Foreign Bank Subsidiaries' Default Risk during the Global Crisis: What Factors Help Insulate Affiliates from their Parents?*

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Abstract

This paper examines the association between the default risk of foreign bank subsidiaries and their parents during the global financial crisis, with the purpose of understanding what factors can help insulate affiliates from their parents. We find evidence of a significant positive correlation between parent banks' and foreign subsidiaries' default risk. This correlation is lower for subsidiaries that have higher capital, retail deposit funding, and profitability ratios and that are more independently managed from their parents. Host country regulations also and more robustly influence the extent to which shocks to the parents affect subsidiaries' default risk. In particular, the correlation between the default risk of the subsidiary and the parent is lower for subsidiaries operating in countries that impose higher capital, reserve, provisioning, and disclosure requirements and tougher restrictions on bank activities.

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1. Introduction

Since the late 1990s, the importance of multinational banks has grown dramatically. Between 1999 and 2009 the average share of bank assets held by foreign banks in developing countries rose from 26 percent to 46 percent.[1] The bulk of the pre-global crisis evidence analyzing the consequences of this significant transformation in bank ownership suggests that foreign bank participation brought many benefits to developing countries, especially in terms of bank competition and efficiency.[2]

The recent global financial crisis, however, highlighted the role of multinational banks in the transmission of shocks across countries. Most of the research has focused on transmission through the lending channel – how foreign bank lending behaved during the crisis. A number of papers, even some before the recent global crisis, have documented that lending by foreign bank affiliates' declines when parent banks' financial conditions deteriorate. Peek and Rosengren (2000) offer evidence based on the behavior of Japanese banks operating in the US during the 1990s Japanese crisis. Schnabl (2012) studies the lending behavior of foreign bank affiliates in Peru in the aftermath of the 1998 Russian crisis. In the context of the recent global crisis, Claessens and van Horen (2013), Choi et al. (2013), and de Haas and van Horen (2013), among others, show that foreign bank lending across countries declined more than domestic bank lending during the period 2008-2009. The last two studies, in particular, find that foreign bank affiliates whose parents' relied more on wholesale funding (in the case of de Haas and van Horen, 2013) and had lower capital ratios (in the case of Choi et al., 2013) experienced a sharper decline in lending.

[1]Data from the World Bank Regulation and Supervision surveys at http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20345037~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html

[2] For a review of the literature see Cull and Martinez Peria (2008).

Rather than focus on how parent banks transmit shocks to their affiliates through the lending channel, this paper explores the association between parent banks' and subsidiaries' default risks during the recent crisis. More specifically, we examine whether an increase in the default risk of a parent bank is positively correlated with a similar rise in its foreign subsidiaries' default risk. By focusing on the correlation between the default risk of parents and subsidiaries, we believe that we are answering a more fundamental question regarding the role of foreign banks in transmitting shocks, since default risk is a broader, more forward looking concept that is more intrinsically related to financial stability.

We also examine the factors that dampen or amplify the correlation between parent banks' and foreign subsidiaries' default risks. In particular, we examine the role of subsidiary financial characteristics (such as capital and funding structure) and the impact of host country bank regulations (e.g., pertaining to bank capital, reserve requirements, bank activities, etc.). The question of how host regulators can limit the transmission of shocks to the affiliates of foreign banks that operate in their country is related to the recent discussion on ring-fencing (see Song, 2004; Cerutti et al., 2010; Cerutti and Schmieder, 2014, D'Hulster, 2014). In cross-border banking, ring-fencing refers to restrictions (whether regulatory or supervisory) on internal transfers of banks' capital, liquidity, and profitability across jurisdictions within the same international banking group. To our knowledge, this is the first paper to examine the impact of subsidiary characteristics and host country regulations in limiting the association between the default risk of a parent and its subsidiaries.

