of international banks in the sample), and the time dimension is unbalanced (i.e., varies by bank) during the period 1995–2004.

The target explanatory variables are the relative allocation of bank assets in three regions: their home countries, $share_{i,t}^{H}$, their subsidiaries located in other industrial countries $share_{i,t}^{I}$, and their subsidiaries in emerging economies $share_{i,t}^{E}$. The asset shares are computed using data from the unconsolidated financial statements to avoid double counting of assets. Since these three variables add-up to one, the regression does not include a constant term. Under this specification, the coefficients associated with the regional distribution of assets provide a way to assess whether international banks with larger exposure overseas obtain any significantly different risk-adjusted returns, on average, during the sample period. In particular, we want to individually test whether $\alpha_1 \geq \alpha_0$, and $\alpha_2 \geq \alpha_0$.

To the extent that the shares of assets abroad are a choice variable for international banks, they bring in potential endogeneity. Arguably, a subsidiary with higher (observed or prospective) profitability would tend to receive a larger capital allocation, growing faster in terms of assets and ending up with a larger relative size. This may introduce a bias toward finding beneficial effects of international diversification (i.e., banks with larger assets abroad having better risk-adjusted returns).[7] We deal with this issue by using lagged values of the asset shares as instruments in the regressions. A look at the data, however, indicates that this problem may not be serious, as the share of bank assets in a particular subsidiary is fairly stable between two consecutive years.

In addition, as mentioned before, there is a potential omitted variable bias originating from our inability to disentangle the cross-border exposures of parent banks from their regular operations in their home countries (since the former also provide exposure to foreign risks and therefore potential diversification gains). The direction of this bias would depend on whether local operations abroad and cross-border operations are substitutes or complements. Under the plausible assumption that local and cross-border operations were substitutes, the results would be biased against finding international diversification gains. This is because any international diversification gains achieved by banks with relatively small local operations abroad (and more heavily reliant on cross-border operations) will be wrongly attributed to their activities at home. On the other hand, if local and cross-border operations were complements, the results would be biased in the opposite direction, overestimating the diversification gains of local operations abroad. Below, we propose a strategy to overcome this problem.

Going back to the specification, the regression includes two Herfindhal indexes measuring the concentration of the assets of each international bank within industrial and emerging countries, as a way to capture the effect of international diversification *within* country groups. These are computed as:

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[7] We notice, however, that this possibility also applies in the opposite, so the direction of the bias is unclear. That is, a bank with better business prospects at home could end up with a lower share of assets in foreign subsidiaries, biasing the coefficients in the opposite direction.

$$H_{i,t}^{G} = \sum_{j \in G} s_{i,j,t}^{2} \qquad \text{for } i=1,2,...,38 \qquad (2)$$

Where H^{G}_{i} indicates the Herfindhal index of parent bank i in country group G (either industrial or emerging), and $s_{i,j}$ is the average share of assets of parent bank i in host country j in year t. The Herfindhal indexes vary in the interval (0, 1], with a larger value indicating a less diversified portfolio (i.e., a higher concentration within industrial or emerging market countries). The shares are computed relative to the assets of the corresponding bank in each group of countries. Thus, a Herfindhal equal to one indicates that the international bank operates in just one country in that particular group. The hypothesis that international diversification brings positive benefits in terms of the risk-return achieved by international banks is consistent with negative coefficients associated with the concentration indexes.

The regressions also include a vector of macroeconomic controls, $macro_{c,t}$, which are intended to isolate the influence of macroeconomic conditions in the home countries of the international banks on their overall performance. In our preferred specification, the vector contains money market rates expressed in US$, and GDP growth. These variables vary along the time dimension and are common to international banks incorporated in the same home country, denoted by index c. The vector also contains a set of home-country dummies to control for time-invariant differences in the average profitability of international banks across their countries of incorporation.

The regressions, computed with robust standard errors, are presented in Table 4. The specification in the first column does not include any controls other than home-country dummies, and thus provides an exploratory comparison of the risk-adjusted returns across international banks with varying levels of exposures overseas. On average, after adjusting for differences in risk-adjusted profitability between home countries, the sampled international banks obtained an overall risk-adjusted ROA of 3.942 during the sampled period. International banks with larger allocation of assets overseas obtained substantially higher risk-normalized returns. In particular, the coefficient associated with the share of assets in emerging market countries (9.408) is significantly larger than the coefficient associated with the share of assets at home, as indicated by the probability values of the tests of coefficient equality presented at the bottom. In terms of the magnitude, international banking groups with an additional 1 percent of their assets allocated to subsidiaries in emerging market countries obtained an average increase in their risk-adjusted returns of 5.466 basis points (i.e., 9.408–3.942). There is also evidence that international banks with a larger share of assets in subsidiaries located in industrial countries were able to obtain better risk-adjusted returns.

These results remain valid after the inclusion of the macroeconomic controls, as shown in the second column. They are consistent with the notion that subsidiaries overseas allow international banks to diversify risk (i.e., to increase their risk-adjusted return) and point to an important underinvestment in emerging countries, at least from the pure risk-return perspective. These two regressions, however, are not well suited to compare

profitability across parent banks with different international diversification profiles, as they ignore differences in the actual patterns of international asset allocation within industrial and emerging market economies. For example, two banks with an equal share of their assets in industrial countries are treated similarly in these tests, regardless of potential differences in the patterns of asset diversification between countries in this group (the same applies to bank exposures to emerging market countries).

