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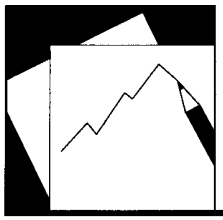

IMF Working Paper

Risk and the Corporate Structure of Banks

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Risk and the Corporate Structure of Banks[1]

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Abstract

We identify different sources of risk as important determinants of banks' corporate structures when expanding into new markets. Subsidiary-based corporate structures benefit from greater protection against economic risk because of affiliate-level limited liability, but are more exposed to the risk of capital expropriation than are branches. Thus, branch-based structures are preferred to subsidiary-based structures when expropriation risk is high relative to economic risk, and vice versa. Greater cross-country risk correlation and more accurate pricing of risk by investors reduce the differences between the two structures. Furthermore, the corporate structure affects bank risk taking and affiliate size.

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I. INTRODUCTION

In recent years, bank mergers and cross-border entry have intensified in advanced economies, and international banks have established a substantial presence in several middle-income and developing countries. Entry in these markets has taken a variety of forms, ranging from the acquisition of domestic institutions with extensive branch networks to the establishment of isolated representative offices aimed at serving niche segments. These movements have reflected a wide range of factors, including regulation in the home and host countries, the timing of financial liberalization, competitive conditions in the target markets, and risk-management considerations. Since the mode of entry affects the degree of the parent bank's responsibility with regard to the affiliate's liabilities, it is likely to be influenced by financial and political factors.[1]

The objective of this paper is to analyze how risk affects the organizational structure of banks' foreign operations. Our primary focus is on a bank's decision to set up affiliates as either subsidiaries or branches.[2] Subsidiaries are locally incorporated stand-alone entities endowed with their own capital and protected by limited liability at the affiliate level. In other words, they are foreign-owned local banks for which the parent bank's legal obligation is limited to the capital invested. By contrast, branches are merely offices of the parent bank without an independent legal personality. As such, the liabilities of branch affiliates represent real claims on the parent bank. Therefore, the decision to enter as either a subsidiary or a branch has important implications for the parent bank's risk exposure.

We focus on two different, albeit related, sources of risk. First, banks are subject to credit or economic risk in the host market. Some of this risk can arise as a result of changes in macroeconomic conditions, as shocks to economic activity and interest rates affect the creditworthiness of borrowers and may lead them to default on their loans, making the affiliate's revenue uncertain. Second, host governments may engage in policies that infringe on the bank's property rights and expropriate either fully or partially the bank's revenue and capital. Such actions may entail direct expropriation, but may also extend to other policies. For instance, banks may be forced to hold government debt or to redirect business toward state-owned or favored institutions. The bank's revenue may also be expropriated through discretionary taxation or capital controls on repatriated profits. One notable example was the forced conversion in 2002 by the Argentinean authorities of foreign denominated assets and liabilities into local currency at a nonmarket-determined exchange rate.[3] We refer to such actions as political risk.

We are interested in how the relative importance of political versus economic risk affects the form

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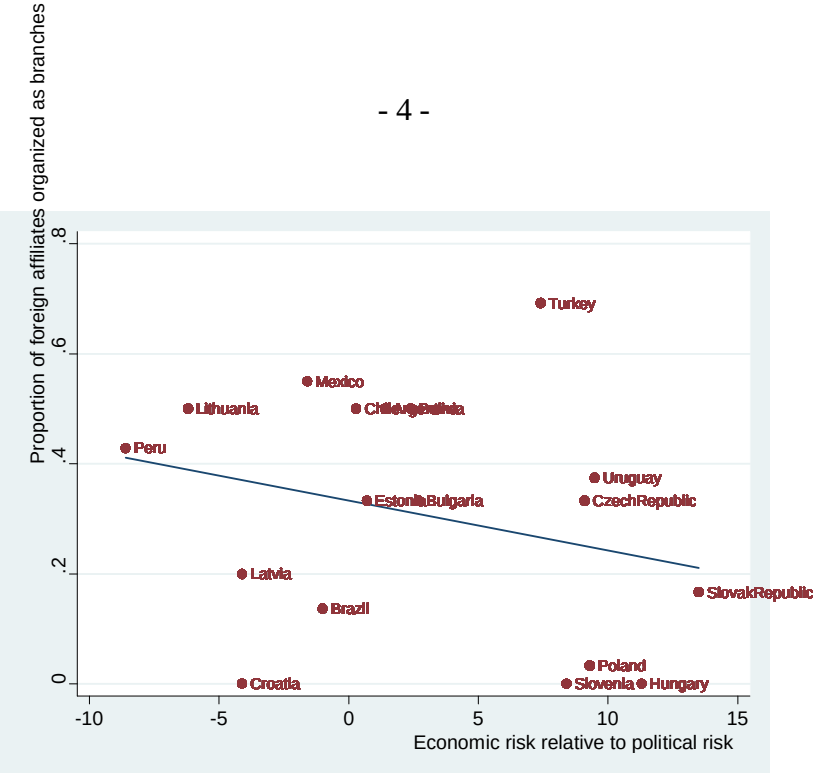
[1] See, for example, Song (2004) and Lastra (2003).

[2] Our model applies to systems where regulation allows both forms of entry. See Cerutti, Dell'Ariccia, and Martinez-Peria (2007) for a discussion of regulatory restrictions on branches and subsidiaries.

[3] Dollar-denominated loans were forcibly converted to pesos at the pre-devaluation rate of one-to-one to the dollar, while bank deposits were converted at the market rate of 1.4 pesos to the dollar. Also, "pesified" deposits and loans were subject to administratively imposed minimum and maximum interest rates, respectively (see de la Torre et al., 2003, for details).



of bank entry in a specific market. Figure 1 plots the proportion of foreign affiliates organized as branches in a sample of host countries against a measure of economic risk relative to political risk.[4] Both indices used in the figure are from the International Country Risk Guide (ICRG). The Economic Risk rating (ICRGE) assesses a country's economic strength or weakness as a function of variables such as the country's GDP per capita, real GDP growth, annual inflation rate, budget balance, and current account balance. The Political Risk rating (ICRGP) provides an assessment of a country's political risk based on factors such as government stability, contract viability, expropriation, profits repatriation, payment delays, internal and external conflicts, corruption, etc.[5]

The figure displays a negative relationship between the relative importance of economic versus political risk and the proportion of foreign affiliates organized as branches. These risks are imperfectly correlated and their absolute level will influence a bank's decision to enter a market. Their relative level, however, affects the form entry will take. When political risk is low relative to economic risk, we see few branches, as banks prefer to expand abroad by setting up subsidiaries. In contrast, when political risk is the relatively greater concern, banks generally choose to organize their foreign affiliates as branches of the parent bank, thus eschewing the limited liability protection afforded by the subsidiary structure.[6]

The model we present explains this pattern and analyzes the implications of risk on banks' organizational form. Furthermore, we show that banks' corporate structures have implications for

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[4]The figure plots the fraction of foreign affiliates organized as branches as a function of the difference between political risk (as measured by ICRGP) and economic risk (as measured by ICRGE*2) for a cross-section of countries. Sources: Cerutti et al. (2007).

[5]A detailed description of both indices can be found at:
http://www.prsgroup.com/ICRG_Methodology.aspx

[6]The empirical evidence present in Figure 1 is based on cross-sectional data. It thus does not speak to the question of whether, over time, banks change the organizational form of their affiliates in response to changes in the risk structure or regulatory environment.

their entry decisions and their scale of entry, as well as for their risk management practices. In our model, a bank that is active across multiple markets can organize its affiliate operations as either branches or subsidiaries. These affiliates are exposed to the two sources of risk discussed above, namely, political and economic risk. We assume that subsidiaries are protected by limited liability at the affiliate level, whereas for branches limited liability applies at the consolidated (parent) bank level. Banks are also subject to minimum capital requirements that in the case of subsidiaries need to be met at the affiliate level, while for the branch structure can be satisfied on a consolidated basis.

