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Abstract

In this paper, we investigate the possible influence that multimarket contact has on the cross-border expansion of commercial banks. To answer our question, we assemble a unique database on the 12,244 subsidiaries of the world's 100 largest banks in 115 countries, spanning the period 2001 to 2007, and develop a measure of multimarket contact. Our mixed effects logistics regressions show clear evidence of the positive influence of multimarket contact on the cross-border expansion of commercial banks.

JEL Classification: D43; F21; G20

Keywords: Multimarket contact; Competition and other forms of market imperfections; FDI; Banks

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1. Introduction

In this paper, we investigate whether multimarket contact, that is, the prior overlapping presence or collocation with rivals banks in multiple markets, has an influence on the cross-border expansion of commercial banks. In order to do so, we assemble a unique and large data set for the time-varying multimarket contact of 12,244 subsidiaries of the world's largest 100 banks in 115 countries from 2001 to 2007, which yield an unbalanced panel of 39,616 bank-year-country observations. Using this data we then develop a measure of multimarket contact. We use the novel mixed effects logistic regression method that accommodates linear dependence in observations covering several bank, country and year observations, to estimate a model of cross-border expansion as a function of multimarket contact. After controlling for parent, home and host country advantages, we find clear evidence of the positive influence of multimarket contact on the cross-border expansion of commercial banks.

Multinational banks produce, distribute and use large quantities of information about their customers, and their diverse products and markets (Jones, 1992). Buckley and Casson (1976) and Grubel (1977) show that this information can be distorted, misused, lost or mispriced if transmitted via external markets or exchanged in contractual arrangements such as licensing or franchising. This potential for the inefficient transmission or exchange of important information gives banks an incentive to follow their customers abroad (Casson, 1990; Williams, 1997). The vast empirical literature finds considerable support for the follow-the-customer hypothesis (see among many others, Fisher and Molyneux, 1998; Focarelli and Pozzolo, 2001).

However, some studies find little or no support for the follow-the-customer hypothesis. For example, Ursacki and Vertinsky (1992) do not find a statistically significant association between trade, a proxy for the follow-the-customer hypothesis, and the presence of foreign banks in Japan and Korea. Other examples include Seth and Quijano (1993) who do not find a statistically significant association between loans granted by the U.S. subsidiaries of Japanese banks and loans secured by Japanese manufacturing firms; while Seth et al. (1998) find that foreign banks in developed countries lend more to local customers than to their domestic customers. Gormely (2010) also shows that foreign banks financed profitable local firms in India. Goldberg and Johnson (1990) find that banks not only follow domestic customers but also service new customers in markets that offer growth opportunities. In a related study spanning several countries, Brealey and Kaplanis (1996) could not explain the size of foreign bank presence with the level of trade and foreign investment (proxies for the follow-the-customer hypothesis) or with the size of the host market (a proxy for the opportunities to service local customers). Together, these results suggest that factors other than the need to follow domestic customers may influence the cross-border expansion of banks.

These findings indicate that parent banks and their subsidiaries not only possess competencies in processing information flows on domestic customers but also other technical and market-making competencies. These latter capabilities can be internalized across borders to service customer needs at a low marginal cost and at a high marginal benefit equivalent to the size of the market (Qian and Delios, 2008).

Some studies find a role for oligopolistic considerations in explaining the location of subsidiaries of multinational banks. In an early study, Ball and Tschoegl (1982) find a positive association between the number of domestic competitors (from Japan in the U.S.) and the

establishment of overseas subsidiaries of Japanese banks in the U.S. In a more recent study, Qian and Delios (2008) also find a statistically significant association between the number of domestic competitors (from Japan in several overseas markets) and the establishment of subsidiaries of Japanese banks in overseas markets. On the other hand, a study by Choi, Tschoegl and Yu (1986) covering several countries shows that multinational banks 'invade' each other's markets. For example, they find a positive association between the number of French banks in Switzerland and the number of Swiss banks in France.

In this paper, we investigate the influence of multimarket contact on the cross-border expansion of commercial banks. By multimarket contact we mean banks' prior overlapping presence, or collocation, with their rivals across multiple overseas markets. To the best of our knowledge, the measure of multimarket contact that we employ here has only featured previously in the banking literature in Degryse and Ongena (2007) and in Presbitero and Zazzaro (2011), though not in the context of the cross-border expansion of banks. Degryse and Ongena (2007) use a linear probability model to assess the influence of multimarket contact (of 104 Belgian banks in 837 postal zones) on bank orientation. In a similar vein, Presbitero and Zazzaro (2011) examine the influence of multimarket contact on the lending decisions of Italian banks (to 4,121 firms in 95 Italian provinces). These studies show that multimarket contact has a considerable influence on the strategic orientation of banks, and in particular, leads banks to focus on relationship-based lending.

We extend this line of investigation by examining the influence of multimarket contact on the cross-border expansion of banks. Banks involved in significant competitive interactions with their rival banks should have incentives to: a) service customers with whom they have established prior relationships thereby deterring rival banks to pose a threat to these relationships; and b) to

develop banking relationships with new customers thereby deterring rival banks from establishing relationships with these new customers. Allowing rival banks to establish relationships with existing or new customers may ultimately pose a threat to the global competitive equilibrium of the industry (Root, 1984).

Our measure of multimarket contact is designed to gauge the extent to which one of the Top 100 banks is present in the 115 sampled markets with its rivals, i.e. with the other "99" banks. This involved the computation of the pairwise overlapping presence or collocation of each bank (in the Top 100) with its peer banks (the other 99), scaled by the number of countries in which the focal bank (of the Top 100) operates. For example, the multimarket contact score of Deutsche Bank, the 1st in the list of 100 banks, is 0.06. This is calculated by averaging its collocation with the other Top 99 banks in each of the 9 markets in which it is present. Similarly, the multimarket score of Hokuriku Bank, the 100th in the list, is 0.06. This is calculated by averaging its collocation with the other Top 99 banks in each of the 4 markets in which it is present. Consider another example, Unicredit has subsidiaries in 15 of the sampled countries and overlaps with Société Générale in 12 of these countries. The multimarket contact score for the Unicredit-Société Générale pair is 0.80. Alternatively, UBS (Union Bank of Switzerland) operates in 35 of the sampled countries and overlaps with United Overseas Bank in 12 countries; in this case the multimarket contact score is 0.34. Overlapping is more intense for the first pair than for the second pair and our metric captures this difference.

The rest of the paper is organized as follows. We review the literature on multinational banking in Section 2 before describing our methodological approach in Section 3. We report the results of a baseline model together with a set of tests designed to explore the robustness of this model in Section 4. Finally, in Section 5 we draw together our conclusions and the related implications of our results.

2. Multinational banking and multimarket contact

Buckley and Casson (1976), Grubel (1977) and Aliber (1984) define multinational banks as firms that own and control operations in more than one country. Foreign operations of banks may be in the form of subsidiaries or branches, which by nature are wholly-owned by parent banks.[1] Heinkel and Levi (1992) show that subsidiaries differ from branches. Banks possessing significant information flows on their customers are likely to establish branches to provide trade finance related services where regulations permit them to do so. Banks possessing significant intangible technical, market-making and/or managerial competencies are likely to establish subsidiaries to provide deposit-lending services to local customers. These subsidiaries may provide services to domestic customers on whom their parents possess information flows, but these will be fringe. Subsidiaries operate as local concerns; are monitored by the local central bank to allay fears of liquidity and possible bank runs; and have access to central bank funding facilities just like other local banks (Du, 2003). Tschoegl (2004) shows subsidiaries of foreign banks are most often owned by parents that are the largest in their domestic markets. He contends that parent banks are likely to prefer establishing subsidiaries in locations where they hold a significant proportion of their assets; these assets are risky; their value depends on local market conditions; the local regulatory authorities are competent and the costs of local governance are lower than the benefits of local supervision and regulation. Assets of parents and subsidiaries signal the possession of intangible assets that can be internalized across borders and enable them to provide services to local customers.

[1] Like previous studies covering large number of banks and countries, we could not assemble consistent data on branches. Future extensions of our study should, if possible, consider the choice between branches and subsidiaries.

The benefits of internalizing parents' intangible technical, market-making and/or managerial competencies that take the form of public goods across borders are likely to be enhanced by home and host country advantages (Esperanca and Gulamhussen, 2001). Certain features of the home country such as the size of the domestic credit and stock markets can provide the necessary seed capital required for establishing overseas subsidiaries (Fisher and Molyneux, 1998). Proximity in terms of bilateral trade between two countries, a proxy for the possession of information processing advantages with domestic customers; of cultural distance, a proxy for the costs of monitoring distant subsidiaries; of language, a proxy for the costs of communicating with subsidiaries in countries that have a different official language; can facilitate the establishment of local subsidiaries (Berger et al., 2004). Home and home-host country proximity advantages should be shared by banks from the same home country and proximate countries but provide a distinct competitive advantage in relation to banks from countries with less developed credit and stock markets and less proximate countries (Ball and Tschoegl, 1982). Finally, host country features can attract or hinder the presence of subsidiaries of foreign banks. Large credit and stock markets indicate the potential for servicing local customers (Focarelli and Pozzolo, 2005), but regulatory restrictiveness can deter the cross-border expansion of banks (Barth, Caprio and Levine, 2001).