To explore the effects of international diversification on risk-adjusted profitability, the previous regressions were estimated again, after adding the indexes of asset concentration within country groups. The results are presented in the third row of Table 4. Adding information on the international concentration of bank operations to the set of explanatory variables increases the point estimates of the coefficients associated with the asset shares in emerging market countries. Consistent with this, the coefficients of the Herfindhal indexes are negative, indicating that the regional concentration of the operations of international banks has been detrimental to their risk-adjusted profitability. The marginal effect of regional concentration is particularly severe for international bank operations in emerging market countries, as the associated coefficient (–1.461) is three times larger that its counterpart in industrial countries (–0.446). This probably reflects the higher volatility of economic conditions in emerging countries, and also the clustering of crisis episodes resulting from exposure to common risk factors and international contagion. To some extent, however, this has been compensated by the fact that international bank operations in emerging market countries have been relatively less concentrated. During the sampled period, the Herfindhal index in emerging market countries averaged 0.40, against with 0.61 for industrial countries. Using these values, the average change in risk-adjusted ROA originated by the regional concentration of bank activities overseas is –0.59 for emerging economies and –0.27 for industrial countries.

We now explore the consequences of international diversification in a more specific way. In particular, we want to assess whether the erosion in risk-adjusted profitability originates from specific geographic regions. This conjecture builds from the strong regional patterns of international bank expansion, and from the fact that macroeconomic conditions tend to move in tandem within geographical regions. To test this, we split the sample of emerging economies in four regions denoted by R: Asia, Africa and the Middle East, Eastern Europe, and Latin America. Based on this partition, we linearly decompose the Herfindhal index of each parent bank in emerging economies, H^E_i, in its regional parts using:

$$H^E_{i,t} = \sum_{R \in E} w^2_{i,R,t} H_{i,R,t} \qquad \text{for } i=1,2,...,38 \qquad (3)$$

which indicates that the Herfindhal index in emerging economies for a given parent bank equals the sum of the Herfindhal indexes of its component geographical regions, $H_{i,t,R}$, weighted by their squared asset shares, $w_{i,t,R}$.

Using this, we re-estimate the regression after replacing the Herfindhal index in emerging economies by its weighted components. All the previous results on the coefficients of the asset shares in the three regions hold, as shown in the fourth column of Table 4, so they do not merit further comments. The coefficients of the disaggregated concentration indexes show some differences in the marginal costs of geographical concentration across regions, with the lower effects obtained in Eastern Europe. Combining these coefficients with the average values of the regional Herfindhal indexes, which are presented in Table 5, indicates that, in fact, regional concentration has been relatively less detrimental to international banks with operations in Eastern Europe. For example, the average drop in risk adjusted profitability for asset concentration in Eastern Europe is –0.032 (–0.102×0.31), compared with –0.806 in Africa and the Middle East, –0.743 in Latin America and –0.666 in Asia.

The results obtained so far could be challenged on two grounds. First, as discussed above, our inability to disentangle the cross-border operations of international banks from their regular operations in their home countries, creates a potential source of bias. Besides, since the regressions do not include bank-level controls, the results could be also driven by other omitted variables at the bank-level. For example, differences in business strategies across banks could have an impact on their profitability, also influencing the nature of their international exposures in a systematic way. Unfortunately, typical controls used in the banking literature (i.e., size, capitalization, or liquidity) offer little help to tackle these issues, as they convey no information of the characteristics of bank businesses.

To tackle these issues, we apply a novel strategy, exploiting differences in the information content of the consolidated and unconsolidated financial statements of parent banks. In particular, unconsolidated financial statements convey information on the activities of parent banks in their home countries, plus other exposures to foreign risks originated from home (including investment in foreign assets and cross-border lending). On the other hand, the consolidated financial statements of parent banks include all the operations mentioned above plus those of their foreign subsidiaries, netting out intra-group transactions. Since both consolidation levels refer to the same institution, taking the difference between consolidated and unconsolidated data isolates the contribution of foreign subsidiaries to the risk-return profile of parent banks. Notably, this also removes unwarranted cross-sectional differences between parent banks, including time-varying unobservable variables such as risk appetite and business strategies.

To implement this idea, we compute the risk-adjusted ROA for each parent bank using both consolidated and unconsolidated data, and obtain the difference between the two (consolidated minus unconsolidated). A positive value of the resulting metric indicates a positive contribution of foreign subsidiaries to the risk-return profile of their parent banks. A practical drawback of this approach is a decrease in sample size, since there are parent banks for which we do not have parallel information at the two consolidated levels. This includes all U.S. and Canadian banks.

To explore the resulting data, Figure 3 plots the difference in risk-adjusted ROA of each parent bank against the average share of their assets in the three groups of countries: (i) home (at the bottom), (ii) other industrial countries (upper-left), and (iii) emerging economies (upper-right). Surprisingly, the graphs show that the average risk adjusted-return obtained by parent banks on a consolidated basis is not consistently above the risk adjusted-return obtained on a stand-alone basis, since roughly half of the differences in risk-adjusted ROA are negative. At the same time, there is strong evidence that higher international exposure is positively correlated with risk-adjusted returns, which is consistent with the previous results.

A more formal test of the relationship between the difference in risk-adjusted ROA and the international exposure of parent banks was obtained by running a set of regressions similar to those reported previously, but after excluding the country fixed effects and the macro-controls (since these are removed by differencing, together with other bank-level idiosyncrasies). The results are presented in Table 6. Due to incomplete data at the two consolidation levels for some parent banks, the sample size drops to 23 international banks and a total of 120 observations.

Overall, the results indicate that foreign subsidiaries had a positive contribution to the risk-adjusted returns of their parent banks. The coefficient of the share of assets at home is close to zero and not statistically significant, implying that, on average, the risk-adjusted returns obtained by parent banks on their consolidated operations are no different from those obtained on *a solo* basis. On the other hand, parent banks with a larger share of their assets abroad, particularly in emerging market countries, have been able to attain higher risk-adjusted returns. These results are roughly unchanged after the inclusion of the Herfindhal indexes. While the signs of the coefficients associated with the Herfindhal indexes are consistent with those reported previously, their standard errors are too large, a result possibly due to the drop in sample size.

Summarizing, there is strong evidence that a larger allocation of bank assets to subsidiaries overseas has contributed to increase the risk-adjusted returns of international banks, albeit regional concentration has reduced such gains. However, the tests conducted so far are largely silent with respect to the optimality of the observed international asset allocation. The next section studies this issue in more detail, using a portfolio approach as a normative framework to study international diversification in banking.