We use data for 93 publicly listed foreign bank subsidiaries, operating in 36 host developing countries and owned by 41 parent bank groups, headquartered in 24 home countries, during the period from September 2008 to December 2009. We estimate the weekly correlation

between parents' and subsidiaries' distance to default and investigate the factors that affect this correlation. Distance to default, which is based on Merton's (1974) structural credit risk model, is the difference between the asset value of the bank and the face value of its debt, scaled by the standard deviation of the bank's asset value. Hence, distance to default is inversely related to default risk. Our focus on developing countries as hosts of foreign bank subsidiaries is driven by the fact that these countries were not at the core of the global financial crisis, allowing us to better identify factors that might help insulate affiliates from their parents potentially in trouble.

Our empirical findings show that a subsidiary's distance to default is significantly correlated with the parent bank's distance to default, even when we account for the distance to default of other banks and firms in the home and host countries, as well as for global factors that may influence subsidiaries' distance to default. This finding is robust to the sample of banks considered and to the way we calculate the distance to default. Also, we find that certain subsidiary characteristics influence the correlation in the distance to default between subsidiaries and parents. In particular, this correlation is lower for subsidiaries that have higher capital, retail deposit funding, and profitability ratios and for subsidiaries that are more independently managed from their parents. Finally, the regulatory regime in place in the host country also and more robustly affects the extent to which shocks to the parents' distance to default influence subsidiaries. In particular, the correlation between the distance to default of the subsidiary and the parent is lower for subsidiaries operating in countries that impose higher capital, reserve, provisioning and disclosure requirements and tougher restrictions on bank activities.

The rest of the paper is structured as follows. Section 2 describes our data. Section 3 details the empirical methodology we use to (a) calculate the distance to default of parent banks and their subsidiaries, (b) estimate the correlation between the distance to default of the parents

and their subsidiaries, and (c) investigate the factors that affect the extent of correlation between the default risk of parent banks and subsidiaries. Section 4 presents results from our econometric analysis. Section 5 concludes.

2. Data

To measure the distance to default of parent banks and their subsidiaries, to estimate the correlation between them, and to assess the factors that affect this correlation, we assembled an original and extensive database of stock market prices and balance sheet characteristics for both publicly traded parent banks and their publicly traded subsidiaries in developing countries. Our sample consists of 93 publicly listed foreign subsidiaries, operating in 36 host developing countries and owned by 41 parent bank groups, headquartered in 24 home countries. Our period of analysis is the peak of the global crisis from September 2008 to December 2009. Table 1 presents a list of all the parent and subsidiary banks we consider in our analysis. Even though the presence of foreign banks has increased in recent decades, the final sample of subsidiaries that we were able to include in the analysis is smaller as the result of two constraints. First, most foreign subsidiaries are not listed in the stock market, since they are privately held.[3] Second, of the ones that are listed in host countries' stock markets, there are several cases that are not traded often, since parent banks control most shares (e.g. 98 percent or more ownership). In this context, we identified about 167 banks in about 44 host countries where foreign banks held important ownership stakes, but we found enough information for only 93 cases. The median ownership stake in the sample was about 61 percent.[4] The limitations to fulfilling the necessary

[3] As a robustness check, we extend the analysis to non-traded banks following the approach outlined in Falkenheim and Pennachi (2003).

[4] In 28 of the 93 foreign subsidiaries included in the sample, the identified parent banks seem to directly control less than 50 percent of the shares. We include them in the analysis because the identified parent banks are portrayed as

data requirements for our analysis does not seem to bias the representation of the final sample, which covers 36 host countries. The dataset used in the analysis also includes stock market prices for all other banks and firms in the home and host countries that are used to construct default risk control variables in the regressions.

We use daily stock market information from Compustat Global for international banks and firms and stock market information from CRSP for U.S. banks. Bank level variables are constructed from Bankscope, a comprehensive commercial database of banks' financial statements produced by Bureau Van Dijk. Since we are interested in how bank characteristics affect the correlation between parents' and their foreign subsidiaries' default risks, and since there have been significant changes to bank balance sheets during the crisis, we construct and use bank-level variables measured prior to the crisis (as of December 2006). For each bank, we calculate relative bank *size* (bank assets to total system assets), *capital ratio* (regulatory capital to risk weighted assets), *equity ratio* (equity to total assets), *provisions* (loan loss provisions divided by total loans), *deposit funding* (deposits divided by total funding), *profitability* (net income divided by total assets), and *liquidity* (liquid assets divided by total assets). We winsorize all financial variables at the 1st and 99th percentile level of their distributions to reduce the influence of outliers and potential data errors.