We identify an important trade-off with respect to how banks choose their corporate structure between the stronger limited liability protection offered by a subsidiary structure and the greater protection against property right infringements offered by the branch structure. We show that when political risks are the prevalent source of uncertainty, a branch-based structure is preferable as it keeps capital with the parent bank, thus shielding it from expropriation by the foreign government. However, when credit risk is more prevalent and of greater consequence, the limited liability of a subsidiary-based structure provides the bank with greater protection since it shields the parent company from losses that might spill over onto its balance sheet.

We also examine how factors such as the cross-market correlation of economic risk, affiliate size, the degree to which depositors and other bank creditors price risk, and banks' risk-taking incentives affect the relative profitability of the branch-based and the subsidiary-based structures. We show that subsidiaries are likely to take on more risk and, consistent with empirical evidence, should be larger than branches on average. For example, in the European Union in 2006, the average foreign subsidiary was about four times as large as the average foreign branch in terms of total assets.[7] This has important implications for the availability and allocation of credit in markets characterized by a significant presence of foreign banks. Likewise, these results, along with those on bank risk taking as a function of corporate structure, have implications for issues related to bank risk management and the design of regulation. We show that, when all bank liabilities are correctly priced and there are no tax distortions, the corporate structure finds a dual in the liability structure of the bank and the two organizational structures have the same expected profitability. In other words, a version of the Modigliani-Miller (1958) irrelevance result applies for banks' organizational structure. However, our main results continue to hold when, as is likely in practice as a result of informational frictions and implicit (or explicit) government guarantees, not all bank liabilities are correctly priced at the margin.

The main contribution of this paper is to identify different sources of risk as important determinants of a bank's corporate structure. We show that the form of a bank's expansion into new markets - via a subsidiary or a branch - is influenced by the types of risks to which the bank will be exposed. Banks can take measures to reduce the effect of risk and to minimize the impact of losses, preserving their capital by their choice of corporate structure. The corporate structure thus becomes a function of the type of risk that is most relevant, with banks designing their organizational form to reduce the inefficiencies introduced by expropriation and to better

[7] The data exclude banks located in the UK. Source European Central Bank (2007).

deal with the economic risks they face. Our results contribute to the recent policy discussion concerning banks' limited use of the EU's "single passport" for bank entry, despite the ease of its use.[8] Consistent with the predictions of our model, subsidiaries are the predominant form of foreign establishment given that political risk is an unlikely concern in the EU. For example, in 2006 foreign subsidiaries accounted for over 60% of total bank assets in New Member Countries, compared to about 6.5% controlled by foreign branches. The dominance of the subsidiary form is the more remarkable given that EU legislation allows banks to easily transform subsidiaries into branches, so as to centralize functions and realize economies of scale.[9]

In the context of the current financial turmoil, the organizational structure of multinational banks has implications for both how the crisis has spread across borders and the available strategies for resolution. For example, several Western European banks, which established a strong presence in Eastern Europe over the past decade, find themselves significantly exposed to the financial crisis in those countries. For some banks, the exposure is primarily through subsidiaries, which provide an easier exit option should losses become too high. Other banks, however, are exposed through branches or through direct cross-border lending, as well as through loans to their subsidiaries. For these banks walking away from their affiliate is far more complicated. The organizational structure is also likely to bear on the political economy of government intervention. In cases in which public funds become necessary, home governments will be more likely to share the burden of intervention when their banks and depositors are directly exposed relative to when they are protected by affiliate-level limited liability. In contrast, host governments will likely be more reluctant to direct resources into a foreign entity that they cannot control than into a subsidiary that is locally incorporated even if foreign-owned.

Beyond this anecdotal evidence, there is a growing empirical literature on this issue. Evidence in support of our findings can be found in a recent empirical paper by Cerutti, Dell'Ariccia, and Martinez-Peria (2007), who find that, after controlling for other legal and regulatory differences between the two corporate structures, subsidiaries are more common in highly risky macroeconomic environments, while branches are prevalent in countries where the main risks stem from possible government intervention and other major political events. Other empirical papers examine what drives the size and presence of the foreign operations of international banks, without necessarily focusing on their corporate structure (see, for example, Goldberg and Saunders (1980), Claessens, Demirgüç-Kunt, and Huizinga (2000), Focarelli and Pozzolo (2005), and Buch (2003)).

A related literature examines the organizational structure of U.S. bank holding companies (generally subsidiary structures) and how this structure has been affected by regulatory changes,

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[8] See, for instance, the speech by Padoa-Schioppa (2004), a former board member of the European Central Bank.

[9] European Central Bank (2007) explains this pattern in a way consistent with our model when it observes that "subsidiaries have the advantage of reducing risk spreading between different legal entities in a banking group." Of course, the pattern may also reflect previous regulation. Unfortunately, we have not found any direct evidence of how quickly banks change the corporate structure of their foreign affiliates when financial liberalization permits organizational forms that were previously banned.

particularly the Riegle-Neal Act (Kane (1996)). However, at the domestic level, the distinction between branches and subsidiaries is somewhat less stark given the expected obligation on the part of parent banks to support their subsidiaries according to the Federal Reserve's long standing "source of strength" doctrine. In this context, there is some evidence that bank holding companies operate well-functioning internal markets for capital for their subsidiaries (Houston, James, and Marcus (1997)).

On the theoretical front, the literature on branches and subsidiaries is somewhat scant. Recent papers by Freixas, Loranth, and Morrison (2007), Loranth and Morrison (2007), Calzolari and Loranth (2007), Harr and Ronde (2005), and Dalen and Olsen (2003) focus on the related issue of the regulation of multinational banks, distinguishing between the appropriate regulatory framework for a branch structure versus that for a subsidiary structure. Kahn and Winton (2004) examine how splitting a financial institution into different subsidiaries may reduce risk-shifting problems. By placing risky loans in a subsidiary, a bank shields the rest of its portfolio from bad realizations. This in turn reduces moral hazard by increasing the cost of shifting from safe to risky assets. These papers, however, do not examine the role of different types of risk on a bank's choice of organizational form. The notion of limited liability at the subsidiary level for multidivisional firms is modeled by Bianco and Nicodano (2006) for the case of nonfinancial firms.[10] However, two important aspects are specific to banks. First, most of the affiliate bank's assets represent loans whose value may be difficult to extract by other parties. Second, banks are typically subject to regulation dictating minimum capital requirements, with the additional distinction that capital kept at home is not subject to expropriation, yet it may still be used to satisfy these requirements (see Eisenbeis and Kaufman (2005) for a discussion of the practical difficulties associated with regulating - and perhaps closing - branches versus subsidiaries of foreign institutions).

The rest of the paper is organized as follows: Section I introduces the model, Section II compares the different bank structures, Section III examines several extensions, and Section IV concludes.

II. MODEL

Consider a bank that operates across two markets. The bank raises deposits, D, at a cost r_D, and equity K, at a cost r_K, where these costs are assumed to be uniform across both markets. The bank then uses these funds to extend risky loans. Define the revenue of the bank's foreign affiliate ($i = 1$) as well as its home office ($i = 0$) as $L_i R_i \epsilon_i$, where L_i is loan quantity and R_i is the average interest rate in market i, which, for now, we treat as fixed. The term $\epsilon_i \in \{0, 1\}$ represents credit or economic risk in country i, modeled as an idiosyncratic noise term affecting the bank's revenue. Let θ be the probability that $\epsilon_i = 0$. We allow for the case in which ϵ_0 and ϵ_1 are correlated: $corr\,(\epsilon_0, \epsilon_1) \neq 0$. In what follows, it is useful to define $P_i \equiv R_i \epsilon_i$ as the realized per-loan revenue received by the bank.

The foreign affiliate is also subject to political risk, which reflects the possibility that the host

[10] See also Flannery, Houston, and Venkataraman (1993), who study how corporate structure for financing multiple projects interacts with firms' capital structure decisions.

government engages in actions that expropriate the revenue (and any capital) from the affiliate. We model this with a variable $q \in \{0, 1\}$, which takes the value one (full expropriation) with probability φ and zero (no expropriation) with probability $1 - \varphi$. While we assume that political risk leads to outright expropriation, it is meant to cover an array of policy actions by foreign governments that infringe on the bank's property rights and decrease its franchise value. For tractability, we assume that political risk is uncorrelated with economic risk. We also assume that there is no political risk associated with lending in the bank's home market.