IV. A PORTFOLIO APPROACH

Following Markovitz (1952), the return and risk of a portfolio of n assets can be decomposed into the contributions of its individual components. Let r denote the $n\times1$ vector of expected returns of individual assets, w the $n\times1$ vector of their corresponding weights in the portfolio, and Σ the $n\times n$ variance-covariance matrix of asset returns in the portfolio. The expected return and variance of the portfolio are given by $\mu = w'r$,

and $\sigma^2 = w'\Sigma w$, respectively. Applying quadratic programming techniques to this setup, it is possible to obtain the vector of nonnegative weights that minimize the variance required to attain a target return, and obtain a set of efficient portfolios in the risk-return space.

This framework appears suitable to analyze international diversification in the banking context, treating the subsidiaries of international banks in each country as individual assets in a global portfolio. But the application of this idea to the case at hand requires some modifications. In the context of portfolio theory, individual securities are treated as perfect substitutes, which is an unlikely assumption for the case of international bank subsidiaries overseas. In fact, launching banking operations in a foreign country is costly from the economic and managerial perspectives and entails multiple frictions—generated by legal, cultural, and historic differences between countries. The costs and frictions to enter a given country are likely to differ across international banks depending, for example, on their origin and other bank-specific characteristics. On the other hand, for a given international bank, the costs of internal capital relocation between its *existing* subsidiaries overseas are likely to be significantly lower, making the substitutability assumption more plausible. Therefore, we restrict the exercise to assessing the optimality of the observed asset allocation within the *observed* set of foreign subsidiaries for each international bank. This means that banking groups are not allowed to open subsidiaries in new countries but only to transfer assets within existing ones. While this clearly reduces potential gains from diversification, it also accounts better for sunk costs in closing and opening new bank affiliates. It also helps us control for regulatory restrictions to foreign entry, which could affect the ability of a bank to operate in a specific country.

Applied in this context, portfolio theory provides a tool to assess the contributions of specific bank subsidiaries (or a subset of them) to the overall risk-return performance of international banks. It also provides a benchmark to assess the optimality of the observed global asset allocation of international banks. Unfortunately, studying the diversification of bank portfolios at the level of individual countries poses some practical limitations. As the collection of foreign subsidiaries (and host countries) of each international bank evolves over time, the yearly coverage of portfolio components tends to be uneven, affecting our ability to compute the variances and covariances of the returns obtained at the level of individual countries. To circumvent this problem, we work at the level of country groups, splitting the operations of each international bank in three groups G, as we did before (G={home, other industrial countries, emerging market countries}).

In particular, let $\pi_{i,c,t}$ denote the unconsolidated after-tax profits obtained by international bank i (or its subsidiaries) in country c during year t, and $A_{i,c,t}$ denote the corresponding

unconsolidated assets.[8] We calculate the return on assets $r_{i,G,t}$ obtained by international bank i in country group G as:

$$r_{i,G,t} = \frac{\sum_{c \in G} \pi_{i,c,t}}{\sum_{c \in G} A_{i,c,t}} \tag{4}$$

Using this, we compute the first two moments of the return distributions obtained by each international bank in the three groups of countries (i.e., we compute the 3×1 vector of expected returns r_i and the 3×3 associated variance-covariance matrix Σ_i), plus the corresponding vector of asset shares w_i. We then estimate the set of efficient mean-variance portfolios for each international bank, by solving (bank indexes are omitted for brevity):

$$\min_{w \geq 0} \sigma = w' \Sigma w \qquad \text{s.t.} \qquad w' r \geq \mu \tag{5}$$

For varying values of target portfolio returns μ. The efficient frontier of each international bank is the set of points in the risk-return space $\{\sigma^*(\mu), \mu\}$, where $\sigma^*(\mu)$ is the solution to (5).

This provides a benchmark to assess the optimality of the observed allocation of international bank assets. Since all the portfolios along the frontier are efficient, choosing a particular combination would require a measure of the risk appetite of international banks, or the return of a risk-free asset. We use an alternative criteria, selecting a point consistent with the average ROA obtained by each parent bank. More precisely, we select an efficient portfolio with a return equal to (or slightly higher than) the observed ROA.[9] We then measure the optimality of international bank portfolios using the horizontal distance between the observed risk-return attained by each international bank (σ_0, μ_0) and its frontier, $d = \sigma_0 - \sigma^*(\mu_0)$. The resulting metric reflects the reduction in risk associated with an efficient *relocation* of international bank assets within its *existing* subsidiaries. Finally, we compute the efficient asset allocation and the implied Sharpe ratios, comparing them with the observed values for each international bank.

[8] Unconsolidated figures provide a closer (albeit imperfect) measure of the profitability of individual business units, since each bank is treated as an independent entity. Admittedly, this may also introduce noise in the aggregation of profits at the group level, as it ignores the effects of mutually canceling transactions between parent banks and their subsidiaries. However, this problem may not be critical, since there are no obvious reasons to believe that this noise is systematic.

[9] In most cases, the ROA of the selected efficient allocation is larger than the ROA of the actual portfolio due to approximation, as the frontier is based on a grid of 20 points.

It is important to emphasize that this approach understates the potential gains of international diversification for two reasons. First, restricting the analysis to diversification within the observed network of foreign subsidiaries for each international bank, neglects potential diversification gains from operating in a different and potentially broader set of countries. Second, the aggregation of bank operations by groups of countries prevents us from assessing the potential diversification gains of alternative asset allocations within county groups. Thus, for example, the sub-portfolio in emerging market countries reflects the diversification achieved by the observed asset allocation in these countries, neglecting potential diversification gains associated with an alternative relocation of assets within this group. These two effects operate in the same direction, introducing an unambiguous and potentially large underestimation of the diversification gains of cross-border operations.