Host country-level variables are collected from a number of sources. We use data from the World Bank 2007 Bank Regulation and Supervision survey to construct different indexes of bank regulation and supervision following the methodology proposed by Barth et al. (2001, 2013).[5] *Capital regulation* captures the amount of capital banks must hold and the stringency of

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strategic partners, and they often have indirect control in the subsidiaries. In unreported results, we verify that the degree of ownership is not a significant factor explaining the relative strength of transmission of default risk from parents to affiliates.

[5] The 2007 survey covers the 2005-2006 period.

regulations on the nature and source of capital. It is an index ranging in value from 0 to 10, with higher values indicating greater stringency. *Activity restrictions* is an index that measures the degree to which the national regulatory authorities restrict banks from engaging in securities, insurance, and real estate activities. Securities activities refers to underwriting, brokering, dealing and all aspects of the mutual fund industry. Insurance activities include underwriting and selling and real estate activities refer to investment, development, and management. The activities restrictions index takes values from 3 (where each of the three activities is permitted) to 12 (where each activity is prohibited). *Disclosure requirements* is an index that captures the type of information banks must disclose about their financial condition. It indicates whether the income statement includes accrued or unpaid interest or principal on nonperforming loans, whether banks are required to produce consolidated financial statements, and whether bank directors are legally liable if information disclosed is erroneous or misleading. The variable ranges from 0 to 3, with higher values indicating greater bank disclosure. *Diversification requirements* is an index which measures whether regulations support geographical asset diversification. It is based on two variables: whether there are explicit, verifiable, and quantifiable guidelines for asset diversification and whether banks are prohibited from making loans abroad. The index takes values from 0 to 2 with higher values indicating more diversification. *Loan Classification Stringency* measures the actual minimum number of days beyond which a loan in arrears must be classified as sub-standard, doubtful, or loss. *Provisioning Stringency* measures the minimum provisions (as a percentage of loans) required as a loan is successively classified as sub-standard, doubtful, and lastly as loss. *Supervisory powers* is an index measuring supervisory authorities' power and authority to take specific preventive and corrective actions. The measure ranges from 0 to 14, where larger numbers indicate greater

supervisory powers. *Prompt corrective powers* measures the extent to which the law establishes predetermined levels of bank solvency deterioration that forces automatic enforcement actions such as intervention, and the extent to which supervisors have the requisite suitable powers to do so. The index ranges from 0 to 6 with higher values indicating more promptness in responding to problems. *Reserve Requirements* is the average level of reserves that banks are required to hold relative to their deposits and other short-term liabilities. *Financial outflow restrictions* is the average of three binary variables measuring bank restrictions on lending to non-residents, maintaining accounts abroad, and on banks' investment abroad. This variable comes from the IMF Annual Report on Exchange Arrangements and Restrictions.

We also control for macro factors that may affect the changes in credit risk of the parents and their subsidiaries. ΔVIX is the change in the Chicago Board Options Exchange Volatility Index, which measures the 30-day expected volatility calculated from implied volatilities from S&P 500 index options. VIX data is obtained from the Chicago Board Options Exchange (CBOE). ΔDEF is the change in the default spread measured as the difference in BAA-AAA yields of US firms. Data comes from the interest rate data releases from the Federal Reserve Board**.** Table 2 lists all the variables used in our analysis, provides their definition, data sources and descriptive statistics. Table 3 presents correlations across the variables.