Banks can choose between organizing their affiliates either as branches or as subsidiaries. The key difference is that a subsidiary is protected by limited liability at the affiliate level, but it also must be separately capitalized. This means that under a subsidiary structure each institution must be allocated a portion K_i of the total capital K such that $K_0 + K_1 = K$, and also such that $K_i \geq kL_i$, where k represents the minimum capital requirement. Branches, in contrast, are not required to hold any capital as the capital requirement can be satisfied at the consolidated level: $K \geq k\,(L_0 + L_1)$. However, parent banks are legally responsible for the branches' liabilities. Whether organized as a branch or as a subsidiary, the balance sheet identity for the bank implies that $L_0 + L_1 = D + K$.

The assumption that branches hold no capital reflects widespread international practice. A number of countries do not impose capital requirements on foreign branches and rely on consolidated supervision and regulation by the home country at the parent bank level. For example, this is the case in the U.S., where lending limits and similar prudential controls applied to foreign branches are generally based on the capital and surplus resources of the foreign parent bank. Similar rules apply in the EU. That said, some countries have introduced capital requirements on foreign branches.[11] This has been driven by two main concerns: reluctance to rely on the home country's regulations, and the worry that, in the case of failure, the resolution process might favor depositors and creditors in the home country at the expense of the host country. Some host regulators have also imposed lending exposure limits and reserve requirements on foreign branches as a form of capital control or to counter their risk management advantage over domestic lenders (see, for example, Song (2004)). Nonetheless, even given these exceptions it should be noted that our assumption continues to be justified by the fact that, in the absence of capital controls, foreign branches can circumvent many of these requirements by booking transactions directly with the parent bank.

The assumption that foreign subsidiaries are protected by limited liability at the affiliate level also reflects a legal reality. Parent banks are not legally bound to support separately incorporated foreign subsidiaries. This is the case even within supranational entities like the EU and contrasts with what can happen in the U.S., where a "source of strength" principle is applied to force parents to support a subsidiary in distress. Indeed, the current crisis has highlighted the need for

[11] For example, Pakistan imposes capital requirements on foreign branches. However, even here the requirement is lower than for locally incorporated banks as long as the branch's foreign parent bank maintains a capital adequacy ratio of at least 8%. In Canada foreign branches have to maintain an unencumbered deposit of acceptable assets equal to the greater of $10 million or 5% of the branch liabilities at an approved Canadian financial institution.

establishing a framework for the cross-border resolution of international banks in distress.

We note that, in practice, the distinction between the two corporate structures may be blurred by contractual arrangements such as ring-fencing of branches and regulatory pressure on parent banks to support their subsidiaries. Nevertheless, it is more difficult for a parent bank to refuse payment for the liabilities of a branch than for those of a subsidiary. Regulators appear to recognize this difference in corporate structure and have sometimes taken actions to allow depositors to better discriminate between the two. For example, in the aftermath of the 2001 crisis, Argentina passed regulations to prevent foreign subsidiaries from using the parent company's name, thus making the distinction between a subsidiary and a branch more transparent for depositors.

A. Branch Structure

A bank with a branch structure makes loans L_0 and L_1 at home and abroad, and receives repayment of $L_i P_i$. Considering that depositors must be repaid if possible, we can write the consolidated profits for the branch structure as

$$\Pi_B = \max\left\{L_0 P_0 - D_0^B r_D + (1-q)\left(L_1 P_1 - D_1^B r_D\right), 0\right\} - K r_K, \tag{1}$$

where D_i^B is the amount of deposits raised in branch i. This expression captures the fact that with branches, the parent bank is liable for any losses at its affiliates, but is not subject to expropriation of its capital, which stays at home. Notably, we assume that in the case of expropriation the parent bank will not have to repay the branch's liabilities. This is consistent with practice, since regulatory provisions and other ring-fencing measures usually limit the responsibilities of parent banks in the event foreign governments engage in "hostile" actions.[12] Of course, without such protection from expropriation risk, the branch structure would have no advantage over a subsidiary structure.

Branches need not hold any capital and, for simplicity, we assume that the branch is financed entirely by local deposits. We thus have $D_1^B = L_1$. We discuss this assumption in Section II. This also guarantees that the bank does not have a currency mismatch, simplifying the analysis.

In its home market, the bank uses its capital to finance its loan portfolio and raises deposits to finance the balance, which means that $D_0^B = L_0 - K$. We can therefore rewrite (1) as

$$\Pi_B = \max\left\{L_0 P_0 - (L_0 - K) r_D + (1-q) L_1 (P_1 - r_D), 0\right\} - K r_K. \tag{2}$$

[12]For example, in the case of U.S. bank branches, Section 25C of the Federal Reserve Act establishes that "a member bank shall not be required to repay any deposit made at a foreign branch of the bank if the branch cannot repay the deposit due to an act of war, insurrection, or civil strife or (2) an action by a foreign government or instrumentality (whether de jure or de facto) in the country in which the branch is located, unless the member bank has expressly agreed in writing to repay the deposit under those circumstances." Similarly, the clauses included in the International Swaps and Derivatives Association (ISDA) Master Agreement stipulate that headquarters will bear no responsibility for transactions made at overseas branches in the case of exchange controls or expropriation (see ISDA (2003), Section 10 (a) Ring-Fencing Agreements).

B. Subsidiary Structure

In contrast to the above, a subsidiary must be separately capitalized (K_1) but is protected by limited liability, so that losses do not spill over from the affiliate to the parent bank. The parent bank, however, does have a claim on the profits of the affiliate, and thus must use them to cover any losses at home. Incorporating the double layer of limited liability, the bank's consolidated profits, Π_S, can be written as

$$\max\{0,\ L_0P_0 - D_0^S r_D + (1-q)\max\left\{L_1P_1 - D_1^S r_D, 0\right\}\} - (K_0 + K_1)\, r_K, \tag{3}$$

where D_i^S is the amount of deposit financing used by affiliate i. Given that the parent bank and the subsidiary each have capital equal to K_i, it must be the case that $D_i^S = L_i - K_i$, for $i = 0, 1$. We can therefore rewrite Π_S as

$$\max\{0,\ L_0P_0 - (L_0 - K_0)\, r_D + (1-q)\max\left\{L_1P_1 - (L_1 - K_1)\, r_D, 0\right\}\} - Kr_K. \tag{4}$$

Note that, in contrast to Harr and Ronde (2005), who consider "parallel-owned" banks, where each bank is protected by its own separate balance sheet, we focus instead on the more common consolidated holding structure since parallel-owned banks, while not rare, are discouraged under the Basel accord.

III. Comparison of Corporate Structures

The advantage of the branch structure is that, by keeping the bank's capital at home, it shields capital from the risk of expropriation by the foreign government in the country where the affiliate operates. This benefit manifests itself through higher leverage at the foreign affiliate and lower domestic deposit liabilities, and hence higher profits in the case of expropriation. By contrast, the subsidiary structure enjoys limited liability at the affiliate level, which protects the parent bank from economic/credit losses that arise at the subsidiary.

In practice, of course, the difference between the risk exposure of branches and subsidiaries is somewhat less stark. On the one hand, branches may be partially financed through liabilities that the parent may have to honor even in the event of foreign expropriation, diminishing the advantage of keeping the bank's capital at home. On the other hand, subsidiaries can be partly funded through shareholder loans from the parent bank, diminishing the protection from limited liability at the affiliate level. However, our main results remain qualitatively the same as long as a branch's liabilities that the parent bank would be forced to honor in the case of expropriation do not exceed those of a subsidiary, and as long as shareholder loans to a subsidiary do not de facto transform it into a branch. In this spirit, as stated above, we assume that branches are fully funded on the local market and that the parent bank's exposure to subsidiaries is limited to its capital.