Summary results are presented in Table 7, comparing the actual asset allocation of international banks worldwide and their associated risk-returns, against the alternative, risk-minimizing portfolios. The reported figures are unweighted averages of the results obtained for individual banks, classified by their countries of incorporation, so they convey information on the profile of the typical international banks. As discussed previously, the sampled banks maintained an average 82.4 percent of their assets at home, 12.6 percent in subsidiaries located in other industrial countries and 5 percent in subsidiaries located in emerging countries, as shown in the first row. In contrast, the optimal allocation matching the observed returns implies an average of 60.1 percent of assets at home, 28.9 percent in other industrial countries, and 11.0 percent in emerging markets. This home bias holds qualitatively for all the countries studied, except for the U.K. and Spain. The later probably reflects the robust economic performance in Spain during the period, combined with large volatility in Latin America, including financial crises in Brazil (1999), Argentina (2001), and Uruguay (2002).

The results, thus, indicate that international diversification gains are large and unexploited. In particular, under the observed asset allocation, international banks obtained an average ROA of 1.1 percent over the entire period, with a standard deviation of 0.7 percent. In contrast, the risk-minimizing allocation for a ROA of 1.5 percent entails a 30 percent reduction in volatility. These results are significant from the financial stability perspective, entailing potentially large reductions in economic and regulatory capital that could be taken into account in the prudential framework.

To further explore the sources of these international diversification gains, we examine the vectors of expected returns in the three groups of countries for each international bank, and their corresponding variance-covariance matrices. Table 8 presents the values for the typical international bank, computed by taking unweighted averages across the entire sample. The figures indicate that the expected returns at home are roughly in line with the expected returns of subsidiaries located in other industrial countries, but substantially lower than average returns in emerging economies. The volatilities of the returns at home and in other industrial countries are also similar, but roughly four-times smaller than the volatility of returns in emerging economies. The diversification gains

from the operations of subsidiaries abroad, including in emerging economies, originate from the low return covariances.

V. CONCLUDING REMARKS

This paper provides evidence that international diversification gains in banking, through the opening up of subsidiaries, are large and not entirely exploited. Our results show robust systematic differences in the risk-return performance of international banks in their home countries vis-à-vis their subsidiaries overseas, indicating that the later are more profitable, on average, but also riskier, particularly in emerging market countries. Larger systematic risks abroad, however, do not prevent the generation of international diversification gains stemming from the generally low correlations of returns between countries. The fact that banking activities in emerging market countries tend to be concentrated in some of the regions has eroded somewhat the gains from international diversification but has by no means depleted them.

Using the mean-variance portfolio model as a benchmark, the results show a substantial home bias in the international allocation of bank assets. Notably, these results come from a test that substantially underestimates the gains from international diversification, as it is restricted to diversification gains *within* the observed set of subsidiaries of each international bank. This implies that—notwithstanding the current regional concentration for emerging economies—the potential gains are sizable.

These finding have two important sets of policy implications. The first one concerns bank regulation. Risk weighting in the single factor model under the first pillar of Basel II does not take into account geographical diversification gains. If they exist and are large—as this paper proposes—home supervisors may want to use the room offered by Basel II's second pillar to consider the entire contribution of foreign exposures to the overall risk performance of bank assets, which depends on return correlations. This would help reduce the likelihood of unwarranted home bias, with positive consequences for the risk-adjusted profitability for international banks and for the financing of growth in host countries, particularly emerging economies.

There are a number of issues to take into account regarding these results. First, our dataset deals with bank internationalization through subsidiaries, but we lack information on branches and cross-border loans. Such comprehensive data would allow us to draw firmer conclusions on the issues but it is unfortunately not available. One possible venue for future research might be case studies for which cross-border bank lending is available. Second, due to data limitations, the assessment of the optimality of the observed allocation of bank assets is based on diversification gains between country groups, and not at the level of individual countries. Future research on this topic, based on more complete bank-level data, will likely find even larger estimates of unexploited diversification benefits.

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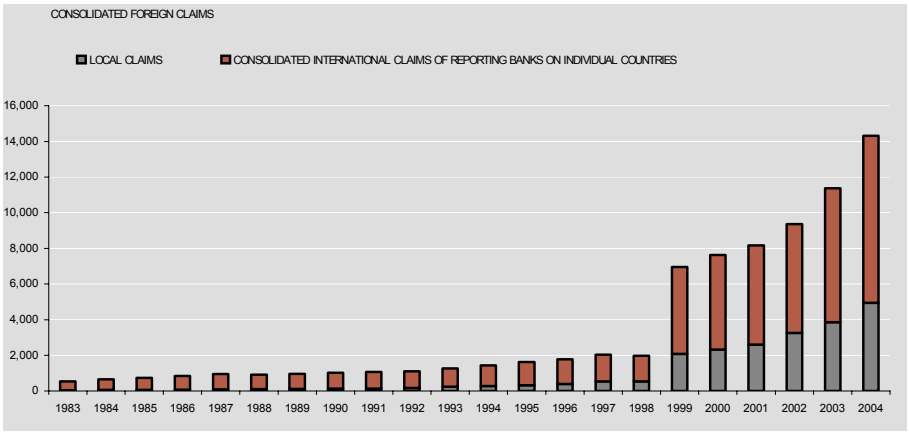
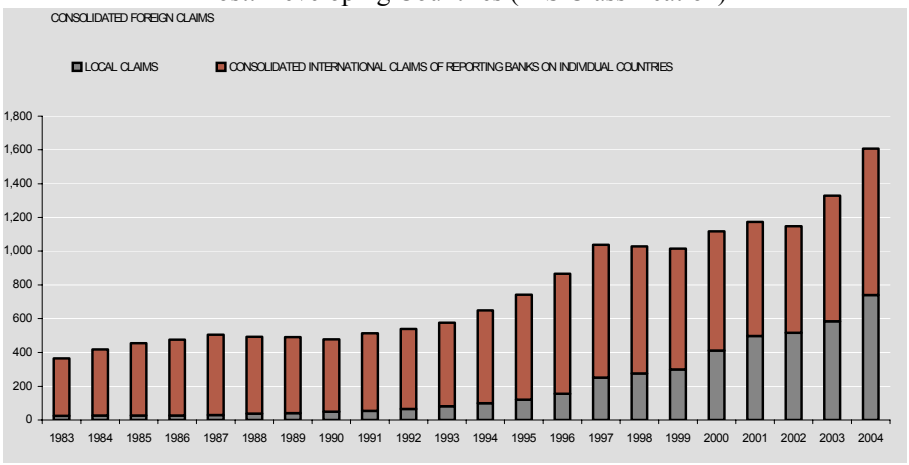
Figure 1. Evolution of Local and Cross-Border Claims of BIS-Reporting Banks, 1983–2004, In Billion US$ 1/