3. Empirical Methodology

3.a. Computing distance to default measures between parents and subsidiaries

Our measure of default risk is the distance to default that comes from the structural credit risk model of Merton (1974). Distance to default is computed as the difference between the asset value of the bank and the face value of its debt, scaled by the standard deviation of the bank's

asset value.[6] In the Merton (1974) model , the market equity value of a bank is modeled as a call option on the company's assets:

$$V_E = V_A e^{-dT} N(d_1) - X e^{-rT} N(d_2) + \left(1 - e^{-dT}\right) V_A$$
$$d_1 = \frac{\log\left(\frac{V_A}{X}\right) + \left(r - d + \frac{s_A^2}{2}\right) T}{s_A \sqrt{T}}; d_2 = d_1 - s_A \sqrt{T} \tag{1}$$

In equation (1), V_E is the market value of a bank. V_A is the value of the bank's assets. X is the face value of debt maturing at time T. r is the risk-free rate and d is the dividend rate expressed in terms of V_A. s_A is the volatility of the value of assets, which is related to equity volatility through the following equation:

$$s_E = \frac{V_A e^{-dT} N(d_1) s_A}{V_E} \tag{2}$$

We simultaneously solve the above two equations to find the values of V_A and s_A. We use the market value of equity for V_E and total liabilities to proxy for the face value of debt X. Since the accounting information is on an annual basis, we linearly interpolate the values for all dates over the period, using beginning and end of year values for accounting items. The interpolation method has the advantage of producing a smooth implied asset value process and avoids jumps in the implied default probabilities at year end (Bartram et al., 2008). s_E is the standard deviation of daily equity returns over the past 3 months. In calculating the standard deviation, we require each bank to have at least 45 non-missing daily returns over the previous three months. T equals one year. r is the one year US treasury yield, which we take to be the risk free rate. We use the

[6] The Merton (1974) distance-to-default measure has been shown to be a good predictor of defaults, outperforming accounting-based models (Campbell, Hilscher and Szilagyi, 2008; Hillegeist, Keating, Cram, and Lundstedt, 2004; and Bharath and Shumway, 2008).

Newton method to simultaneously solve the two equations above. For starting values for the unknown variables, we use $V_A = V_E + X$ and $s_A = s_E V_E/(V_E+X)$. We winsorize s_E and $V_E/(V_E+X)$ at the 1st and 99th percentile levels to reduce the influence of outliers. After we determine asset values V_A, we follow Campbell, Hilscher and Szilagyi (2008) and assign asset return m to be equal to the equity premium (6%).[7] Merton's distance-to-default (*dd*) is finally computed as:[8]

$$dd = \frac{log\left(\frac{V_A}{X}\right) + \left(m - d - \frac{s_A^2}{2}\right)T}{s_A\sqrt{T}} \tag{3}$$

As a robustness check, we compute two alternative measures of Merton's distance to default: (a) a simplified version of the Merton formula applied to the sample of listed subsidiaries and (b) a synthetic 'market comparable' measure to extend the analysis to the sample of non-listed subsidiaries. The simplified approach follows Byström (2006) and does not rely on distributional assumptions and makes the default risk less sensitive to the leverage ratio at very high levels equity volatility. Byström (2006) shows that, when applied to a sample of US firms, the simplified model provides the same relative default risk rankings as the Merton model.[9] The simplified formula we use is given by:

$$log\ (X/(V_E+X))\ /\ (X/(V_E+X)-1)\times s_E. \tag{4}$$

[7] We obtain similar distance to default values if we compute asset returns (V_A), as $\max(\frac{V_{A,t}}{V_{A,t-1}} - 1, r)$, following Hillegeist et al. (2004).

[8] The default probability is the normal transform of the distance-to-default measure and is defined as PD = F (–dd), where F is the cumulative distribution function of a standard norm

[9] For large values of leverage, the formula further simplifies to $1/s_E$. Atkeson, Eisfeldt and Weill (2013) show theoretically that one can approximate a firm's distance to insolvency using data on the inverse of the volatility of that firm's equity returns.