The following result is the main implication of our analysis:

Proposition 1 *There exists some level of political risk $\overline{\varphi} \in (0,1)$ for which $E[\Pi_S] = E[\Pi_B]$, and such that $E[\Pi_S] > E[\Pi_B]$ for $\varphi < \overline{\varphi}$ and $E[\Pi_S] < E[\Pi_B]$ for $\varphi > \overline{\varphi}$. This threshold value of political risk $\overline{\varphi}$ is increasing in θ, the probability of default.*

Proof: See the Appendix.

Proposition 1 identifies a trade-off between the protection from economic risk through limited liability and that from political risk through the concentration of capital in the home country. When political risk is sufficiently high, expected bank profits are lower under a subsidiary structure than under a branch structure. The intuition for this result stems from the protection of the bank's capital that is provided by the branch structure. Even if a foreign government appropriates all the revenue from the bank's foreign affiliate, none of the parent bank's capital will be subject to expropriation, thus reducing the losses to the parent bank associated with foreign political actions.

By contrast, when there is little political risk, the subsidiary structure is strictly superior to a branch structure. To understand this result, note that when political risk is not much of a concern, the only losses to which banks are subject are losses due to credit risk or to macroeconomic shocks that lead to reductions in revenue. With a branch structure, whenever the affiliate's revenue is not enough to cover its deposits, the parent bank becomes liable and must make the affiliate's depositors whole to the best of its ability. By contrast, a subsidiary with insufficient revenue to repay depositors will simply default, saving the parent bank from having to absorb the affiliate's losses.[13]

Note as well that, since a subsidiary structure is optimal when political risk is low, this corresponds to a situation in which the predominant risk faced by financial institutions is not expropriation by foreign authorities, but rather credit risk in the affiliates' portfolios. Therefore, we can restate the result above by saying that a subsidiary structure is optimal when credit risk is relatively high, and that a branch structure will be preferred when credit risk is low. The proposition establishes the precise relationship between the threshold value of political risk beyond which a branch structure is optimal and the credit risk a bank faces: as credit risk (θ) increases, the threshold value ($\overline{\varphi}$) of political risk must also increase. This is simply because greater credit risk increases the value of the limited liability protection afforded through a subsidiary structure.

From Proposition 1 we can obtain the following comparative static result concerning the degree of cross-country correlation in economic risk.

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[13] In the Internet Appendix, available at http://www.afajof.org/supplements.asp, we establish a similar result for the more general case where ϵ_i has full support in $[0,1]$.

Corollary 1 *1) The difference in expected profits between a subsidiary structure and a branch structure is decreasing in the cross-country correlation of economic risks for all levels of political risk:* $\frac{\partial(E[\Pi_S]-E[\Pi_B])}{\partial corr(\epsilon_0,\epsilon_1)} < 0$*. 2) The threshold value of political risk* $\overline{\varphi}$ *for which* $E[\Pi_S] = E[\Pi_B]$ *is decreasing in the cross-country correlation of economic risks.*

Proof: See the Appendix.

The first part of the corollary explores the effect of changes in the degree of correlation between economic risk at home and abroad on the profits of the two alternative corporate structures. When economic risks in the foreign affiliate become more correlated with the risks faced domestically, the additional protection afforded by limited liability at the affiliate level will be reduced, since losses in a bank's foreign operations will tend to occur contemporaneously with losses in the home country. Corollary 1 therefore establishes that as the degree of correlation increases, the difference in expected profits between the two corporate structures changes as well, and tends to favor branches.

Intuition for this result can be obtained by focusing on what happens in the absence of political risk. With perfectly correlated economic risks, so that $\epsilon_0 = \epsilon_1$, we have $\Pi_S - \Pi_B = 0$ since if the foreign affiliate goes under, so will the parent bank. Hence, if limited liability is binding at the affiliate level it will also be binding on a consolidated basis, and banks obtain no benefit from a fragmented capital structure. Put differently, there are no states of the world in which the foreign affiliate is in difficulty but the home bank is not, and vice versa. As risks become less correlated, however, the probability that the parent bank remains profitable while the affiliate fails increases. When that happens, the difference $\Pi_S - \Pi_B$ also decreases. It bears noting, however, that this does not imply that Π_S and Π_B necessarily get closer together for all values of expropriation risk. Specifically, for values of φ such that $\Pi_S - \Pi_B > 0$, an increase in the correlation between ϵ_0 and ϵ_1 makes the two structures more similar, while for values of φ such that $\Pi_S - \Pi_B < 0$, an increase in the correlation between ϵ_0 and ϵ_1 makes the two structures more different.

The second part of the corollary applies this finding directly to the threshold value $\overline{\varphi}$ of political risk beyond which a branch structure is optimal. Corollary 1 establishes a simple comparative static: since correlation in economic risks reduces the relative benefit of a subsidiary structure, an increase in this correlation favors a branch structure. This is reflected in a downward shift in the threshold value of political risk: as $\overline{\varphi}$ decreases, the values of political risk for which a branch structure is preferred increase, while those for which a subsidiary structure is optimal decrease.

IV. EXTENSIONS AND ROBUSTNESS

In this section we relax some of the assumptions in the model. First, we endogenize the rates of return on bank assets. We then show that while expected profits are invariant across corporate structures when all risks are fully priced, our results continue to hold as long as the pricing for some fraction of the bank's liabilities is insensitive to risk. Finally, we endogenize bank risk taking.

Since in our setting the primary determinant of banks' choice of corporate structure is the risk faced at the foreign affiliate, throughout this section we make two simplifications. First, we assume that there is no economic risk in the home market, so that $\epsilon_0 = 1$. Second, we restrict our attention to cases in which the home institution is "large" relative to the foreign affiliate, which in our context simply means that a negative shock at an affiliate branch would not be sufficient to bring down the parent bank.

A. Endogenous Rates of Return on Bank Assets

In the preceding analysis we assumed that the promised return banks obtain on their loans, R_i, is fixed and does not depend on the scale of operations for each bank. While this is consistent with an oligopolistic market structure where banks are protected by barriers to competition, in more contestable markets we would expect returns to reflect market characteristics and credit demand conditions. In principle, market structure considerations may affect not only the form of entry but also the scale of entry to the extent that increasing the size of foreign operations reduces their return. In equilibrium, of course, banks should allocate their resources in such a way that the marginal return in each market is the same, thus endogenizing the scale of each bank's operations at home and abroad.

Allowing banks to determine the scale of their operations does not affect the qualitative nature of our results, but does yield some additional implications concerning the size of subsidiaries relative to branches. One way to introduce scale into the bank's decision-making problem is to allow the bank's promised interest rate, R_i, to be decreasing in loan quantity L_i: $R_i'(L_i) < 0$. It is straightforward now to establish that: (1) entry into the foreign market will occur, for either a branch or a subsidiary, as long as the total combined economic and political risk is sufficiently small; (2) when political risk (φ) is large, a branch structure is preferred, whereas a subsidiary structure is optimal when this risk is small; and (3) the optimal size of both affiliate structures is decreasing in the level of political risk φ. More interestingly, however, political risk affects the optimal size of branches and subsidiaries to a different degree, so that when political risk is high relative to macroeconomic risk, banks with a branch structure will optimally choose a larger affiliate than those with a subsidiary structure, and viceversa when it is low (details are available in the Internet Appendix).

The intuition for point (1) is straightforward, as entry should only take place if the bank anticipates a sufficiently high probability that it's loans will be repaid and it will earn some revenue. Point (2) simply confirms the finding in Proposition 1 concerning the optimal corporate structure for the case in which banks adjust their investment decisions to reflect the risks and returns in each market. To understand point (3), note that when a bank expands the scale of its affiliate, it increases its overall cost since it must raise additional capital at a marginal cost of r_K, as well as raise additional deposits at a cost of r_D. As φ increases, the probability that loans will be repaid decreases, which needs to be compensated by an increase in the promised repayment per loan and hence a reduced scale. However, as φ increases, the likelihood that the deposits will have to be repaid also decreases, reducing the expected payment made by the parent bank. Since a branch structure finances a higher fraction of its loan portfolio with liabilities from the market in which

the affiliate operates, its reduction in expected payment is larger than for a subsidiary structure. Therefore, banks with branch structures have higher incentives to hold larger portfolios than do subsidiary structures when political risk is high, while the converse is true when political risk is low.