Competitive interactions between rival banks can also encourage the establishment of subsidiaries. The findings reported by Ball and Tschoegl (1982), Choi, Tschoegl and Yu (1986) and Qian and Delios (2008) indicate that banks establish subsidiaries in overseas markets as a reaction to the presence of their domestic or multinational rivals. These findings are importantly associated with multimarket contact (Scott, 1982, 1991; Bernheim and Whinston, 1990) which recognizes the existence of incentives for firms in establishing operations in at least some of the

markets inhabited by their rivals, thus signaling their ability to respond should their position come under threat. The behavior predicted by this theory is different from that foreseen by the classical oligopoly theory (Scherer and Ross, 1990). The latter predicts perfect collusion based on the assumption of complete information and decreasing returns. The former predicts competitive interaction on the assumption of imperfect information and increasing returns, that is, when the doubt in "free riding" is too high to justify the trust implicit in dividing the market together. In this setting, firms do not cooperate to carve the market up together, but instead anticipate the potential moves of their rivals, thereby creating conditions for competitive interaction (Mester, 1987). As time passes, firms may expand abroad in a recognizable pattern that permits better coordination, which might involve allowing their rivals to dominate some markets in exchange for similar treatment in other markets (see the mutual forbearance hypothesis postulated by Edwards, 1955).

To overcome the difficulties associated with the exchange of their intangible capabilities in external markets, banks can internalize their transactions through wholly-owned subsidiaries. The possession of intangible competencies inhibits banks from establishing consensuses to carve out markets together because of the risks associated with the dissipation of information. Internalization of intangible technical, market-making and managerial competencies may spur imperfect competition (Buckley and Casson, 1976; Williams, 1997). Banks involved in intense multimarket contact should have strong incentives to establish new subsidiaries to seize the opportunity to develop relationships with new customers: a bank that establishes a relationship with a customer in an overseas market is likely to pose a threat to the relationship that its rival bank has developed with the same customer in another market, a behavior that precludes mutual

forbearance (see also Degryse and Ongena, 2007; Ghemawat and Thomas, 2008; Presbitero and Zazzaro, 2011).[2]

3. Empirical setup

Previous studies assessed the influence of competition from domestic (Ball and Tschoegl, 1982; Qian and Delios, 2008) or other multinational (Choi, Tschoegl and Yu, 1986) banks in the establishment of overseas subsidiaries using aggregate (number of banks from the home country or number of banks from another country) measures at the host country level. These country-level studies are certainly useful in understanding the influence of aggregate competition on cross-border bank flows. [3]

However, we believe that a fuller understanding of the competitive interactions between rival banks vying for the same customers is required to further understand the motives for cross-border banking. By assembling a new and large dataset, we are able to construct a measure of the multimarket contact of subsidiaries of multinational banks. Our pairwise measure of competitive interaction quantifies every possible combination of each bank with at least one rival in the sampled countries and quantifies their multimarket contact (or overlapping presence, or collocation). The measure allows us to revisit the factors influencing the cross-border expansion of commercial banks over the globe, controlling for parent, home and host country advantages.

3.1. Sample

[2] Berger et al. (2007) show in their study of the performance effects of multimarket contact that technological progress permitted large banks engaged in multimarket contact to compete more efficiently against small banks focused in single markets in the 1990s than in the 1980s. We do not study the performance effects of multimarket contact. However, in unreported tests, we found a positive relationship between our measure of multimarket contact and the Tobin's q, return on assets and return on equity, controlling for several parent bank, subsidiary, and home and host country characteristics.

[3] In unreported tests, we found a positive association between the number of rival bank subsidiaries and the local of the focal bank.

We collected yearly data on foreign bank subsidiaries from Bankscope (Fitch Ratings, Bureau van Dijk)[4] over 2001-2007, a relatively stable period that was before the ongoing and post the Asian financial crises, post abolition of the Glass-Steagall act, post the digital technology revolution and boom, and post the rapid globalization of the world economy. We supplemented this data with additional, relevant data from Thomson Financial and from the web sites of individual banks. Together, these data provide a unique record of the worldwide time-varying presences of subsidiaries of the Top 100 commercial banks across 115 countries.

We chose countries in which at least one of the Top 100 sampled banks has a subsidiary. Subsidiaries of foreign banks operate as local concerns and are monitored by the local central bank to allay fears of liquidity and possible bank runs (Du, 2003). They operate on an equal competitive footing in overseas markets (Ball and Tschoegl, 1982) and parent banks are likely to use this structure when engaging in competitive interactions with peer banks (Heinkel and Levi, 1992). The choice of listed banks for our study ensures that the necessary data is available for all of the banks in our sample, and guarantees a common standard of information disclosure. Although most of the data on subsidiaries are self-reported, listed banks are urged to disclose credible information to shareholders and stock exchanges. We chose the Top 100 listed commercial banks based on the value of their total assets. These "Top 100" banks did not suffer significant changes in their relative worldwide positions over 2001-2007, the timeframe of our study. However, to accommodate new entries into the "Top 100" list, we formed an initial sample comprising 111 different banks according to those that were in the Top 100 at least once from

[4] We considered subsidiaries in which parent banks own at least 50.1%. Banks with this level of ownership and control are likely to be able to influence corporate strategic decisions. It is possible to own less than 50.1% and control the subsidiaries. We were unable to assemble consistent data based on this latter definition. Future extensions of our study might involve the investigation of this issue.

2001 to 2007. The 111 banks in the initial sample are from 27 countries[5] and had total assets of $54,563 billion (USD) in 2007 (approximately five times the GDP of the U.S. and Germany combined, or five times the GDP of the Euro Zone and the Middle East and North Africa combined). In 2007, these 111 banks represented 60% of the total assets of all large banks with assets in excess of $10 billion (USD).

To summarize, our sample of the Top 100 commercial banks (in essence we have 111, due to the mutation of the Top 100 list) over the period from 2001 to 2007 yielded an unbalanced panel of 39,616 observations. We present detailed descriptive statistics of our data (including the variables that we use in the robustness tests) in Table 1.

3.2. Dependent variable

Our dependent variable, BANK SUBSIDIARY (BS), is binary in nature and is coded as 1 if a bank has a subsidiary in the host country in year t and 0 otherwise (see also Focarelli and Pozzolo, 2001; 2005).

3.3. Independent variables

The explanatory variable which is the focus of this study is MULTIMARKET, which has been constructed to represent the degree of banks' multimarket contact. This variable is a general formulation of the variable proposed by Ghemawat and Thomas (2006) who model the multimarket contact of the world's six largest cement manufacturers and it is consistent with the

[5] The home countries of the initial sample are Austria, Belgium, Brazil, Canada, China, Denmark, France, Germany, Great Britain, Greece, Hong Kong, India, Ireland, Israel, Italy, Japan, the Netherlands, Portugal, the Republic of Korea, Singapore, Spain, Sweden, Switzerland, Taiwan, Turkey, and the U.S.

measure of both Degryse and Ongena (2007) and Presbitero and Zazzaro (2011). [6] The variable has been designed to gauge the extent to which one of the Top 100 banks is present in the 115 sampled markets where its rivals, the other "Top-99" banks, may also be present. Specifically, the variable measures the extent to which Bank j is present in its rivals' markets, m. It is formally given by:

$$\text{MULTIMARKET}_{j,t} = \frac{1}{m}\sum_{m}\left[\frac{1}{j}\sum_{j}\left(I_{i,m,t} * I_{j,m,t}\right)\right] \qquad (1)$$

where i denotes the rivals of Bank j; m is a foreign country where Bank j operates; $I_{i,m,t}$ and $I_{j,m,t}$ are dummies that equal 1 if Bank i or Bank j operate in that particular market m in year t, and 0 otherwise.

Equation 1 counts the average overlapping presences of Bank j with its rivals, (all the possible bank pairs combining Bank j with its rivals), i.e., the number of contacts, and scales this number by the number of foreign countries in which Bank j has at least one subsidiary. In Figure 1 we present the range of MULTIMARKET scores per year, which displays fairly significant variability over the sampled period, 2001-2007.

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[6] Degryse and Ongena (2007) use the following closed form: $\frac{2}{n\, f_{ji}(f_j - 1)}\sum_{k=1}^{b}\sum_{l=k+1}^{b} a_{kl} D_{kj} D_{lj}$, since they analyze n postal zones (markets) for b banks. This form, like ours, scales the sum of all bank pairs in the borrower's postal zone j by the relative frequency of their bilateral contacts in other postal zones; D are dummy variables that take the value of 1 if bank k or l respectively operates in postal zone j. Presbitero and Zazzaro (2011) use the functional distance of the banking system from province j:

$\text{FUNCTIONAL DISTANCE} = \frac{\sum_{b=1}^{\beta_j}\left[\text{Branches}_{j,b} \text{x} \ln(1 + \text{KM}_{j,z_b})\right]}{\sum_{b=1}^{\beta_j}\text{Branches}_{j,b}}$, where β_j is the number of banks that operate in the focal province j; Branches counts the branches of bank b in the focal province j; z_b is the province where the bank is headquartered; and KM is the distance in kilometers between branches and headquarters.

We present detailed descriptive statistics of our data (including the variables that we use in the robustness tests) in Table 1. In this Table, MULTIMARKET ranges from 0 (77 Bank; Hua Xia Bank) to 0.56 (Société Générale), with a mean of 0.06 (Bankinter; BNP Paribas). For example, the Bank of Communications Co. (China) has a MULTIMARKET score of 0.47, while Comerica Bank (U.S.) has 0.10. These figures show that there are considerable differences between the multimarket contacts of the world's largest commercial banks. They also indicate that not all banks have subsidiaries in all markets, since in this case the MULTIMARKET score would equal 1. Our study intends to capture the influence of these varying score on the cross-border expansion of commercial banks.