The synthetic 'market comparable' measure follows Falkenheim and Pennachi (2003). We use publicly traded banks to identify a statistical relationship between accounting variables (which are available for all banks) and the two key variables that feed into the structural credit risk calculation of the Merton model, namely, market leverage and volatility of asset returns. We then use these statistical relationships and the accounting information to compute market leverage and asset return volatility for all non-publicly traded banks. The key assumption of this methodology is that non-public banks would have on average the same credit risk profiles conditional on observable accounting variables as publicly listed banks. Appendix 1 provides a detailed explanation of the methodology. This approach has two limitations. First, there could be a selection bias in the estimation of credit risk for non-publicly traded banks. Since publicly traded banks can be significantly different than non-publicly traded banks along a number of dimensions, the relationship between credit risk and observable accounting variables may not be the same for non-traded banks. Second, we are interested in correlations and use weekly estimates of credit risk for subsidiary banks and their parents. There may not be enough time-series variation in the weekly coefficient estimates from cross-sectional regressions of publicly traded banks and the observable accounting variables.

3.b. Estimating the size and determinants of the correlation between parents and subsidiaries

To examine the correlation between the foreign bank parents' and their subsidiaries' changes in distance to default, we estimate equation (5) below:

$$\begin{aligned}\Delta ddSUB_{i,t} &= \beta^0 + \beta^1 \Delta ddPARENT_{i,t} + \beta^2 \Delta ddCSUB_t + \beta^3 \Delta ddCPARENT_t \\ &\quad + \beta^4 \Delta VIX_t + \beta^5 \Delta DEF + \gamma_i + \varepsilon_{i,t}\end{aligned} \tag{5}$$

where $\Delta ddSUB_{i,t}$ is the weekly change in distance-to-default of the subsidiary *i* in week t;

$\Delta ddPARENT_{i,t}$ is the weekly change in distance-to-default of the parent of subsidiary i; $\Delta ddCSUB_t$ and $ddCPARENT_t$ are changes in average distance-to-defaults of all the publicly traded banks and companies in the host country and parent bank country (excluding the foreign subsidiary and parent banks in question), respectively. ΔVIX_t is the weekly change in the VIX volatility index. This variable is included to capture innovations in macro volatility that affects all banks in our sample. Similarly, ΔDEF_t is the change in interest rate spread between Aaa and Bbb rated companies and is included to capture innovations in the default risk premium. We also include subsidiary fixed effects, γ_i, to control for time invariant heterogeneity across subsidiaries.

Since we are interested in uncovering factors that may amplify or dampen the correlation between the foreign bank parents' and their subsidiaries' changes in distance to default, we include firm level characteristics and country level regulations in the regression specified in (5) and interactions of these variables with $\Delta ddPARENT_{i,t}$. In particular, we estimate equation (6) below:

$$\begin{aligned}\Delta ddSUB_{i,t} &= \beta^0 + \beta^1 \Delta ddPARENT_{i,t} + \beta^2 \Delta ddCSUB_t + \beta^3 \Delta ddCPARENT_t \\ &+ \beta^4 \Delta VIX_t + \beta^5 \Delta DEF + \beta^6 X_i \times \Delta ddPARENT_{i,t} + \beta^7 M_c \\ &\times \Delta ddPARENT_{i,t} + \gamma_i + \varepsilon_{i,t}\end{aligned} \tag{6}$$

Above, X_i are foreign subsidiary characteristics (size, liquidity, funding structure, capital, etc.) computed as of December 2006 as described above. M_c are subsidiary host country regulations measured as of 2006. The errors are clustered at the host country level.

On average, we expect to find a positive correlation between foreign banks' subsidiaries and parent banks' distance to default, after controlling for country-level averages in the distance to default of all companies in the home and host countries and for global factors such as the VIX

index. In other words, we expect that the financial health of the parent will be associated with that of the subsidiary. How large this correlation will be is an empirical question that we hope to address.

A number of theoretical papers emphasize the role of capital, profitability, asset liquidity and funding structure as potential buffers in absorbing liquidity and economic shocks (Allen and Gale 2000, Repullo 2004, Von Thadden 2004, Diamond and Rajan 2005, Cifuentes et al. 2004). We expect that the correlation between the distance to default of the subsidiary and the parent will be higher for more fragile foreign subsidiaries (i.e., those lacking the means to absorb shocks at the beginning of the crisis). At the same time, we expect the correlation between the subsidiary and the parent to be lower for subsidiaries operating in countries where the regulatory authorities impose tighter regulatory regimes, which *de jure* or *de facto* help to ring fence the foreign subsidiary from a parent in distress.