Finally, one interesting implication obtained from combining (2) and (3) is that since the optimal branch's and subsidiary's sizes are decreasing in the degree of expropriation risk (φ), and subsidiaries are optimal when expropriation risk is low, we can conclude that banks operating with a subsidiary structure should have larger affiliates on average than those operating with a branch structure, in terms of the size of the affiliate's loan portfolio. This is consistent with the evidence for the European Union in 2006, where the average foreign subsidiary was about four times as large as the average foreign branch in terms of total assets.[14] This suggests that the corporate structure of a bank across markets, when chosen optimally, has implications for the availability and allocation of bank credit in each market in which the bank operates.

B. Endogenous Rates on Deposits

So far, we have assumed that the affiliates' cost of funds is exogenous and does not depend on the organizational structure of the bank. In practice, however, this cost is likely to reflect, at least to some extent, the different exposures implied by the two organizational forms. While deposits are often covered by some form of insurance, the rate investors demand on other bank liabilities such as subordinated debt depends on the riskiness of the bank's portfolio.[15] It is possible that endogenizing the rates of return on deposits as well as other liabilities could tilt the balance in favor of one structure or the other. Formally, this would imply that the threshold value of expropriation risk $\overline{\varphi}$ above which branches are preferred could shift up or down once we allow the return on banks' liabilities to adjust for risk.

To study this formally, we first consider the extreme case where the liabilities of the parent bank must be priced so as to properly reflect all risk. Since the relative sizes of the parent and the affiliate banks are such that the parent bank would not go under even when the affiliate is a branch and suffers a negative shock, the liabilities of the parent will be remunerated at the risk free rate, which we denote by r^*. Assuming that political expropriation implies that depositors also lose their holdings at the expropriated bank, the affiliate will pay the rate $r_b = \frac{r^*}{1-\varphi}$ when organized as a branch and the higher rate $r_s = \frac{r^*}{(1-\theta)(1-\varphi)}$ when organized as a subsidiary. Our point here is not to argue that depositors are never repaid when the bank's property rights are infringed. In the Argentinean crisis of 2001, for example, depositors were repaid. (However, U.S. dollar-denominated deposits were forcibly converted into Argentinean pesos and newly imposed controls made it difficult to access foreign exchange markets.) Rather, we adopt the most extreme assumption that when the bank is expropriated so are its depositors in order to study the case in which all risk must be priced. Indeed, when depositors are repaid in the case of expropriation, expected profits are higher for the branch structure (the difference in expected profits is $\varphi K_1 r$)

[14] The data exclude banks located in the UK. Source ECB (2007).

[15] See, for example, Martinez-Peria and Schmukler (2001).

since depositors would demand compensation from their banks for economic risk but not for political risk. We can now state the following result.

Proposition 2 *When all the bank's liabilities are priced to fully reflect risk, expected profits are invariant across organizational structures:* $E[\Pi_S] = E[\Pi_B]$.

Proof: See the Appendix.

With risk-neutral creditors and symmetric information, this result reflects a version of the Modigliani-Miller (1958) theorem that usually states that capital structure is irrelevant when markets are complete and there is no distortion introduced by taxation. Indeed, the corporate structure of the bank has a dual in its liability structure since it is the fragmented capital structure implicit in a subsidiary arrangement that shields the parent bank from the failure of its affiliates and can increase value in those circumstances.

While the irrelevance result in Proposition 2 represents a useful benchmark, in practice it is unlikely that *all* bank liabilities are correctly priced at the margin. First, asymmetric information between banks and creditors prevents the latter from correctly pricing risk. Second, the widespread use of deposit insurance insulates a large portion of bank liabilities from market discipline.

We therefore turn to the case in which only a portion of each bank's liabilities are covered by a government-sponsored insurance scheme; the remainder are uninsured and thus the bank must offer an interest rate rate to investors that reflects any risk borne by them. Specifically, suppose that a portion $1-\gamma$ of the affiliate's liabilities is insured and hence priced as risk-free, while the pricing for the remaining portion, γ, correctly reflects the risk of repayment. An alternative interpretation is that market participants expect a bailout of the bank's liabilities with probability $1-\gamma$. We can then write the following proposition:

Proposition 3 *For any* $\gamma < 1$, *there is a threshold value of political risk* $\overline{\varphi}(\gamma) < 1$ *such that* $E[\Pi_S] < E[\Pi_B]$ *for* $\varphi > \overline{\varphi}(\gamma)$, *and* $E[\Pi_S] > E[\Pi_B]$ *for* $\varphi < \overline{\varphi}(\gamma)$.

Proof: See the Appendix.

This proposition extends our main result from Proposition 1 to the case of partial pricing of the bank's liabilities. In particular, it establishes that as long as all risk is not perfectly reflected in the pricing of the bank's liabilities, a branch structure will be preferred when political risk is high, while a subsidiary structure will be optimal when political risk is low and credit risk is the primary concern. This covers the case of deposit insurance, where at least some portion of a

bank's liabilities are insured against the bank's failure by the government. For $\gamma = 1$, all risk is priced in the bank's liabilities, and the two structures become equivalent, as in Proposition 2.

C. Bank Risk Taking

Throughout, we have allowed capital to play the role of a buffer in partially shielding depositors (or the deposit insurance fund) from negative shocks to the bank's portfolio (see, for instance, Diamond and Rajan (2000) or Peura and Keppo (2006)). However, so far it has not played its more classical role of influencing banks' incentives to take risk, as in Koehn and Santomero (1980), Kim and Santomero (1988), or Holmstrom and Tirole (1997). Excessive risk taking on the part of banks is indeed one major rationale for capital regulation. In this section, we consider the case in which banks can affect the riskiness of their loan portfolio: at a cost, banks can reduce the risk of default of their loan portfolio in the affiliate market by screening and monitoring clients. Specifically, assume that the bank can choose a monitoring effort $\beta \leq 1$, with associated average cost $\frac{v\beta}{2}^2$. Monitoring reduces the risk of the project, so that successful projects repay the associated loans with probability β (see, for example, Dell'Ariccia and Marquez (2006)).[16] In what follows we assume that risk choices are made at the parent level.

Consider again the expressions for the expected profits of the branch and subsidiary structures, respectively, including the terms related to bank monitoring:

$$\begin{aligned} E[\Pi_B] &= L_0 R_0 - (L_0 - K)\, r_D - r_K K \\ &+ (1-\varphi)\left(\beta_B\,(1-\theta)\, L_1 R_1 - L_1 r_D\right) - \frac{v\beta_B^2}{2} L_1 \qquad (5) \\ E[\Pi_S] &= L_0 R_0 - (L_0 - K_0)\, r_D - r_K K \\ &+ \beta_S\,(1-\varphi)\,(1-\theta)\,(L_1 R_1 - (L_1 - K_1)\, r_D) - \frac{v\beta_S^2}{2} L_1. \qquad (6) \end{aligned}$$

Under these assumptions we can state the following result:

Proposition 4 *There exists a threshold value of political risk $\widetilde{\varphi} < 1$ such that $E[\Pi_S] < E[\Pi_B]$ for $\varphi > \widetilde{\varphi}$ and $E[\Pi_S] > E[\Pi_B]$ for $\varphi < \widetilde{\varphi}$.*

Proof: See the Appendix.

This proposition extends our main result to the case in which banks endogenously choose the riskiness of their portfolio, and once again establishes that when political risk is relatively high, banks will prefer to organize their corporate structure as branches rather than subsidiaries. From

[16] One simple interpretation of monitoring is as ex ante loan screening, so that the bank can expend costly resources in identifying safer projects.

the perspective of the bank's risk choices, we also note that under a branch structure the bank has much to lose from the failure of its foreign affiliate, since the parent bank is obligated to pay back all claims against the affiliate. As a result, for a given level of risk and lending activity, a branch-based corporate structure will have higher incentives to monitor its foreign loan portfolio and reduce risk. A bank with a foreign subsidiary will have lower incentives to monitor because of the limited liability benefit, and thus will have a lower cost of monitoring. This is established formally in the proof of Proposition 4, where we show that $\beta_B > \beta_S$, that is, monitoring by a bank with a branch structure is always greater than that by a bank with a subsidiary structure.