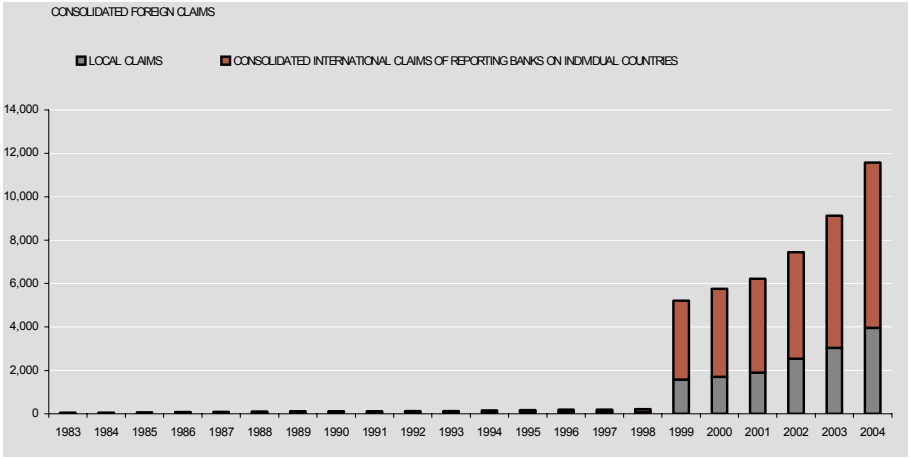
Host: All Countries



Host: Developing Countries (BIS Classification)



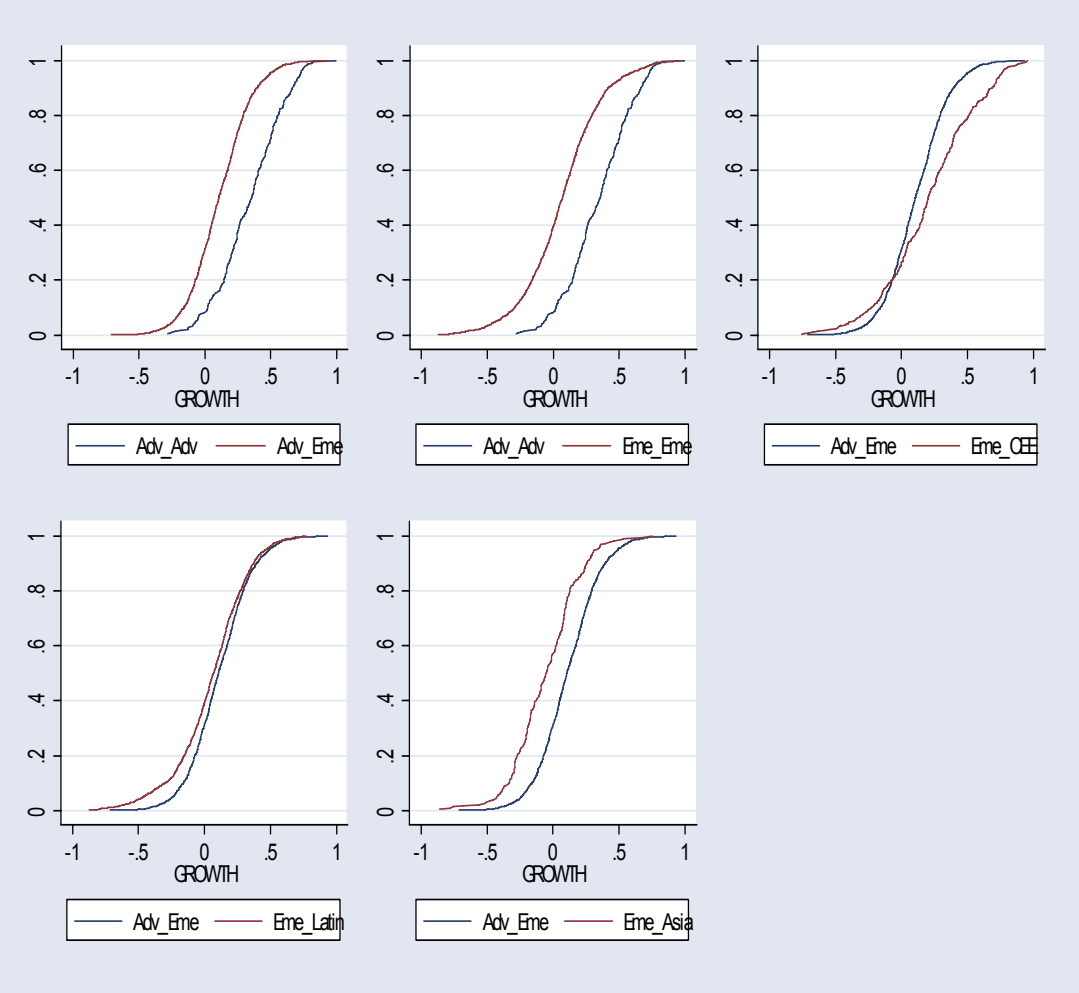
Host: Developed Countries (BIS Classification)



Source: Bank of International Settlements.