We also explore the importance of two measures of distance/proximity between the subsidiary and the parent: *geographical distance* (log of distance, measured in kilometers, between the parent/home country and the host country) and *cultural proximity* (as measured by whether the subsidiary and the parent have a common official language)[10]. A priori, we expect geographical distance to reduce the correlation between the parent and subsidiary distance to default, since geographically distant subsidiaries may be less integrated into the parent group and the parent bank might find it difficult to exercise control over the local management of the subsidiary (Rajan, Servaes, and Zingales, 2000, de Haas and van Horen, 2013). When it comes to cultural proximity, the impact might be more ambiguous. On the one hand, cultural distance might operate like geographical distance and reduce the correlation between subsidiaries' and

[10] Both variables, geographical distance and cultural proximity, were taken from Mayer and Zignago (2011). See http://www.cepii.fr/anglaisgraph/bdd/distances.htm.

parents' default risk because more distant subsidiaries might be harder to monitor. On the other hand, cultural proximity might reduce the correlation between subsidiaries and parents if these subsidiaries are granted more independence because the parent is more comfortable decentralizing some control when it is more familiar with the culture and business environment in the host country.[11]

4. Results

4.1. The correlation between the parent and subsidiary distance to default

Figure 1 shows the average changes in Merton distance to default for all parent banks and, separately, for all subsidiaries over the period September 2008 to December 2009. It is clear from the figure that there is a very high correlation between changes in parent and subsidiaries distance to default. Because this figure does not control for other factors that can jointly influence these variables, we turn next to our empirical estimations that control for global factors and for changes in the distance to default of all firms operating in the corresponding parent and host countries.

Table 4 shows that foreign bank subsidiaries' distance to default, calculated following Merton's model, is significantly correlated with parent banks' distance to default, even when we control for the average distance to default among all companies in home and host countries, respectively, and when we account for global factors like the VIX and the corporate credit spread. The correlation in the distance to default between foreign subsidiaries and their parents varies between a maximum of 0.45, when no other variables are added, and a minimum of 0.27

[11] Related to the idea that cultural proximity might result in better treatment for some subsidiaries, Giannetti and Yafeh (2012) show that cultural proximity affects financial contracts in a large dataset of international syndicated bank loans. For example, they find that lead banks offer larger loans at a lower interest rate to more culturally close borrowers.

when we include all controls. This correlation is not only statistically and economically significant, but also it is almost twice as large as the correlation of the distance to default of the foreign subsidiaries vis-à-vis all companies in the home and host countries.

We conduct three variants of Table 4 as robustness checks. First, we show the same estimations as in Table 4, but excluding some parents banks which own many of the subsidiaries in our sample (see Table 5). We find that the estimates of the association between the distance to default of foreign bank subsidiaries and their parents does not change much when we exclude some parent banks with multiple subsidiaries. The correlation varies only between 0.26 and 0.29. Second, we repeat the types of estimations shown in Table 4, but using the simplified measure of distance to default proposed by Byström (2006). As shown in Table 6, the correlation between foreign subsidiaries and their parents is highly significant and ranges between 0.2 and 0.3. Finally, Table 7 shows the correlation between subsidiaries' and parents' synthetic 'market comparable' measure of distance to default following Falkenheim and Pennachi (2003). These regressions are done for the 310 foreign subsidiaries (both listed and unlisted) that operate in the host countries in our sample. In this case, the correlations between subsidiaries and parents continue to be significant, but are smaller in size, ranging from almost 0.09 to 0.19. The lower correlations are to be expected since, as mentioned earlier, we use annual accounting data and weekly cross-sectional estimates to create the synthetic 'market comparable' measures which do not have as much time-series variation as the actual distance-to-default measure.[12]

4.2 The factors that affect the correlation between the parent and subsidiary distance to default

[12] We have also replicated the analysis of publicly traded firms using synthetic measures of distance to default. We also find low correlations between the parents and the subsidiaries for this smaller sample of publicly traded banks.