V. Discussion and Conclusions

This paper studies banks' corporate structure choices, focusing on two commonly observed alternative arrangements. Subsidiary structures shield the parent bank from large losses at the affiliate level thanks to the limited liability that applies at each subsidiary. This corporate structure is thus valuable when the parent bank is most concerned about minimizing its credit risk exposure across the varied markets in which it may operate. By contrast, a branch structure offers no such protection, but allows the parent bank to retain its capital domestically even as it operates in foreign markets. The bank's capital is thus shielded from the risk that a foreign authority may expropriate some or all of the bank's operations.

The analysis clearly abstracts from a number of real world considerations that may affect a bank's choice of corporate structure, such as differential taxation, regulatory restrictions on how banks are permitted to expand abroad, etc. Nevertheless, our analysis illustrates how banks can design their organization structures to better cope with two primary sources of risk, namely, political risk and credit risk. The predictions of our model for banks' organizational forms are consistent with the extant empirical literature (e.g., Cerutti, Dell'Ariccia, and Martinez-Peria (2007)). Moreover, our analysis has implications for the relative sizes of branches versus subsidiaries, and for the risk-taking incentives of the different structures.

APPENDIX: PROOFS

Proof of Proposition 1: Note that, taking the expectation of bank profits with respect to the expropriation risk q, we can write

$$\begin{aligned} E_q\left[\Pi_B\right] &= \varphi \max\left\{L_0 R_0 \epsilon_0 - (L_0 - K) r_D, 0\right\} + \\ &\quad (1-\varphi) \max\left\{L_0 R_0 \epsilon_0 - (L_0 - K) r_D + L_1 \left(R_1 \epsilon_1 - r_D\right), 0\right\} - K r_K, \end{aligned}$$

so that the expected profits of the branch-based bank are just a weighted average of two terms representing whether expropriation does or does not occur. It is therefore linear in the probability of expropriation φ.

Similarly, for the subsidiary-based bank we can write

$$\begin{aligned} E_q\left[\Pi_S\right] &= \varphi \max\{L_0 R_0 \epsilon_0 - (L_0 - K_0) r_D, 0\} \\ &+ (1-\varphi) \max\{L_0 R_0 \epsilon_0 - (L_0 - K_0) r_D + \max\left\{L_1 R_1 \epsilon_1 - (L_1 - K_1) r_D, 0\right\}, 0\} - K r_K, \end{aligned}$$

which again is just a weighted average of the two terms, and is therefore also linear in φ.

Consider now the first term of (A1) and (A2). For $\epsilon_0 = 0$, $\max\left\{L_0 R_0 \epsilon_0 - (L_0 - K) r_D, 0\right\} = 0 = \max\{L_0 R_0 \epsilon_0 - (L_0 - K_0) r_D, 0\}$, so that the two terms are the same. For $\epsilon_0 = 1$, however, we have $\max\left\{L_0 R_0 \epsilon_0 - (L_0 - K) r_D, 0\right\} = L_0 R_0 - (L_0 - K) r_D > L_0 R_0 - (L_0 - K_0) r_D = \max\{L_0 R_0 \epsilon_0 - (L_0 - K_0) r_D, 0\}$ since $K > K_0$. Therefore,

$$E\left[\max\left\{L_0 R_0 \epsilon_0 - (L_0 - K) r_D, 0\right\}\right] > E\left[\max\{L_0 R_0 \epsilon_0 - (L_0 - K_0) r_D, 0\}\right],$$

so that the expected contribution to the bank's payoff from the first term is strictly higher in the branch than in the subsidiary case.

Consider now the second term of (A1) and (A2). For $\epsilon_0 = 0$, for the branch this term becomes $\max\left\{-(L_0 - K) r_D + L_1 \left(R_1 \epsilon_1 - r_D\right), 0\right\}$. For the subsidiary, by contrast, this term is $\max\{-(L_0 - K_0) r_D + \max\left\{L_1 R_1 \epsilon_1 - (L_1 - K_1) r_D, 0\right\}, 0\}$. Note now that if $\epsilon_1 = 0$, both terms are clearly the same since they are both equal to zero. If instead $\epsilon_1 = 1$, then the term for the branch case becomes $\max\left\{-(L_0 - K) r_D + L_1 \left(R_1 - r_D\right), 0\right\} \leq \max\{-(L_0 - K_0) r_D + \max\left\{L_1 R_1 - (L_1 - K_1) r_D, 0\right\}, 0\}$, which equals the term in the subsidiaries case. The two expressions are equal whenever $L_1 R_1 - (L_1 - K_1) r_D \geq 0$, which is simply the condition that the foreign affiliate is not guaranteed to always lose money. Therefore, conditional on $\epsilon_0 = 0$ the two structures yield the same profit.

The case in which $\epsilon_0 = 1$ is analyzed similarly. For this case the second term in $E_q\left[\Pi_B\right]$ becomes $\max\left\{L_0 R_0 - (L_0 - K) r_D + L_1 \left(R_1 \epsilon_1 - r_D\right), 0\right\}$, while for $E_q\left[\Pi_S\right]$ it is $\max\{L_0 R_0 - (L_0 - K_0) r_D + \max\left\{L_1 R_1 \epsilon_1 - (L_1 - K_1) r_D, 0\right\}, 0\}$. Consider again the case where $\epsilon_1 = 0$. The term for the branch can then be written as $\max\left\{L_0 R_0 - (L_0 - K) r_D - L_1 r_D, 0\right\} < L_0 R_0 - (L_0 - K_0) r_D = \max\{L_0 R_0 - (L_0 - K_0) r_D, 0\}$, which is the term for the subsidiary. Finally, for $\epsilon_1 = 1$

both terms are the same since limited liability never binds for either corporate structure.

Putting these two arguments together establishes that

$$\begin{aligned} & E\left[\max\left\{L_0R_0\epsilon_0-(L_0-K)\,r_D+L_1\left(R_1\epsilon_1-r_D\right),0\right\}\right] \\ < \;& E\left[\max\{L_0R_0\epsilon_0-(L_0-K_0)\,r_D+\max\left\{L_1R_1\epsilon_1-(L_1-K_1)\,r_D,0\right\},0\}\right], \end{aligned}$$

so that the expected contribution to the bank's payoff from the second term is strictly higher in the subsidiary than in the branch case.

Since the expectation of the first term in $E_q\left[\Pi_B\right]$ is greater than that of the first term in $E_q\left[\Pi_S\right]$, while the reverse is true for the second term, we have now established that: 1) $E\left[\Pi_S\right]-E\left[\Pi_B\right]>0$ for $\varphi=0$, and 2) $E\left[\Pi_S\right]-E\left[\Pi_B\right]<0$ for $\varphi=1$. Moreover, since both $E\left[\Pi_S\right]$ and $E\left[\Pi_B\right]$ are linear in φ, this also establishes that $E\left[\Pi_S\right]-E\left[\Pi_B\right]$ is monotonically decreasing in φ.