The average MULTIMARKET of each bank is based on its pairwise contact with other banks. It is also useful to have a better understanding of these figures. In terms of bank pairs and taking year 2005 as an example, Bank of America (1,082 billion USD, ranked 10th in terms of assets) and UBS (1,568 billion USD, ranked 3rd in terms of assets) have a very high degree of multimarket contact (0.97). Sumitomo Mitsui Bank (859 billion USD, ranked 17th in terms of assets) and Société Générale (1,001 billion USD, ranked 14th in terms of assets) also produce a very high multimarket contact score (0.93). Bank of Communications (176 billion USD, ranked 46th in terms of assets) and Millennium BCP (91 billion USD, ranked 59th in terms of assets) generate a low multimarket contact score (0.06). Royal Bank of Scotland (1,304 billion USD, ranked 8th in terms of assets) and Chiba Bank or Comerica (54 billion USD, ranked 91st in terms of assets) produce a very low multimarket contact score (0.02).

It is also interesting to visualize the variability of MULTIMARKET across banks and host countries as illustrated in Figure 2. For the sake of clarity, we draw a simple random sample from the data set using the random number generator to graph the average MULTIMARKET scores

from 2001 to 2007, in the bank-host plane. This simple random sampling method attributes the same probability of singling out each observation from the whole data set. We use a subset of 5,000 observations in which MULTIMARKET is averaged across the period of analysis; this represents more than 85% of the averaged sample values from 2001 to 2007. The size of the circles in Figure 2 are an increasing function of multimarket contact (that varies between 0 and 1). The highest values in terms of host country are observed in the U.K. (0.43) and U.S. (0.36) (see Panels 1, 2 and 3 of Table 8 for robustness tests without these influential host countries; reported in section 4 (4.2)). Values around the mean (0.06) are observed in Bulgaria, Uruguay and South Africa. The lowest values are observed in Kazakhstan (0.02) or Ecuador (0.01). Our study has been designed to examine cross-border expansion of commercial banks on the basis of these varying patterns of multimarket contact.

In Table 1 we also present descriptive statistics for other variables that may influence the cross-border expansion of banks. We use size (the logarithm of total assets) of the parent and its subsidiaries as a proxy for intangible technical and market-making advantages. We use two variables to capture home country-related advantages: PRIVATE CREDIT TO GDP and STOCK MARKET CAPITALIZATION TO GDP. We use three variables to capture home-host country proximity-related advantages: BILATERAL TRADE, computed as the sum of imports and exports on a yearly basis, scaled by the exports of the home country to the host countries as a proxy for information-processing advantages associated with domestic customers[7]; CULTURAL DISTANCE, a composite index based on Hofstede; and a dummy variable, COMMON LANGUAGE, which takes the value of 1 if the home and host countries share a common official

[7] We do not consider foreign investment at it is considered a biased measure of overseas activity of firms; depending on the host country characteristics, this variable either overestimates (in countries where labor is more productive) or underestimates (in countries where productivity is low) the overseas activity of firms (Beugelsdijk et al., 2010).

language and 0 otherwise, which we obtained from the U.S. translation data service. Following previous studies (see footnote 1), we use two additional home-host country proximity characteristics in robustness tests (reported in section 4 (4.2)): (i) asymmetric distance (denoted SCALED GEOGRAPHIC DISTANCE) - this novel measure circumvents the symmetry trap of other variables used in the extant literature; and (ii) geographic proximity (COMMON BORDER). Both variables proxy barriers to internationalization, geographically closer countries most often share a number of characteristics that facilitate the cross-border expansion of banks. We report the findings in Table 4, Panels 4 (SCALED GEOGRAPHIC DISTANCE) and 5 (COMMON BORDER). Finally, we use PRIVATE CREDIT TO GDP and STOCK MARKET CAPITALIZATION TO GDP as proxies for host country advantages in addition to a variable that we refer to as REGULATORY RESTRICTIVENESS, which is the degree to which the national regulatory authorities allow commercial banks to engage in "non-traditional" activities (securities, insurance and real estate) and own non-financial firms, as a proxy for the host country's regulatory advantages. Table 2 presents the pairwise correlations between these variables which suggest that multicollinearity within our data set is not a problem.

3.4. Modeling procedure

We model the cross-border expansion of commercial bank j as a function of:

$$\text{BANKSUBSIDIARY}_{jt} = \underbrace{f(\alpha + \beta\ \text{MULTIMARKET}_{jt} + \gamma_i\ \text{controls}_{jt}}_{\text{fixed}} + \underbrace{u_{i,j} + \varepsilon_{i,jt})}_{\text{random}} \quad (3)$$

where α is a constant, and where β and γ are the fixed effects; the controls include two parent-bank, two home-country, three home-host country proximity, three host-country characteristics; $u_{i,j}$ represent the random effects; $\varepsilon_{i,jt}$ are the error terms; and the temporal reference, t, is the year.

The standard family of logistic models, cross-section and pooled, assumes that observations are independent. This is inappropriate for modeling the cross-border expansion of commercial banks because of the unbalanced nature of our panel that may contain intra-country, intra-bank and intra-year correlations that could lead to biased coefficient estimates (Cameron and Trivedi, 2005; Greene, 2008; Uchida and Nakagawa, 2007). The mixed-effects logistic regression model is considered the most appropriate, discrete choice model and captures the cross-country and cross-bank heterogeneity, relaxing the independence of irrelevant alternatives that are often a restrictive and inaccurate characterization of choice particularly for large panels (Cameron and Trivedi, 2009). This computationally demanding model translates into a logistic model in which the coefficient estimates are random but normally distributed across banks (Hensher, Jones and Greene, 2007; Train 2003). Apart from this, mixed models include fixed effects that mitigate the omitted variable issue plaguing many other regression-based estimation techniques. The model involves a two-step estimation procedure. In the first step, the starting values of the parameter estimates that increase the probability of successful convergence are refined. In the second step, the likelihood function is computed iteratively. The Hausman test rejected the assumption of the independence of irrelevant alternatives embedded in the standard family of logistic regressions thereby favoring the use of the mixed effects logistic regression. We use the Laplacian approximation of the log-likelihood function (Liu and Pierce 1994; Pinheiro and Chao, 2006).

4. Results

4.1 Baseline model results

In this section of the paper we present the findings of our baseline model described in section 3 (Table 3). In Panel 1 of Table 3, the MULTIMARKET is positively and significantly

related at the 1% level and has a standard deviation of 1.07, which is significantly different from zero, revealing a random effect. This random effect means that the intercept of banks in our sample is 1.07 higher or lower than the average. The probability that a bank in our sample establishes a subsidiary in our sample is 83% resulting from the computation of $100x\Phi(1-\beta_k / s_k)$, where Φ is the cumulative standard normal distribution and β_k and s_k are the sample mean and the standard deviation estimate of coefficient k (Hole, 2007). These results show that the SIZE of the parent and subsidiary, variables capturing parents' internalization advantages, are positively and significantly (at the 1% level) related to cross-border expansion. We find that the PRIVATE CREDIT and STOCK MARKET CAPITALIZATION, variables meant to capture home country advantages, are also positively and significantly related (at the 1% level) to the cross-border expansion of commercial banks. With regard variables that are designed to capture home-host country advantages: the BILATERAL TRADE and COMMON LANGUAGE variables are positively related to cross-border expansion (at the 1% level); while the CULTURAL DISTANCE variable, is negatively related to cross-border expansion (also at the 1% level). Perhaps surprisingly, host country PRIVATE CREDIT and STOCK MARKET CAPITALIZATION, variables meant to capture host country advantages, are negatively and significantly (at the 1% level) related with the dependent variable

Overall, the results presented in Panel 1 of Table 3 indicate that multimarket contact is an important factor in the cross-border expansion of commercial banks. However, in order to assess potential non-linear affects we re-estimated our baseline specification with the square of MULTIMARKET and report the results in Panel 2 of Table 3. Using the square of our variable of interest allows us to capture any potential diminishing effect of increasing multimarket contact. Our results show that MULTIMARKET is still positively and significantly related (at the 1%

level) to cross-border expansion, while the square of the variable is negatively, but not significantly related to cross-border expansion. Parent, home and home-host country advantage variables exhibit the expected relationships.

4.2 Robustness tests of the baseline results

We perform several tests to verify the robustness of our baseline specifications; these are presented in Tables 4 to 8. We re-estimated the baseline specification of our model: a) without MULTIMARKET to assess its incremental predictive ability in explaining the cross-border expansion of commercial banks; b) without the value of subsidiary assets (because they take a positive value only when there is cross-border expansion); c) using only new entries (Table 4, Panels 1 (MULTIMARKET) and 2 (square of MULTIMARKET); d) using the complementary log-log model (Table 5, Panels 1 and 2); e) splitting imports and exports (Table 6, Panels 1 (IMPORTS) and 2 (EXPORTS)); f) excluding influential home countries (Table 7, Panels 1 (without U.S.), 2 (without Japan) and 3 (without the U.S. and Japan)); g) excluding influential host countries (Table 8, Panels 1 (without U.K.), 2 (without the U.S.) and 3 (without the U.K. and U.S.)); h) with additional controls used in other studies on cross-border expansion of banks (Table 9, Panels 1 (SCALED GEOGRAPHIC DISTANCE) and 2 (COMMON BORDER)); and finally i) using the instrumental variables method to ascertain potential reverse causality of MULTIMARKET, our variable of interest (Table 10, Panels 1 (EQUITY), 2 (PERFORMANCE) and 3 (LIQUIDITY)).