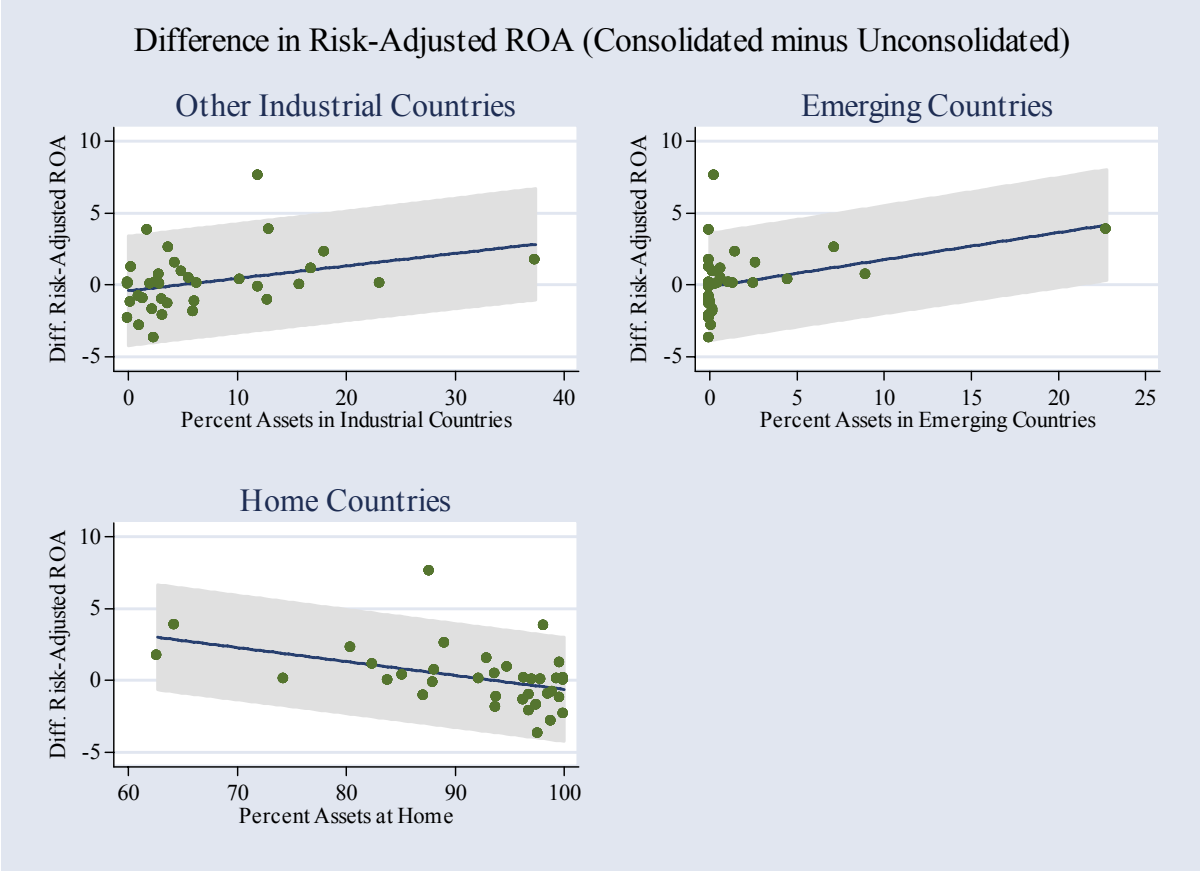
1/ There is a break in the series in 1999 due to a change in definitions.

Figure 2. Cumulative Frequencies of GDP Growth Correlations
By Groups of Countries



This figure compares the cumulative distribution frequencies of the pair-wise correlations of GDP growth by groups of countries.

Figure 3. Risk-Adjusted Profitability and International Exposure of Parent Banks



This figure plots the difference between the risk-adjusted ROA obtained by each international bank on a consolidated basis minus the risk-adjusted ROA obtained on a solo basis, against their asset allocation in three groups of countries: their home countries, other industrial countries, and emerging economies. The lines show the fitted values of a linear regression and two standard deviation bands are depicted by the shaded areas.

Table 1. Regional Distribution of Bank Subsidiaries Overseas

	Country of incorporation of parent banks								
	Canada	France	Germany	Italy	Japan	Spain	U.K.	U.S.	Total
Number of institutions									
Number of mother banks	5	4	5	5	7	2	4	6	38
Number of subsidiaries	27	70	67	30	38	33	61	73	399
In Industrial Economies	15	33	40	19	26	12	35	29	209
In Emerging Economies	12	37	27	11	12	21	26	44	190
Africa and Middle East	.	17	.	.	.	.	12	6	35
Asia	3	6	3	.	9	.	7	12	40
Eastern Europe	.	10	23	9	1	.	2	7	52
Latin America	9	4	1	2	2	21	5	19	63
Regional distribution of assets (unweighted averages, in percent)									
Home Country	92.1	93.9	78.6	90.4	78.3	67.7	50.4	93.7	82.4
Subsidiaries Overseas	7.8	6.1	21.4	9.5	21.7	32.2	49.5	6.2	17.6
In Industrial Economies	7.2	5.1	20.6	7.7	20.3	11.9	23.1	4.6	12.6
In Emerging Economies	0.6	1.0	0.8	1.8	1.4	20.3	26.4	1.6	5.0
Africa and Middle East	.	0.5	.	.	.	.	3.9	0.2	0.5
Asia	0.1	0.1	0.1	.	1.1	.	20.6	0.6	2.5
Eastern Europe	.	0.3	0.7	1.6	.	.	.	0.1	0.4
Latin America	0.5	0.1	.	0.2	0.3	20.3	1.9	0.7	1.6

The upper panel of this table presents the distribution of bank subsidiaries overseas, classified by their location and the country of incorporation of their parent banks. The lower panel presents the unweighted average distribution of international bank assets, grouped by their countries of incorporation.