It remains to show that $\overline{\varphi}$ is increasing in θ. To see this, recall that both structures are identical whenever $\epsilon_0=0$. Moreover, the branch structure is always preferred conditional on expropriation (i.e., for $q=1$). Consider, therefore, the case in which there is no political risk ($q=0$) and $\epsilon_0=1$. Increasing θ increases the probability that $\epsilon_1=0$, which reduces the expected advantage of a subsidiary structure since both structures are the same in this case. Therefore, on net an increase in θ reduces the advantage of a subsidiary, and benefits the branch structure. This implies that the threshold probability of expropriation beyond which a branch structure is optimal, $\overline{\varphi}$, must be increasing in θ, as desired. ■

Proof of Corollary 1: To establish part (1), we use the following table, which describes the realized profits for the branch and the subsidiary structures in the four possible states of the world, conditional on no expropriation $(q=0)$:

	$\epsilon_1=1$	$\epsilon_1=0$
$\epsilon_0=1$	$\Pi_S=\Pi_B>0$	$\Pi_S=L_0R_0-(L_0-K_0)\,r_D-Kr_K$ $\Pi_B=\max\left\{L_0R_0-(L_0-K)\,r_D-L_1r_D,0\right\}-Kr_K$
$\epsilon_0=0$	$\Pi_S=\Pi_B\geq-Kr_K$	$\Pi_S=\Pi_B=-Kr_K$

We can now write the difference in expected profits as

$$E[\Pi_S|q=0]-E[\Pi_B|q=0]=\Pr\left(\epsilon_0=1,\epsilon_1=0\right)\min\left\{L_0R_0-(L_0-K_0)\,r_D,L_1r\right\}>0.$$

Moreover, since $\frac{\partial\Pr(\epsilon_0=1,\epsilon_1=0)}{\partial corr(\epsilon_0,\epsilon_1)}<0$, we have that $\frac{\partial(E[\Pi_S|q=0]-E[\Pi_B|q=0])}{\partial corr(\epsilon_0,\epsilon_1)}<0$. This establishes that, conditional on no expropriation, the difference in expected profits is decreasing in the cross-country correlation of economic risks.

On the other hand, conditional on expropriation $(q=1)$, the bank's payoff is the same independent of the realization of the economic risk shock at the foreign affiliate. It's realized profits in the four possible states of the world are therefore described in the following table:

	$\epsilon_1 = 1, \quad \epsilon_1 = 0$
$\epsilon_0 = 1$	$\Pi_S = L_0R_0 - (L_0 - K_0)\, r_D - Kr_K$
	$\Pi_B = L_0R_0 - (L_0 - K)\, r_D - Kr_K$
$\epsilon_0 = 0$	$\Pi_S = \Pi_B \geq -Kr_K$

We can now write

$$E[\Pi_S|q=1] - E[\Pi_B|q=1] = -\Pr(\epsilon_0 = 1)\, K_1 r_k < 0.$$

Note that this implies that $\frac{\partial(E[\Pi_S|q=1] - E[\Pi_B|q=1])}{\partial corr(\epsilon_0,\epsilon_1)} = 0$.

Now, since

$$E[\Pi_S] - E[\Pi_B] = \varphi\,(E[\Pi_S|q=1] - E[\Pi_B|q=1]) + (1-\varphi)\,(E[\Pi_S|q=0] - E[\Pi_B|q=0]),$$

it follows that $\frac{\partial(E[\Pi_S] - E[\Pi_B])}{\partial corr(\epsilon_0,\epsilon_1)} =$

$$\begin{aligned} & \varphi \frac{\partial\,(E[\Pi_S|q=1] - E[\Pi_B|q=1])}{\partial corr\,(\epsilon_0,\epsilon_1)} + (1-\varphi)\frac{\partial\,(E[\Pi_S|q=0] - E[\Pi_B|q=0])}{\partial corr\,(\epsilon_0,\epsilon_1)} \\ = \quad & (1-\varphi)\frac{\partial\,(E[\Pi_S|q=0] - E[\Pi_B|q=0])}{\partial corr\,(\epsilon_0,\epsilon_1)} < 0, \end{aligned}$$

which establishes the result.

For part (2), note that the threshold value of political risk, $\overline{\varphi}$, solves the following equation:

$$\varphi\,(E[\Pi_S|q=1] - E[\Pi_B|q=1]) + (1-\varphi)\,(E[\Pi_S|q=0] - E[\Pi_B|q=0]) = 0.$$

We can therefore write the identity

$$(E[\Pi_S|q=1] - E[\Pi_B|q=1]) = -\frac{\overline{\varphi}}{1-\overline{\varphi}}\,(E[\Pi_S|q=0] - E[\Pi_B|q=0]).$$

Then, given that $\frac{\partial(E[\Pi_S|q=0] - E[\Pi_B|q=0])}{\partial corr(\epsilon_0,\epsilon_1)} < 0$ and $\frac{\partial(E[\Pi_S|q=1] - E[\Pi_B|q=1])}{\partial corr(\epsilon_0,\epsilon_1)} = 0$, it must be the case that $\frac{\partial \frac{\overline{\varphi}}{1-\overline{\varphi}}}{\partial corr(\epsilon_0,\epsilon_1)} < 0$, which implies that $\frac{\partial \overline{\varphi}}{\partial corr(\epsilon_0,\epsilon_1)} < 0$, as desired. ■

Proof of Proposition 2: The expected profits for the subsidiary structure are

$$E[\Pi_S] = L_0R_0 - (L_0 - K_0)\, r^* + (1-\theta)\,(1-\varphi)\,(L_1R_1 - (L_1 - K_1)\, r_s) - Kr_K,$$

while for the branch structure they are

$$E[\Pi_B] = L_0R_0 - (L_0 - K)\, r^* + (1-\varphi)\,((1-\theta)\, L_1R_1 - L_1r_b) - Kr_K.$$

We can thus write

$$E[\Pi_S] - E[\Pi_B] = -K_1r^* - (1-\theta)\,(1-\varphi)\,(L_1 - K_1)\, r_s + (1-\varphi)\, L_1r_b.$$

Substituting for r_s and r_b yields

$$\begin{aligned} E[\Pi_S] - E[\Pi_B] &= -K_1 r^* - (1-\theta)(1-\varphi)(L_1 - K_1)\frac{r^*}{(1-\theta)(1-\varphi)} + (1-\varphi)L_1\frac{r^*}{(1-\varphi)} \\ &= 0, \end{aligned}$$

demonstrating that there is no difference in the expected profits of a bank with a branch structure and one with a subsidiary structure. ■

Proof of Proposition 3: The expected interest rate on the affiliate's deposits under the subsidiary structure is

$$r_s = \frac{\gamma r^*}{(1-\theta)(1-\varphi)} + (1-\gamma)r^*,$$

while for the branch structure it is

$$r_b = \frac{\gamma r^*}{(1-\varphi)} + (1-\gamma)r^*.$$

As above, we can write the difference in the expected profits as

$$E[\Pi_S] - E[\Pi_B] = -K_1 r^* - (1-\theta)(1-\varphi)(L_1 - K_1)r_s + (1-\varphi)L_1 r_b.$$

We can now substitute for r_s and r_b to obtain

$$E[\Pi_S] - E[\Pi_B] = (1-\gamma)r^*\left[(1-\varphi)L_1\theta - K_1(1-(1-\theta)(1-\varphi))\right].$$

For $\varphi = 0$, $E[\Pi_S] - E[\Pi_B] = (1-\gamma)\theta r^*[L_1 - K_1] > 0$, while for large enough values of φ it is obviously negative.[17] ■

Proof of Proposition 4: From the first-order conditions with respect to β, we obtain

$$\begin{aligned} \beta_B &= \min\left\{\frac{(1-\theta)(1-\varphi)R_1}{v}, 1\right\} \\ \beta_S &= \min\left\{\frac{(1-\theta)(1-\varphi)}{v}(R_1 - r_D(1-k)), 1\right\}, \end{aligned}$$

which means that screening is always higher under the branch structure. Assuming that $\beta_B, \beta_S < 1$, we can substitute these values into the profit expressions and impose $K_1 = kL_1$ to obtain

$$E[\Pi_S] - E[\Pi_B] = L_1 r_D\left((1-\varphi) - k - \frac{((1-\theta)(1-k)(1-\varphi))^2}{v}\left(\frac{R_1}{1-k} - \frac{r_D}{2}\right)\right).$$

This difference converges to $-kL_1 r_D$ for φ going to one, so that $E[\Pi_S] - E[\Pi_B] < 0$ as $\varphi \to 1$.

[17] Note that this solution implicitly requires a restriction on the parameters. Namely, R needs to be large enough that both structures are viable for large values of φ.