First, we computed the -2 log-likelihood of the model with the MULTIMARKET variable (-5,088) and without the MULTIMARKET variable (-5,408) to evaluate the impact of excluding it as an explanatory variable (in the interests of brevity these findings are not reported here). The

likelihood ratio statistic represents the difference between the -2 log-likelihood of each model, with and without the variable of interest. This is equivalent to running the model with MULTIMARKET and restricting its value to zero to assess whether this restriction affects the fit of the model (Wald test). We compared this difference (266) with the critical value from the chi-squared distribution with 1 degree of freedom (the difference between the degrees of freedom of the two models). Given that $\chi^2 = 266$ exceeds 10.8 at $p<0.001$, the null hypothesis that the two distributions are similar is rejected. That is, we do not accept that the observed values of χ^2 have the same distribution (at the 1% level of significance). This indicates that the MULTIMARKET variable does have incremental, explanatory power.

Second, in Table 4 we considered only (new) entries from 2002 (not the stock of 2001) to 2007, which allows us to focus solely on flows. In Panel 1, MUKTIMARKET is again positively and significantly (at the 1% level) related to cross-border expansion, further reinforcing our findings reported in Table 3. In Panel 2, the square of MULTIMARKET is negative and significantly (1%-level) related to cross-border expansion indicating its diminishing influence with increasing levels of multimarket contact. Variables intended to capture parent, home and host-country advantages have the expected signs. Variables intended to capture host country advantages are positively related to cross-border expansion but their magnitude and impact (their odds ratios are around 1) are very small compared to our variable of interest.

Third, in Table 5, we re-estimated the baseline model using the complementary log-log model, a standard logistic model, which circumvents the skewed nature of our dependent variable, BS, which has a large number of 0 observations. The baseline results remain qualitatively unaltered further reinforcing the finding that MULTIMARKET is a significant

explanatory variable alongside parent and home country advantages (and to some extent host country advantages) in explaining the cross-border expansion of commercial banks.

Fourth, in Table 6, we split BILATERAL TRADE into its component parts, IMPORTS and EXPORTS, and estimated their effects separately. Not surprisingly, the effects are not different: both are positively (IMPORTS is significant but EXPORTS is non-significant) related to the cross-border expansion. The MULTIMARKET variable continues to be positively and significantly related (at the 1% level) to cross-border expansion and the influence of the variables capturing parent and home country advantages remains unaltered, further reinforcing the findings of the baseline specification of the model.

Fifth, in Table 7 (Panels 1, 2 and 3) we excluded countries that might be exerting a large influence on the results: the U.S. (Panel 1) and Japan (Panel 2) and the U.S. and Japan together (Panel 3). Together these two countries represent 10% of the total number of subsidiaries of the Top 100 list. Our previous findings for MULTIMARKET, and parent and home country (and to some extent host country) advantages are reinforced. Sixth, in Table 8 we excluded influential host countries such as the U.K. (Panel 1) and U.S. (Panel 2) and the U.K. and U.S. together (Panel 3), since they also represent 10% of the number of subsidiaries of the Top 100 list. Again, our previous findings for MULTIMARKET, and parent and home country (and to some extent host country) advantages are reinforced.

Seventh, in Table 9 (Panels 4 and 5) we included additional bilateral characteristics that can also explain the cross-border expansion of commercial banks, namely a variable we refer to as SCALED GEOGRAPHIC DISTANCE, which represents the geographic distance between home and host country scaled by the host country GDP, and a variable entitled COMMON BORDER,

which captures the existence of a common border between the home and host countries. The coefficient of the scaled distance is negative as expected and significant at the 1% level; the explanatory variable of interest and the controls remain largely unaffected in terms of their signs and statistical significance, with the exception of bilateral trade, which becomes statistically insignificant. Again, our previous findings for the key variable of interest, MULTIMARKET, and parent and home country (and to some extent host country) advantages are reinforced.

Finally, in Table 10, we re-estimated our baseline specifications using the instrumental variables (IV) method, to assess potential reverse causality of MULTIMARKET, our variable of interest. We used measures of equity, performance (net operating income to total operating income) and liquidity (deposits and short-term funding) summarized in Table 1 as instruments. The results of the second-stage regressions presented in Table 10 show that our findings remain robust.

5. Summary and conclusions

Despite its relevance for academics, policy makers and practitioners, the extent to which competition influences the cross-border expansion of banks remains a largely underexplored issue. In this paper we therefore contribute to the literature on cross-border bank expansion in three important regards. First, we integrate concepts from multimarket contact theory with internalization theory to model the cross-border expansion of commercial banks. Specifically, we investigate whether multimarket contact influences the cross-border expansion of commercial banks. Second, we assemble fresh data on multimarket contact of 12,244 subsidiaries of the world's largest 100 banks in 115 countries from 2001 to 2007. Third, we use the novel mixed effects logistic regression method that accommodates inter- and cross- bank, country and year

correlations to estimate a model of cross-border expansion of commercial banks as a function of multimarket contact controlling for parent, home and host country advantages.

Internalization theory, with its emphasis on transaction costs, indicates that banks produce significant information flows on bank-customer relationships, and intangible technical, market-making, and management skills in their domestic activities. Both information flows and intangible competencies can be mispriced, distorted or even misused if transacted via external markets or contractual arrangements leading banks to cloak their operations within wholly-owned and controlled overseas operations. The risks of dissipation of information on bank-customer relationships and intangible competencies inhibit the establishment of consensuses with rival banks to carve out the market together. Multimarket contact theory, with its emphasis on competitive interaction, predicts that firms compete to service local and global customers. The risk associated with free-riding tends to be too high to justify the trust required to divide the market together, although over time firms may forbear the presence of direct competitors in some markets in exchange for similar treatment in other markets. Bank-customer relationships developed in one market can pose threats to relationships developed by rival banks with the same customer in other markets. This precludes forbearance in the banking industry. Building on these complementary theories, and extending previous studies on the influence of oligopolistic reaction based on aggregate data, we test the influence of multimarket contact on the cross-border expansion of commercial banks with firm-level data.

Previous considerations of competitive interactions show that oligopolistic reaction from domestic and multinational rival banks critically influences aggregate location of banking activity. We integrate and extend these studies to consider the influence of multimarket contact on the cross-border expansion of commercial banks. Our findings based on freshly assembled

micro-analytic data covering a large number of banks, countries and years; novel mixed effects logistic regression technique; and a number of robustness tests; show that multimarket contact critically determines the cross-border expansion of commercial banks. This finding does not point to the need for new theories of multinational banking. Rather it reveals an insight already predicted by existing theories but not tested before.

Our study could be extended in several ways. First, in the future, the globalization of the industry is very likely to be driven by the intense competitive interaction among banks. Studies in the field could therefore consider distinct forms of competition on cross-border expansion of subsidiaries of banks. Second, our study covered a period following the Mexican, Asian and Brazilian crises, but prior to the global financial crisis. If appropriate data can be assembled, it may then be informative to study the influence of distinct forms of competition on the cross-border expansion of banks during periods of financial crisis. Third, it may also be interesting to study the performance effects of competition on a global scale, both prior to and following periods of financial crisis.

From a bank managerial perspective, our results suggest that executives at headquarters are likely to establish new subsidiaries following intense multimarket contact. From a regulatory perspective, our findings indicate that local regulators may want to monitor the establishment of new subsidiaries more closely because they are likely to increase competition, or at least change the competitive environment in local markets and, at the same time, because there is likely to be an associated increase in the demand for domestic central bank facilities.

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Figure 1
Variation of MULTIMARKET spanning 2001 to 2007