Table 2. Summary Statistics of the Correlations of Selected Macroeconomic Variables Between Groups of Countries

	Mean	Min.	Max.	No. Obs.
GDP Growth				
Industrial vs. Industrial	0.413	-0.247	0.997	210
Industrial vs. Emerging	0.126	-0.603	0.929	1386
Emerging vs. Emerging	0.066	-0.872	0.957	2145
Industrial vs. Africa & Middle East	0.085	-0.517	0.694	462
Industrial vs. Asia	0.120	-0.495	0.542	189
Industrial vs. Eastern Europe	0.171	-0.603	0.929	315
Industrial vs. Latin America	0.139	-0.462	0.630	420
Government Bond Yields				
Industrial vs. Industrial	0.725	-0.282	0.997	134
Industrial vs. Emerging	0.255	-1.000	1.000	189
Emerging vs. Emerging	0.247	-1.000	1.000	69
Industrial vs. Africa & Middle East	.	.	.	0
Industrial vs. Asia	0.136	-0.723	1.000	82
Industrial vs. Eastern Europe	0.856	-1.000	1.000	43
Industrial vs. Latin America	0.004	-0.824	0.945	64
Money Market Rates in US$				
Industrial vs. Industrial	0.597	-0.244	1.000	103
Industrial vs. Emerging	0.113	-1.000	1.000	447
Emerging vs. Emerging	0.243	-1.000	1.000	463
Industrial vs. Africa & Middle East	-0.071	-1.000	0.998	135
Industrial vs. Asia	0.105	-0.929	0.959	86
Industrial vs. Eastern Europe	0.213	-1.000	1.000	112
Industrial vs. Latin America	0.240	-0.861	1.000	114
First Principal Component				
Industrial vs. Industrial	1.085	-0.770	2.513	87
Industrial vs. Emerging	-0.711	-3.457	2.637	101
Emerging vs. Emerging	-0.755	-2.580	1.782	30
Industrial vs. Africa & Middle East	.	.	.	0
Industrial vs. Asia	-1.118	-3.457	0.739	53
Industrial vs. Eastern Europe	0.446	-2.359	2.637	22
Industrial vs. Latin America	-0.859	-2.558	0.659	26

This table displays summary statistics of the correlations of selected macroeconomic variables between country pairs. The results are presented by groups of countries, splitting them in industrial versus emerging market countries, and further splitting the later by geographical regions. Correlations with the same country are excluded from the computations.

Table 3. Summary Statistics of Returns and Risk by Country Groups
(In Percent)

	Mean	St. Dv.	Min.	Max.	No. Obs.
Pooled Data					
Home	1.2	2.9	-8.7	26.5	229
Industrial	1.2	3.6	-19.5	48.9	1123
Emerging	1.8	6.3	-41.2	68.6	930
Averaging by Banks					
Home country					
Return	1.4	2.5	-1.2	10.1	38
Risk	1.0	1.8	0.0	9.3	38
Risk-Normalized Return	4.4	6.7	-0.3	35.7	38
Industrial countries					
Return	1.2	2.9	-7.2	24.6	209
Risk	1.2	2.3	0.0	15.4	207
Risk-Normalized Return	3.1	9.3	-1.3	126.7	207
Emerging countries					
Return	2.1	6.3	-25.6	58.6	190
Risk	2.8	5.5	0.0	51.0	190
Risk-Normalized Return	2.6	7.0	-68.9	34.4	190

This table presents summary statistics of the returns and risk obtained by international banks and their subsidiaries overseas in three groups of countries. Returns are measured by the yearly ROA, and risk by its standard deviation. The data come from the unconsolidated financial statements of parent banks. The statistics in the upper panel are based on the pooled dataset, treating institutions at each point in time as individual observations. The statistics in the lower panel are based on a two-stage approach. First we compute the average return, risk, and risk-normalized return for each bank. Second, we average across banks in each group of countries.

Table 4. The Effect of Bank Internationalization on Risk-Adjusted Profitability
Dependent Variable is Risk-Normalized ROA

	[1]	[2]	[3]	[4]
	ROA/StDv	ROA/StDv	ROA/StDv	ROA/StDv
Percent assets in home country (coef_1)	3.942	3.880	4.929	4.966
	[0.445]***	[0.830]***	[0.930]***	[0.917]***
Percent assets in industrial (coef_2)	8.577	8.519	8.032	8.828
	[2.104]***	[2.205]***	[2.189]***	[2.231]***
Percent assets in emerging (coef_3)	9.408	9.426	11.990	11.301
	[2.177]***	[2.238]***	[2.425]***	[2.696]***
GDP Growth		0.113	0.106	0.117
		[0.124]	[0.120]	[0.117]
Money Market Rate in US$		-0.087	-0.093	-0.115
		[0.121]	[0.115]	[0.112]
Herfindhal index in industrial			-0.446	-0.275
			[0.508]	[0.505]
Herfindhal index in emerging			-1.461	
			[0.444]***	
Herfindhal Africa and Middle East				-2.304
				[1.124]**
Herfindhal Asia				-1.479
				[0.575]**
Herfindhal Eastern Europe				-0.102
				[0.445]
Herfindhal Latin America				-2.478
				[0.647]***
Observations	236	236	236	236
R-squared	0.83	0.84	0.84	0.85
coef_1=coef_2				
F-Stat	5.03	4.98	2.16	3.14
Prob > F =	0.03	0.03	0.14	0.08
coef_1=coef_3				
F-Stat	6.27	6.51	8.55	5.85
Prob > F =	0.01	0.01	0.00	0.02

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

This table presents the results of regressions of the risk-normalized ROA obtained by parent banks, on their asset shares in three groups of countries: (i) home, (ii) other industrial countries, and (iii) emerging economies. The regressions include a set of home-country macroeconomic controls, home-country fixed effects, and Herfindhal indexes of asset concentration in specific regions. F-tests of coefficient equality and their p-values are displayed at the bottom.