Now impose the optimal level of monitoring for the branch structure, β_B, on both structures. We then have

$$E[\Pi_S] - E[\Pi_B] = L_1 r_D \left(-(1-k)\frac{(1-\theta)^2 (1-\varphi)^2 R_1}{v} - k + (1-\varphi) \right),$$

which for $\varphi = 0$ becomes

$$E[\Pi_S] - E[\Pi_B] = L_1 r_D (1-k) \left(1 - \frac{(1-\theta)^2 R_1}{v} \right) > 0$$

since we must have that $\beta_B = \frac{(1-\theta)R_1}{v} \leq 1$. Hence, a fortiori $E[\Pi_S] > E[\Pi_B]$ when we allow for β to be chosen optimally in each structure at $\varphi = 0$.

Finally, consider the derivative of the difference in profits of the two structures with respect to political risk, which is given by

$$\frac{\partial \left(E[\Pi_S] - E[\Pi_B] \right)}{\partial \varphi} = L_1 r_D \left(-1 + 2\frac{(1-\theta)^2 (1-k)^2 (1-\varphi)}{v} \left(\frac{R_1}{1-k} - \frac{r_D}{2} \right) \right).$$

The second derivative can then be obtained as

$$\frac{\partial^2 \left(E[\Pi_S] - E[\Pi_B] \right)}{\partial \varphi^2} = -2 L_1 r_D \frac{(1-\theta)^2 (1-k)^2}{v} \left(\frac{R_1}{1-k} - \frac{r_D}{2} \right) < 0,$$

which establishes that the difference $E[\Pi_S] - E[\Pi_B]$ is concave in φ, for all $\varphi \in [0,1]$. Since for $\varphi = 0$, $E[\Pi_S] - E[\Pi_B] > 0$, while for $\varphi = 1$, $E[\Pi_S] - E[\Pi_B] < 0$, it follows by concavity that $E[\Pi_S] - E[\Pi_B]$ can only cross zero once for $\varphi \in (0,1)$. This establishes that there exists a $\widetilde{\varphi} < 1$ such that $E[\Pi_S] > E[\Pi_B]$ for $\varphi < \widetilde{\varphi}$ and $E[\Pi_S] < E[\Pi_B]$ for $\varphi > \widetilde{\varphi}$. It remains to be shown that at such $\widetilde{\varphi}$ both structures are viable. However, it is evident that for any $\widetilde{\varphi}$ there exists a $\overline{v}$ small enough such that both structures are viable. ■

References

Bianco, Magda, and Giovanna Nicodano, 2006, "Pyramidal Groups and Debt," *European Economic Review*, Vol. 50, pp. 937-61.

Buch, Claudia, 2003, "Information or Regulation: What Drives the International Activities of Commercial Banks? *Journal of Money, Credit, and Banking*, Vol. 35, pp. 851-69.

Calzolari, Giacomo, and Gyongyi Loranth, 2007, "Regulation of Multinational Banks: A Theoretical Inquiry," Working Paper, Judge Business School, Cambridge, UK.

Campello, Murillo, 2002, "Internal Capital Markets in Financial Conglomerates: Evidence from Small Bank Responses to Monetary Policy," *Journal of Finance*, Vol. 57, pp. 2773-805.

Cerutti, Eugenio, Giovanni Dell'Ariccia, and Maria Soledad Martinez-Peria, 2007, "How do Banks go Abroad: Branches or Subsidiaries?" *Journal of Banking and Finance*, Vol. 31, pp. 1669-692.

Claessens, Stijn, Asli Demirg-Kunt, and Harry Huizinga, 2000, "How Does Foreign Entry Affect Domestic Banking Markets? *Journal of Banking and Finance*, Vol. 25, pp. 891-911.

Dalen, Dag, and Trond Olsen, 2003, "Regulatory Competition and Multinational Banking," CESifo Working paper No. 971.

De La Torre, Augusto, Eduardo Levy Yeyati, and Sergio Schmukler, 2003, "Living and Dying with Hard Pegs: The Rise and Fall of Argentina's Currency Board," *Economia*, Vol. 3, pp. 43-107

Dell'Ariccia Giovanni, and Robert Marquez, 2006, "Competition Among Regulators and Credit Market Integration," *Journal of Financial Economics*, Vol. 79, pp. 401-30.

Diamond, Douglas, and Raghuram Rajan, 2000, A Theory of Bank Capital," *Journal of Finance*, Vol. 55, pp. 2431-465.

Eisenbeis, Robert, and George Kaufman, 2005, "Bank Crisis Resolution and Foreign-owned Banks," *Federal Reserve Bank of Atlanta Economic Review*, Vol. 90, pp. 1-18.

European Central Bank, 2007, EU Banking Structures.

Flannery, Mark, Joel Houston, and Subramanyam Venkataraman, 1993, "Financing Multiple Investment Projects," *Financial Management*, Vol. 22, pp. 161-72.

Focarelli, Dario, and Albert Pozzolo, 2005, "Where do Banks Expand Abroad? An Empirical Analysis," *Journal of Business*, Vol. 78, pp. 2435-465.

Freixas, Xavier, Gyongyi Loranth, and Alan Morrison, 2007, "Regulating Financial Conglomerates," *Journal of Financial Intermediation*, Vol. 16, pp. 479-514.

Goldberg, Lawrence, and Anthony Saunders, 1980, "The Causes of U.S. Bank Expansion Overseas: The Case of Great Britain," *Journal of Money, Credit, and Banking*, Vol. 13, pp. 365-74.

Harr, Thomas, and Thomas Ronde, 2005, "Branch or Subsidiary? Capital Regulation of Multinational Banks," Working Paper, University of Copenhagen.

Holmstrom, Bengt, and Jean Tirole, 1997, "Financial Intermediation, Loanable Funds, and the Real Sector," *Quarterly Journal of Economics*, Vol. 112, pp. 663-91.

Houston, Joel, Christopher James, and David Marcus, 1997, "Capital Market Frictions and the Role of Internal Capital Markets in Banking, *Journal of Financial Economics*, Vol. 46, pp. 135-64.

Kahn, Charles, and Andrew Winton, 2004, "Moral Hazard and Optimal Subsidiary Structure for Financial Institutions," *Journal of Finance*, Vol. 59, pp. 2531-75.

Kane, Edward, 1996, "De Jure Interstate Banking: Why Only Now?" *Journal of Money, Credit, and Banking*, Vol. 28, pp. 141-61.

Kim, Daesik, and Anthony Santomero, 1988, "Risk in Banking and Capital Regulation," *Journal of Finance*, Vol. 43, pp. 1219-233.

Koehn, Michael, and Anthony Santomero, 1980, "Regulation of Bank Capital and Portfolio Risk," *Journal of Finance*, Vol. 35, pp. 1235-244.

Lastra, Rosa, 2003, "Cross-border Bank Insolvency: Legal Implications in the Case of Banks Operating in Fifferent Jurisdictions in Latin America," *Journal of International Economic Law*, Vol. 6, pp. 79-110.

Loranth, Gyongyi, and Alan Morrison, 2007, "Deposit Insurance, Capital Regulations, and Financial Contagion in Multinational Banks," *Journal of Business, Finance and Accounting*, Vol. 34, pp. 917-49.

Martinez-Peria, Maria Soledad, and Sergio Schmukler, 2001, "Do Depositors Punish Banks for Bad Behavior? Market Discipline, Deposit Insurance, and Banking Crises," *Journal of Finance*, Vol. 56, pp. 1029-051.

Modigliani, Franco, and Merton Miller, 1958, "The Cost of Capital, Corporate Finance and the Theory of Investment," *American Economic Review*, Vol. 48, pp. 261-97.

Padoa-Schioppa, Tommaso, 2004, "How to Deal with Emerging Pan-European Financial

Institutions?" Speech at the Conference on Supervisory Convergence organized by the Dutch Ministry of Finance, The Hague, November 3.

Peura, Samu, and Jussi Keppo, 2006, Optimal Bank Capital with Costly Recapitalization, *Journal of Business*, Vol. 79, pp. 2163-201.

Shin, Hyun-Han, and Rene Stulz, 1998, "Are Internal Capital Markets Efficient?" *Quarterly Journal of Economics*, Vol. 113, pp. 531-52.

Song, Inwon, 2004, "Foreign Bank Supervision and Challenges to Emerging Market Supervisors," IMF Working paper 04/82.