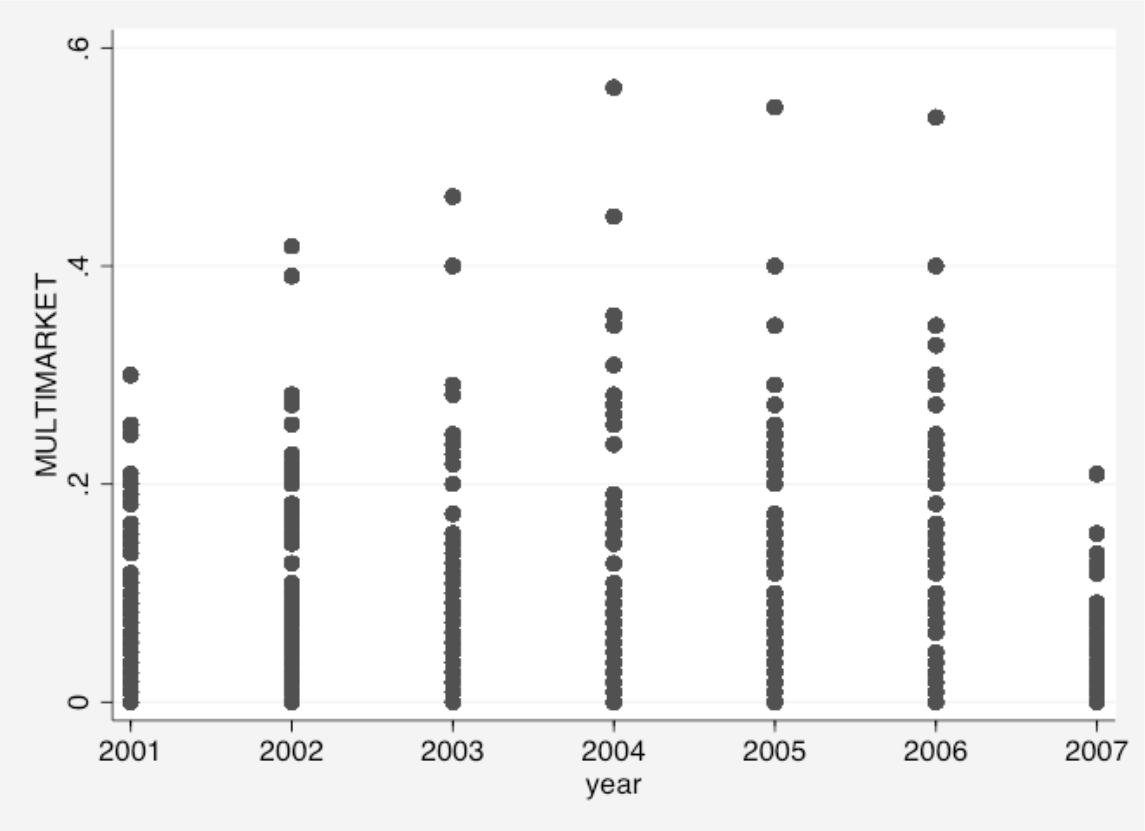
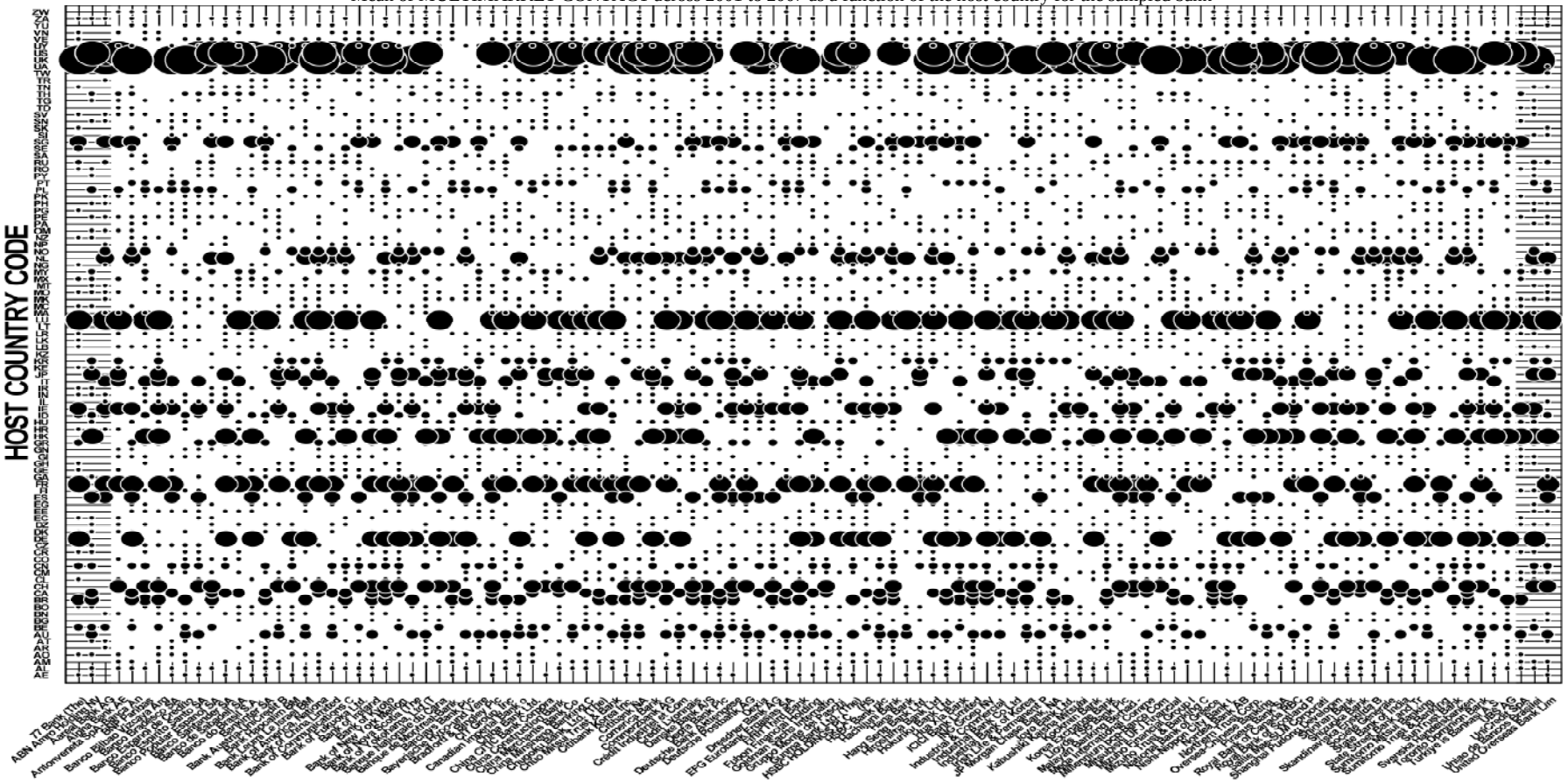


Figure 2
Mean of MULTIMARKET CONTACT across 2001 to 2007 as a function of the host country for the sampled bank



Note: AE: United Arab Emirates; AL: Albania; AM: Armenia; AO: Angola; AR: Argentina; AT: Austria; AU: Australia; BD: Bangladesh; BE: Belgium; BG: Bulgaria; BN: Brunei Darussalam; BO: Bolivia; BR: Brazil; BW: Botswana; CA: Canada; CD: Congo, Democratic Republic; CG: Congo, Republic; CH: Switzerland; CL: Chile; CM: Cameroon; CN: China; CO: Colombia; CR: Costa Rica; CU: Cuba; CV: Cape Verde; CZ: Czech Republic; DE: Germany; DJ: Djibouti; DK: Denmark; DZ: Algeria; EC: Ecuador; EE: Estonia; EG: Egypt; ES: Spain; FI: Finland; FJ: Fiji; FR: France; GA: Gabon; GE: Georgia; GH: Ghana; GI: Gibraltar; GM: Gambia; GN: Guinea; GR: Greece; GW: Guinea Bissau; GY: Guyana; HK: Hong Kong; HR: Croatia; HU: Hungary; ID: Indonesia; IE: Ireland; IL: Israel; IN: India; IQ: Iraq; IR: Iran, Islamic Republic; IT: Italy; JP: Japan; KE: Kenya; KI: Kiribati; KM: Comoros; KR: Korea, Republic; KZ: Kazakhstan; LB: Lebanon; LK: Sri Lanka; LR: Liberia; LS: Lesotho; LT: Lithuania; LU: Luxembourg; MA: Morocco; MC: Monaco; MK: Macedonia, The Former Yugoslav; MO :Macau; MT: Malta; MW: Malawi; MX: Mexico; MY: Malaysia; MZ: Mozambique; NA :Namibia; NG: Nigeria; NL: Netherlands; NO: Norway; NP: Nepal; NZ: New Zealand; OM: Oman; PA: Panama; PE: Peru; PF: French Polynesia; PG: Papua New Guinea; PH: Philippines; PK: Pakistan; PL: Poland; PT: Portugal; PY: Paraguay; QA: Qatar; RO: Romania; RU: Russian Federation; RW: Rwanda; SA: Saudi Arabia; SD: Sudan; SE: Sweden; SG: Singapore; SI: Slovenia; SK: Slovakia; SL: Sierra Leone; SN: Senegal; SV: El Salvador; SZ: Swaziland; TD: Chad; TG: Togo; TH: Thailand; TN: Tunisia; TO: Tonga; TR: Turkey TW: Taiwan; TZ: Tanzania, United Republic; UA: Ukraine; UG: Uganda; UK: United Kingdom; US: United States; UY: Uruguay; VE: Venezuela; VN: Viet Nam; WS: Samoa; YU: Yugoslavia; ZA: South Africa; ZM: Zambia; ZW: Zimbabwe.

Table 1
Descriptive statistics

	N	Min.	Max.	Mean	Std. Dev.	Units	Source
BANK SUBSIDIARY (BS)	39,616	0	1	0.10	0.30	ratio	Bankscope
Competitive interaction							
MULTIMARKET	39,616	0.00	0.56	0.06	0.09	ratio	Bankscope
SQUARE OF MULTIMARKET	39,616	0.00	1.361	0.35	0.17	ratio	Bankscope
Parent advantages							
LOGARITHM OF PARENT ASSETS	39,616	19.24	24.76	18.75	1.57	million USD	Bankscope
LOGARITHM OF SUBSIDIARY ASSETS	39,616	0.69	23.43	0.51	2.67	million USD	Bankscope
Home-country advantages							
HOME PRIVATE CREDIT TO GDP	39,616	81.56	212.46	131.66	49.33	percent	IMF/World Bank http://www.worldbank.org/wbsite/external
HOME STOCK MARKET CAPITALIZATION TO GDP	39,616	0.12	5.61	0.92	0.53	percent	IMF/World Bank http://www.worldbank.org/wbsite/external
Home-host proximity advantages							
BILATERAL TRADE	39,616	0.00	148.29	1.96	6.50	percent	http://stats.oecd.org/index.aspx?datasetcode=fdi_flow_partner
CULTURAL DISTANCE	39,616	0.02	12.39	2.45	1.59	number	http://www.geert-hofstede.com/
COMMON LANGUAGE (DUMMY)	39,616	0	1	0.11	0.31	dichotomous	www.translation- services-usa.com/
Host-country advantages							
HOST PRIVATE CREDIT TO GDP	39,616	3.09	212.46	57.86	49.98	percent	IMF/World Bank http://www.worldbank.org/wbsite/external
HOST STOCK MARKET CAPITALIZATION TO GDP	39,616	0.00	0.56	0.49	0.67	percent	IMF/World Bank http://www.worldbank.org/wbsite/external
HOST REGULATORY RESTRICTIVENESS	39,616	1.00	3.50	2.42	0.63	number	Barth, Caprio and Levine (2001)
Additional controls for robustness tests							
IMPORTS	39,616	0	340.12	6.44	22.12	million USD	http://stats.oecd.org/index.aspx?datasetcode=fdi_flow_partner
EXPORTS	39,616	0	302.31	4.60	16.05	million USD	http://stats.oecd.org/index.aspx?datasetcode=fdi_flow_partner
SCALED GEOGRAPHIC DISTANCE	39,616	0.01	2.91	0.94	0.52	ratio	http://chemical-ecology.net/
COMMON BORDER	39,616	0	1	0.02	0.14	dichotomous	IMF/World Bank http://www.worldbank.org/wbsite/external
HOST CIVIL LAW (DUMMY)	39,616	0.00	1.00	0.14	0.35	dichotomous	Barth, Caprio and Levine (2001)
EQUITY	39,616	0.00	128	14.3	20.3	billion USD	Bankscope
NET INTEREST INCOME TO TOTAL OP. INCOME	39,616	-14.77	54.90	1.56	6.78	ratio	Bankscope
LIQUIDITY	39,616	0.00	1,980.00	222.00	317.00	million USD	Bankscope