Table 5. Average Herfindhal Indexes by Groups of Countries

		Emerging Market Countries				
	Industrial Countries	Total Emerging	Africa and the Middle East	Asia	Eastern Europe	Latin America
Canada	0.69	0.50	.	0.59	.	0.21
France	0.54	0.25	0.34	0.32	0.64	0.38
Germany	0.47	0.33	.	0.34	0.43	0.20
Italy	0.69	0.45	.	.	0.30	0.16
Japan	0.71	0.47	.	0.56	0.07	0.19
Spain	0.58	0.38	.	.	.	0.38
U.K.	0.70	0.44	0.51	0.44	0.27	0.37
U.S.	0.54	0.39	0.21	0.44	0.16	0.51
Average	0.61	0.40	0.35	0.45	0.31	0.30

This table presents the unweighted averages of the Herfindhal indexes of bank asset allocation in industrial and emerging market countries. The later are further decomposed by specific geographic regions. The index numbers vary in the range (0, 1], with a larger value indicating higher concentration of bank assets.

Table 6. The Effect of Bank Internationalization on Risk-Adjusted Profitability
Dependent Variable is the Difference in Risk-Normalized ROA
(Consolidated minus Unconsolidated)

	[1] Diff. in Risk-Normalized ROA	[2] Diff. in Risk-Normalized ROA	[3] Diff. in Risk-Normalized ROA
Percent assets in home country (coef_1)	-0.345	0.406	0.610
	[0.289]	[0.496]	[0.554]
Percent assets in industrial (coef_2)	4.191	4.328	4.343
	[1.785]**	[1.724]**	[1.807]**
Percent assets in emerging (coef_3)	3.753	4.918	5.876
	[1.059]***	[0.972]***	[1.268]***
Herfindhal index within industrial		-0.802	-0.823
		[0.645]	[0.685]
Herfindhal index within emerging		-0.320	
		[0.489]	
Herfindhal Africa and Middle East			-5.116
			[2.458]**
Herfindhal Asia			-1.192
			[1.035]
Herfindhal Eastern Europe			-0.259
			[0.546]
Herfindhal Latin America			-0.008
			[0.772]
Observations	120	119	119
R-squared	0.25	0.32	0.35
coef_1=coef_2			
F-Stat	5.10	3.80	3.23
Prob > F =	0.026	0.054	0.075
coef_1=coef_3			
F-Stat	17.67	28.41	19.63
Prob > F =	0.000	0.000	0.000

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

The dependent variable is the difference between the risk-normalized ROA obtained by each international bank on a consolidated basis, minus the risk-normalized ROA obtained on a solo basis. The target variables are the share of assets of each international bank in three country groups: (i) their home country, (ii) other industrial countries, and (iii) emerging economies. F-tests of coefficient equality and their p-values are displayed at the bottom.

Table 7. Comparison Between Observed and Optimal Portfolios Allocations by Country of Incorporation of International Banks
(In percent)

				Asset Allocation Percent of Assets in:		
	Return	Risk	Sharpe	Home	Industrial	Emerging
Actual Portfolios (Period Average)						
Average	1.1	0.7	1.7	82.4	12.6	5.0
Canada	0.7	0.2	3.9	92.1	7.2	0.7
Germany	0.3	0.4	0.9	78.6	20.6	0.9
Spain	0.8	0.2	4.5	67.7	11.9	20.3
France	0.4	0.1	3.7	93.9	5.1	1.0
U.K.	5.1	2.2	2.3	50.4	23.9	26.5
Italy	0.5	0.7	0.7	90.4	7.7	1.9
Japan	0.7	1.3	0.6	78.3	20.3	1.3
U.S.	1.1	0.2	4.5	93.7	4.7	1.6
Optimal Portfolios (Frontier)						
Average	1.5	0.5	3.1	60.1	28.9	11.0
Canada	2.1	0.2	8.6	72.2	23.5	4.3
Germany	0.5	0.3	2.0	46.3	46.7	7.1
Spain	0.8	0.1	10.2	77.7	17.2	5.2
France	0.5	0.1	6.2	79.9	17.0	3.0
U.K.	5.2	2.4	2.2	52.9	17.1	29.9
Italy	0.9	0.3	3.1	44.5	36.9	18.6
Japan	1.1	0.4	3.0	41.4	44.7	14.0
U.S.	1.1	0.2	4.9	79.2	15.6	5.2
Deviation (Actual-Optimal)						
Average	0.4	-0.2	1.5	22.3	-16.2	-6.0
Canada	1.4	0.1	4.7	19.8	-16.2	-3.6
Germany	0.2	-0.1	1.1	32.3	-26.1	-6.2
Spain	0.0	-0.1	5.7	-9.9	-5.2	15.2
France	0.1	0.0	2.6	14.0	-11.9	-2.0
U.K.	0.1	0.2	-0.1	-2.6	6.8	-3.4
Italy	0.4	-0.4	2.4	45.9	-29.2	-16.7
Japan	0.4	-0.9	2.5	37.0	-24.3	-12.6
U.S.	0.0	0.0	0.5	14.6	-10.9	-3.6

This table presents a comparison of the observed allocation of assets by international banks and their implied risk-returns, against an optimal, risk-minimizing allocation, that renders similar returns. The results are disaggregated by the countries of incorporation of international banks. All figures are unweighted averages.

Table 8. Returns and Variance-Covariance Matrix of the Typical International Bank

	Home	Industrial	Emerging
Variances-Covariances			
Home	3.58	0.20	0.45
Industrial	0.20	2.85	0.27
Emerging	0.45	0.27	12.17
Returns	1.32	0.78	3.30
Weights	82.4	12.6	5.0

This table presents the unweighted average of the variance-covariance matrix of yearly returns of international banks in three groups of countries: (i) home, (ii) other industrial countries, and (iii) emerging countries. The figures are based on unconsolidated financial statements. The table also displays the average returns and the actual asset allocation in these three groups of countries.