Table 2
Pairwise correlations

		1	2	3	4	5	6	7	8	9	10	11	12
1	MULTIMARKET	1											
2	LOG OF PARENT ASSETS	-0.01	1										
3	LOG OF SUBSIDIARY ASSETS	**0.28**	**0.18**	1									
4	HOME PRIVATE CREDIT TO GDP	-0.01	**0.16**	**-0.03**	1								
5	HOME STOCK MARKET CAPITALIZATION TO GDP	**-0.03**	**0.16**	**0.02**	**0.31**	1							
6	BILATERAL TRADE	**0.41**	0.00	**0.17**	-0.01	0.00	1						
7	CULTURAL DISTANCE	**0.23**	-0.01	0.00	**0.14**	**0.04**	0.01	1					
8	COMMON LANGUAGE (DUMMY)	0.00	**0.02**	**0.04**	**0.08**	**0.19**	**0.08**	**-0.19**	1				
9	SCALED GEOGRAPHIC DISTANCE	**-0.15**	**-0.03**	**-0.14**	**0.05**	0.02	**-0.25**	0.01	**0.11**	1			
10	COMMON BORDER	**0.10**	**0.04**	**0.17**	**-0.06**	**-0.03**	**0.42**	**-0.10**	**0.10**	**-0.26**	1		
11	HOST PRIVATE CREDIT MARKET TO GDP	**0.56**	**0.02**	**0.15**	-0.01	**0.04**	**0.33**	**0.34**	**0.02**	**-0.11**	**0.08**	1	
12	HOST STOCK MARKET CAPITALIZATION TO GDP	**0.49**	**0.06**	**0.12**	0.02	**0.08**	**0.20**	**0.29**	**0.07**	-0.01	**0.04**	**0.61**	1
13	HOST REGULATORY RESTRICTIVENESS	**-0.35**	0.01	**-0.10**	0.00	0.00	**-0.09**	**-0.13**	-0.01	**0.07**	**-0.08**	**-0.40**	**-0.35**

Multimarket gauges the extent to which one of the Top 100 banks is present in the 115 sampled markets with its rivals, the other "99" banks. The log of bank assets is the logarithm of total assets. The log of subsidiary assets is the logarithm of the total assets of all bank subsidiaries in the host country. Home private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the home country. Bilateral trade is the sum of exports plus imports of the home country and the host country as a percentage of the total exports of the home country. Cultural distance is a composite index based on Hofstede indices. Common language is a dummy variable with a value of 1 if the home and host countries share the same language. Scaled geographic distance is the distance between home and host countries divided by the GDP of the host country. Common border is a dummy equaling 1 if home and host countries share a physical border. Host private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the host country. Host regulatory restrictiveness is the degree to which national regulatory authorities allow commercial banks to engage in nontraditional activities. Home private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the home country. Significance at the 1% level is denoted by bold.

Table 3
Baseline specifications. Results of the mixed-effects logistic regressions.

	BANK SUBSIDIARY (0/1) Baseline - multimarket				BANK SUBSIDIARY (0/1) Baseline – square of multimarket			
	Estimates	Std. errors		Exp(B)	Estimates	Std. errors		Exp(B)
	(1)				(2)			
Competitive interaction								
MULTIMARKET	7.39	0.92	***	1,614	8.66	1.80	***	5,768
SQUARE OF MULTIMARKET					-1.41	2.51		0.24
Parent advantages								
LOG OF PARENT ASSETS	0.57	0.04	***	1.76	0.55	0.04	***	1.73
LOG OF SUBSIDIARY ASSETS	0.57	0.02	***	1.77	0.58	0.01	***	1.79
Home-country advantages								
HOME PRIVATE CREDIT TO GDP	0.00	0.00	***	1.00	-0.00	0.00	***	1.00
HOME STOCK MARKET CAPITALIZATION TO GDP	0.01	0.00	***	1.01	0.01	0.00	***	1.01
Home-host proximity advantages								
BILATERAL TRADE	0.01	0.00	***	1.01	0.04	0.02	*	1.04
CULTURAL DISTANCE	-0.20	0.02	***	0.82	-0.18	0.02	***	0.84
COMMON LANGUAGE (DUMMY)	0.43	0.09	***	1.54	0.45	0.09	***	1.57
Host- country advantages								
HOST PRIVATE CREDIT MARKET TO GDP	-0.01	0.00	***	0.99	-0.01	0.00	***	0.99
HOST STOCK MARKET CAPITALIZATION TO GDP	-0.01	0.00	***	0.99	-0.01	0.00	***	0.99
HOST REGULATORY RESTRICTIVENESS	-1.33	1.27		0.26	-1.44	1.18		0.24
CONSTANT	-11.66	3.05	***	0.00	-11.40	2.88	***	0.00
Standard deviations of random parameters								
MULTIMARKET	2.77	1.07			3.85	1.29		
LOG OF BANK ASSETS	0.26	0.03			0.24	0.03		
CONSTANT	5.16	0.69			4.95	0.65		
Model statistics								
Total number of cases	39,616				39,616			
Chi-square	829				270			
LR test vs. standard logistic regression	0.000				0.000			
AIC	10,580				11,450			
BIC	10,709				11,580			
Log-likelihood (model)	-5,275				-5,209			
Sensitivity (% of actual positives correctly identified)	68 %				67 %			
Specificity (% of actual negatives correctly identified)	97 %				97 %			

Multimarket gauges the extent to which one of the Top 100 banks is present in the 115 sampled markets with its rivals, the other "99" banks. The log of bank assets is the logarithm of total assets. The log of subsidiary assets is the logarithm of the total assets of all bank subsidiaries in the host country. Home private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the home country. Bilateral trade is the sum of exports plus imports of the home country and the host country as a percentage of the total exports of the home country. Cultural distance is a composite index based on Hofstede indices. Common language is a dummy variable with a value of 1 if the home and host countries share the same language. Host private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the host country. Host regulatory restrictiveness is the degree to which national regulatory authorities allow commercial banks to engage in nontraditional activities. Home private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the home country. Significance at the 1%, 5% or 10% level is denoted by ***, ** or *, respectively.

Table 4
Baseline specifications. Results of the mixed-effects logistic regressions with only for new entries from 2002 to 2007.

	BANK SUBSIDIARY (0/1) baseline - new entries				BANK SUBSIDIARY (0/1) Baseline – new entries (sq. multimarket)			
	Estimates	Std. errors		Exp(B)	Estimates	Std. errors		Exp(B)
	(1)				(2)			
Competitive interaction								
MULTIMARKET	11.00	1.02	***	59,996	14.05	0.99	***	1265,907
SQUARE OF MULTIMARKET					-7.80	1.29	***	0.00
Parent advantages								
LOG OF PARENT ASSETS	0.52	0.04	***	1.68	0.48	0.02	***	1,61
LOG OF SUBSIDIARY ASSETS	0.37	0.01	***	1.44	0.37	0.01	***	1,44
Home-country advantages								
HOME PRIVATE CREDIT TO GDP	0.00	0.00		1.00	0.00	0.00		1,00
HOME STOCK MARKET CAPITALIZATION TO GDP	0.00	0.00	***	1.00	0.00	0.00	***	1,00
Home-host proximity advantages								
BILATERAL TRADE	0.01	0.00	***	1.01	0.01	0.00	***	1,01
CULTURAL DISTANCE	-0.17	0.02	***	0.84	-0.13	0.02	***	0.88
COMMON LANGUAGE (DUMMY)	0.45	0.09	***	1.56	0.44	0.09	***	1,55
Host- country advantages								
HOST PRIVATE CREDIT MARKET TO GDP	0.00	0.00		1.00	0.00	0.00		1,00
HOST STOCK MARKET CAPITALIZATION TO GDP	0.00	0.00		1.00	0.00	0.00		1,00
HOST REGULATORY RESTRICTIVENESS	-0.87	1.24		0.42	-0.08	0.17		0.92
CONSTANT	-13.85	2.99	***	0.00	-14.26	0.63	***	0.00
Standard deviations of random parameters								
MULTIMARKET	2.91	1.08			0.24	3.79		
LOG OF BANK ASSETS	0.27	0.03			0.04	0.01		
CONSTANT	4.98	0.66			0.00	0.24		
Model statistics								
Total number of cases	39,616				39,616			
Chi-square	282				193			
LR test vs. standard logistic regression	0.000				0.000			
AIC	10,877				10,886			
BIC	11,006				11,023			
Log-likelihood (model)	-5,424				-5,209			
Sensitivity (% of actual positives correctly identified)	61 %				61 %			
Specificity (% of actual negatives correctly identified)	96 %				96 %			

Multimarket gauges the extent to which one of the Top 100 banks is present in the 115 sampled markets with its rivals, the other "99" banks. The log of bank assets is the logarithm of total assets. The log of subsidiary assets is the logarithm of the total assets of all bank subsidiaries in the host country. Home private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the home country. Bilateral trade is the sum of exports plus imports of the home country and the host country as a percentage of the total exports of the home country. Cultural distance is a composite index based on Hofstede indices. Common language is a dummy variable with a value of 1 if the home and host countries share the same language. Host private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the host country. Host regulatory restrictiveness is the degree to which national regulatory authorities allow commercial banks to engage in nontraditional activities. Home private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the home country. Significance at the 1%, 5% or 10% level is denoted by ***, ** or *, respectively.

Table 5
Baseline specifications. Results of complementary log-log regressions.

	BANK SUBSIDIARY (0/1) Baseline - multimarket				BANK SUBSIDIARY (0/1) baseline - square of multimarket			
	Estimates	Std. errors		Exp(B)	Estimates	Std. errors		Exp(B)
	(1)				(2)			
Competitive interaction								
MULTIMARKET	4.60	0.20	***	99.66	8.06	0.47	***	3,151
SQUARE OF MULTIMARKET					-5.94	0.77	***	0.00
Parent advantages								
LOG OF PARENT ASSETS	0.41	0.02	***	1.51	0.43	0.02	***	1.53
LOG OF SUBSIDIARY ASSETS	0.28	0.00	***	1.33	0.28	0.00	***	1.32
Home- country advantages								
HOME PRIVATE CREDIT TO GDP	0.00	0.00	***	1.00	0.00	0.00	***	1.00
HOME STOCK MARKET CAPITALIZATION TO GDP	0.00	0.00	***	1.00	0.00	0.00	***	1.00
Home-host proximity advantages								
BILATERAL TRADE	0.01	0.00	***	1.01	0.00	0.00	*	1.00
CULTURAL DISTANCE	-0.01	0.01		0.99	-0.02	0.01		0.98
COMMON LANGUAGE (DUMMY)	0.28	0.06	***	1.32	0.33	0.06	***	1.39
Host- country advantages								
HOST PRIVATE CREDIT MARKET TO GDP	0.00	0.00		1.00	0.00	0.00	*	1.00
HOST STOCK MARKET CAPITALIZATION TO GDP	0.00	0.00	***	0.99	0.00	0.00	***	1.00
HOST REGULATORY RESTRICTIVENESS	-0.20	0.04		0.82	-0.16	0.04		0.85
CONSTANT	-11.19	0.35	***	0.00	-11.70	20.36	***	0.00
Model statistics								
Total number of cases	39,616				39,616			
Chi-square	13,686				13,756			
LR test vs. standard logistic regression	0.000				0.000			
AIC	11,814				11,746			
BIC	11,917				11,858			
Log-likelihood (model)	-5,985				-5,860			
Sensitivity (% of actual positives correctly identified)	41 %				40 %			
Specificity (% of actual negatives correctly identified)	95 %				95 %			

Multimarket gauges the extent to which one of the Top 100 banks is present in the 115 sampled markets with its rivals, the other "99" banks. The log of bank assets is the logarithm of total assets. The log of subsidiary assets is the logarithm of the total assets of all bank subsidiaries in the host country. Home private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the home country. Bilateral trade is the sum of exports plus imports of the home country and the host country as a percentage of the total exports of the home country. Cultural distance is a composite index based on Hofstede indices. Common language is a dummy variable with a value of 1 if the home and host countries share the same language. Host private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the host country. Host regulatory restrictiveness is the degree to which national regulatory authorities allow commercial banks to engage in nontraditional activities. Home private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the home country. Significance at the 1%, 5% or 10% level is denoted by ***, ** or *, respectively.

Table 6
Baseline specifications. Results using exports and imports separately as a robustness test.

	BANK SUBSIDIARY (0/1) with imports				BANK SUBSIDIARY (0/1) with exports			
	Estimates	Std. errors		Exp(B)	Estimates	Std. errors		Exp(B)
	(1)				(2)			
Competitive interaction								
MULTIMARKET	7.75	0.94	***	2,310	7.64	0.95	***	2,089
Parent advantages								
LOG OF PARENT ASSETS	0.52	0.04	***	1.69	0.54	0.04	***	1.71
LOG OF SUBSIDIARY ASSETS	0.58	0.02	***	1.78	0.59	0.02	***	1.80
Home-country advantages								
HOME PRIVATE CREDIT TO GDP	0.00	0.00	***	1.00	0.00	0.00	***	1.00
HOME STOCK MARKET CAPITALIZATION TO GDP	0.01	0.00	***	1.01	0.01	0.00	***	1.01
Home-host proximity advantages								
IMPORTS	0.00	0.00	***	1.00				
EXPORTS					0.00	0.00		1.00
CULTURAL DISTANCE	-0.20	0.03	***	0.82	-0.19	0.03	***	0.83
COMMON LANGUAGE (DUMMY)	0.33	0.09	***	1.39	0.39	0.09	***	1.47
Host- country advantages								
HOST PRIVATE CREDIT MARKET TO GDP	-0.01	0.00	***	0.99	-0.01	0.00	***	0.99
HOST STOCK MARKET CAPITALIZATION TO GDP	-0.01	0.00	***	0.99	-0.01	0.00	***	0.99
HOST REGULATORY RESTRICTIVENESS	-1.31	1.14		0.27	-1.45	1.20		0.24
CONSTANT	-10.72	2.78	***	0.00	-10.87	2.93	***	0.00
Standard deviations of random parameters								
MULTIMARKET	2.66	1.05			2.75	1.06		
LOG OF BANK ASSETS	0.24	0.03			0.25	0.03		
CONSTANT	4.71	0.67			5.01	0.67		
Model statistics								
Total number of cases	39,616				39,616			
Chi-square	1,754				1,848			
LR test vs. standard logistic regression	0.000				0.000			
AIC	10,216				10,498			
BIC	10,343				10,626			
Log-likelihood (model)	-5,093				-5,234			
Sensitivity (% of actual positives correctly identified)	40%				40%			
Specificity (% of actual negatives correctly identified)	98%				97%			

Multimarket gauges the extent to which one of the Top 100 banks is present in the 115 sampled markets with its rivals, the other "99" banks. The log of bank assets is the logarithm of total assets. The log of subsidiary assets is the logarithm of the total assets of all bank subsidiaries in the host country. Home private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the home country. Imports and exports refer to the host country. Cultural distance is a composite index based on Hofstede indices. Common language is a dummy variable with a value of 1 if the home and host countries share the same language. Host private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the host country. Host regulatory restrictiveness is the degree to which national regulatory authorities allow commercial banks to engage in nontraditional activities. Home private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the home country. Significance at the 1%, 5% or 10% level is denoted by ***, ** or *, respectively.

Table 7
Baseline specifications. Robustness tests without influential home countries.

	BANK SUBSIDIARY (0/1) without U.S.				BANK SUBSIDIARY (0/1) without Japan				BANK SUBSIDIARY (0/1) without U.S. and Japan			
	Estimates	Std. errors		Exp(B)	Estimates	Std. errors		Exp(B)	Estimates	Std. errors		Exp(B)
		(1)				(2)				(3)		
Competitive interaction												
MULTIMARKET	7.86	1.07	***	2,589	7.38	0.99	***	1,603	7.90	1.17	***	2,709
Parent advantages												
LOG OF PARENT ASSETS	0.56	0.04	***	1.75	0.51	0.04	***	1.66	0.46	0.04	***	1.59
LOG OF SUBSIDIARY ASSETS	0.57	0.02	***	1.77	0.59	0.02	***	1.80	0.59	0.02	***	1.81
Home-country advantages												
HOME PRIVATE CREDIT TO GDP	0.00	0.00	***	1.00	0.00	0.00	***	1.00	0.00	0.00	***	1.00
HOME STOCK MARKET CAPITALIZATION TO GDP	0.01	0.00	***	1.01	0.00	0.00	***	1.00	0.00	0.00	***	1.00
Home-host proximity advantages												
BILATERAL TRADE	0.01	0.00	***	1.01	0.01	0.00	***	1.01	0.01	0.00	**	1.01
CULTURAL DISTANCE	-0.23	0.03	***	0.79	-0.12	0.03	***	0.89	-0.15	0.03	***	0.86
COMMON LANGUAGE (DUMMY)	0.35	0.10	***	1.42	0.09	0.09		1.09	0.01	0.10	***	1.01
Host country advantages												
HOST PRIVATE CREDIT MARKET TO GDP	-0.01	0.00		0.99	-0.01	0.00	***	0.99	-0.01	0.00	***	0.99
HOST STOCK MARKET CAPITALIZATION TO GDP	-0.01	0.00	***	0.99	-0.01	0.00	***	0.99	-0.01	0.00	***	0.99
HOST REGULATORY RESTRICTIVENESS	-0.93	1.23		0.40	-0.92	1.30		0.40	-0.69	1.18		0.50
CONSTANT	-12.20	3.00	***	0.00	-11.98	3.12	***	0.00	-11.59	2.88	***	0.00
Standard deviations of random parameters												
MULTIMARKET	2.85	1.26			2.93	1.15			3.12	1.39		
LOG OF BANK ASSETS	0.24	0.04			0.25	0.04			0.22	0.04		
CONSTANT	4.92	0.75			5.13	0.72			4.52	0.82		
Model statistics												
Total number of cases	35,116				30,814				26,389			
Chi-square	1,581				1,431				1,186			
LR test vs. standard logistic regression	0.000				0.000				0.000			
AIC	8,861				9,559				7,918			
BIC	8,988				9,684				8,040			
Log-likelihood (model)	-4,415				-4,765				-3,944			
Sensitivity (% of actual positives correctly identified)	67 %				68 %				68 %			
Specificity (% of actual negatives correctly identified)	97 %				96 %				96 %			

Multimarket gauges the extent to which one of the Top 100 banks is present in the 115 sampled markets with its rivals, the other "99" banks. The log of bank assets is the logarithm of total assets. The log of subsidiary assets is the logarithm of the total assets of all bank subsidiaries in the host country. Home private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the home country. Bilateral trade is the sum of exports plus imports of the home country and the host country as a percentage of the total exports of the home country. Cultural distance is a composite index based on Hofstede indices. Common language is a dummy variable with a value of 1 if the home and host countries share the same language. Host private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the host country. Host regulatory restrictiveness is the degree to which national regulatory authorities allow commercial banks to engage in nontraditional activities. Home private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the home country. Significance at the 1%, 5% or 10% level is denoted by ***, ** or *, respectively.

Table 8
Baseline specifications. Robustness tests without influential host countries.

	BANK SUBSIDIARY (0/1) without U.K..				BANK SUBSIDIARY (0/1) without the U.S.				BANK SUBSIDIARY (0/1) without U.K. and the U.S.			
	Estimates	Std. errors		Exp(B)	Estimates	Std. errors		Exp(B)	Estimates	Std. errors		Exp(B)
			(1)				(2)				(3)	
Competitive interaction												
MULTIMARKET	7.65	0.96	***	2,094	7.67	0.98	***	2,151	7.95	1.02	***	2,849
Parent advantages												
LOG OF PARENT ASSETS	0.58	0.04	***	1.78	0.58	0.04	***	1.79	0.59	0.04	***	1.81
LOG OF SUBSIDIARY ASSETS	0.58	0.02	***	1.78	0.58	0.02	***	1.78	0.58	0.02	***	1.79
Home-country advantages												
HOME PRIVATE CREDIT TO GDP	0.00	0.00	**	1.00	0.00	0.00	**	1.00	0.00	0.00		1.00
HOME STOCK MARKET CAPITALIZATION TO GDP	0.00	0.00	***	1.00	0.01	0.00	***	1.01	0.00	0.00	***	1.00
Home-host proximity advantages												
BILATERAL TRADE	0.01	0.00	***	1.01	0.02	0.00	***	1.02	0.02	0.00	***	1.02
CULTURAL DISTANCE	-0.21	0.03	***	0.81	-0.19	0.02	***	0.83	-0.20	0.03	***	0.82
COMMON LANGUAGE (DUMMY)	0.47	0.09	***	1.60	0.49	0.10	***	1.64	0.54	0.10	***	1.71
Host country advantages												
HOST PRIVATE CREDIT MARKET TO GDP	-0.01	0.00	**	0.99	-0.01	0.00	**	0.99	-0.01	0.00	**	0.99
HOST STOCK MARKET CAPITALIZATION TO GDP	-0.01	0.00	***	0.99	-0.01	0.00	***	0.99	-0.01	0.00	***	0.99
HOST REGULATORY RESTRICTIVENESS	-0.87	1.28		0.42	-1.94	1.16		0.14	-1.52	1.16		0.22
CONSTANT	-13.02	3.13	***	0.00	-10.60	2.77	***	0.00	-11.87	2.81	***	0.00
Standard deviations of random parameters												
MULTIMARKET	2.90	1.13			2.98	1.11			3.12	1.18		
LOG OF BANK ASSETS	0.25	0.03			0.23	0.03			0.23	0.03		
CONSTANT	5.07	0.69			4.55	0.69			4.42	0.69		
Model statistics												
Total number of cases	38,999				39,031				38,414			
Chi-square	340				374				298			
LR test vs. standard logistic regression	0.000				0.000				0.000			
AIC	10,178				10,080				9,676			
BIC	10,306				10,209				9,804			
Log-likelihood (model)	-5,074				-5,025				-4,823			
Sensitivity (% of actual positives correctly identified)	67%				66%				67%			
Specificity (% of actual negatives correctly identified)	98%				97%				98%			

Multimarket gauges the extent to which one of the Top 100 banks is present in the 115 sampled markets with its rivals, the other "99" banks. The log of bank assets is the logarithm of total assets. The log of subsidiary assets is the logarithm of the total assets of all bank subsidiaries in the host country. Home private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the home country. Bilateral trade is the sum of exports plus imports of the home country and the host country as a percentage of the total exports of the home country. Cultural distance is a composite index based on Hofstede indices. Common language is a dummy variable with a value of 1 if the home and host countries share the same language. Host private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the host country. Host regulatory restrictiveness is the degree to which national regulatory authorities allow commercial banks to engage in nontraditional activities. Home private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the home country. Significance at the 1%, 5% or 10% level is denoted by ***, ** or *, respectively.

Table 9
Baseline specifications. Robustness tests with scaled distance and common border.

	BANK SUBSIDIARY (0/1) with distance				BANK SUBSIDIARY (0/1) with common border			
	Estimates	Std. errors		Exp(B)	Estimates	Std. errors		Exp(B)
			(4)				(5)	
Competitive interaction								
MULTIMARKET	7.83	0.96	***	2.510	7.39	0.92	***	1.614
Parent advantages								
LOG OF PARENT ASSETS	0.54	0.04	***	1.71	0.57	0.04	***	1.76
LOG OF SUBSIDIARY ASSETS	0.56	0.02	***	1.75	0.57	0.02	***	1.77
Home-country advantages								
HOME PRIVATE CREDIT TO GDP	0.00	0.00	***	1.00	0.00	0.00	***	1.00
HOME STOCK MARKET CAPITALIZATION TO GDP	0.01	0.00	***	1.01	0.01	0.00	***	1.01
Home-host proximity advantages								
BILATERAL TRADE	0.00	0.00		1.00	0.01	0.00	***	1.01
CULTURAL DISTANCE	-0.19	0.02	***	0.82	-0.20	0.02	***	0.82
COMMON LANGUAGE (DUMMY)	0.41	0.09	***	1.51	0.43	0.09	***	1.54
SCALED GEOGRAPHIC DISTANCE	-0.43	0.08	***	0.65				
COMMON BORDER					-0.01	0.16		0.99
Host country advantages								
HOST PRIVATE CREDIT MARKET TO GDP	-0.01	0.00	***	0.99	.0.01	0.00	***	0.99
HOST STOCK MARKET CAPITALIZATION TO GDP	-0.01	0.00	***	0.99	-0.01	0.00	***	0.99
HOST REGULATORY RESTRICTIVENESS	-1.17	1.26		0.31	-1.33	1.27		0.26
CONSTANT	-11.26	3.07	***	0.00	-11.66	3.06	***	0.00
Standard deviations of random parameters								
MULTIMARKET	2.97	1.08			2.76	1.07		
LOG OF BANK ASSETS	0.25	0.03			0.26	0.03		
CONSTANT	5.12	0.69			5.16	0.69		
Model statistics								
Total number of cases	38,716				39,616			
Chi-square	1,933				1,858			
LR test vs. standard logistic regression	0.000				0.000			
AIC	10,390				10,746			
BIC	10,527				10,858			
Log-likelihood (model)	-5,179				-5,275			
Sensitivity (% of actual positives correctly identified)	67 %				67 %			
Specificity (% of actual negatives correctly identified)	97 %				97 %			

Multimarket gauges the extent to which one of the Top 100 banks is present in the 115 sampled markets with its rivals, the other "99" banks. The log of bank assets is the logarithm of total assets. The log of subsidiary assets is the logarithm of the total assets of all bank subsidiaries in the host country. Home private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the home country. Bilateral trade is the sum of exports plus imports of the home country and the host country as a percentage of the total exports of the home country. Cultural distance is a composite index based on Hofstede indices. Common language is a dummy variable with a value of 1 if the home and host countries share the same language. Scaled geographic distance is the distance between home and host countries divided by the GDP of the host country. Common border is a dummy equaling 1 if home and host countries share a physical border. Host private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the host country. Host regulatory restrictiveness is the degree to which national regulatory authorities allow commercial banks to engage in nontraditional activities. Home private credit to GDP and stock market capitalization to GDP are proxies for the financial development of the home country. Significance at the 1%, 5% or 10% level is denoted by ***, ** or *, respectively.

Table 10
Robustness tests – controlling for endogeneity with two-stage instrumental variables regressions (based on Panel 1 of the baseline).

	BANK SUBSIDIARY (0/1) Instrument: equity				BANK SUBSIDIARY (0/1) Instrument: performance				BANK SUBSIDIARY (0/1) Instruments: liquidity			
	Estimates	Std. errors		Exp(B)	Estimates	Std. errors		Exp(B)	Estimates	Std. errors		Exp(B)
	(1)				(2)				(3)			
MULTIMARKET	3.10	0.12	***	22.20	3.86	0.17	***	47.46	3.37	0.13	***	29.08
Model statistics												
Total number of cases	38,956				37,272				38,776			

Multimarket gauges the extent to which one of the Top 100 banks is present in the 115 sampled markets with its rivals, the other "99" banks. We run two-stage instrumental variable regressions to control for endogeneity of multimarket contact in the cross-border expansion of banks by plugging instruments and the explanatory variables of the baseline specification in the first stage regression. We use the following instruments: (a) the parent's equity; (b) performance: the new operating income divided by total operating income; (c) liquidity: the bank deposits and short-term debt. Significance at the 1% level is denoted by ***.