Table 8 explores how subsidiary characteristics affect the association between the Merton distance to default of foreign bank subsidiaries and that of their parents. We find that the parent bank's distance to default has a smaller impact on the subsidiary's distance to default when subsidiaries have higher capital, deposit funding, and profitability ratios. Also, the association between the parent and the subsidiary distance to default is lower for countries that are physically distant but culturally closer. These results survive even when we combine all variables together as in column 8.10.

How should we interpret the significance of geographical distance and cultural proximity? We view geographical distance and cultural proximity as proxies for more independent management of the subsidiary from its parents. Though, we are unable to conclusively confirm this hypothesis, we are able to offer some suggestive evidence for a subset of banks. In particular, for 47 subsidiaries, using information obtained from banks' annual reports, we were able to construct a proxy for subsidiary management independence from the parent: the *share of declared independent board members* (i.e., ratio of members identified as being independent because they own no or a small number of shares in the bank, are not clients or suppliers of the bank and do not have family members working in the bank). The share of independent board members is positively and significantly correlated with our measures of geographical distance and cultural proximity: the correlation is 0.92 with geographical distance and 0.65 with cultural proximity. Hence, we interpret the negative interaction of the geographical distance and cultural proximity measures with the distance of default of the parent as suggestive of the fact that more independently managed subsidiaries exhibit a lower correlation between the measures of distance to default of the subsidiaries and parents.

Table 9 shows estimations allowing for threshold effects in the impact of subsidiary characteristics on the association between distance to default of foreign subsidiaries and their parents. Rather than interact the aforementioned correlation with continuous measures of affiliate characteristics, we use a dummy which equals one for those affiliates whose characteristics rank above the median. We find that for subsidiaries with capital, deposit funding, provisions, and geographical distance above the median, the correlation between the subsidiaries' and the parents' distance to default is lower. In particular, holding everything else constant, for subsidiaries with low capital ratios (i.e., those below the median) the correlation between the subsidiary and the parent distance to default equals 0.37, while for those above the median the correlation falls to 0.25. We find similar effects when comparing subsidiaries above and below the median funding and profitability ratios, as well as for those above and below the median geographical distance.

Table 10 allows us to corroborate the significance of subsidiary characteristics (except for the capital ratio) even when we control for host country dummies and parent distance to default interactions, which are included but not reported. These interactions are intended to account for any host country factors that can mitigate the impact of the parent distance to default. As before, we find that for subsidiaries that have higher retail deposit funding ratios and that are culturally closer to the parent, the correlation between the subsidiaries' and the parents' distance to default is lower. We also find that for relatively larger subsidiaries this correlation is higher.

Table 11 investigates the impact of host country regulations on the correlation between foreign subsidiaries' and parents' distance to default. We find that in host countries where regulators impose greater disclosure, capital, liquidity and provisioning requirements and where the range of activities banks can undertake is more limited, parent banks' distance to default have

a smaller impact on the subsidiaries' distance to default. For example, a one standard deviation increase in the index of capital regulation lowers the correlation of the distance to defaults from 0.29 to 0.18. The economic impact for all other statistically significant variables is roughly of the same magnitude.

Table 12 repeats the estimations of Table 11 but controlling for the specific subsidiary characteristics and variables that we found to be significant in Table 8. Even though our sample is reduced significantly when we do this, none of the results regarding the impact of host country regulations change. We continue to find that in host countries where regulators impose greater disclosure, capital, liquidity and provisioning requirements and where the range of activities banks can undertake is more limited, parent banks' distance to default have a smaller impact on the subsidiaries' distance to default.

5. Conclusions

While many papers have examined how foreign bank parent conditions affect lending by their overseas subsidiaries, this paper is the first to analyze the correlation between parents' and subsidiaries' default risk. More importantly, we also analyze the subsidiary characteristics and policies that can dampen or amplify this correlation. These issues are important because they allow host countries to assess how exposed they are to shocks affecting multinational banks and what factors can help reduce this exposure.

Our analysis shows that there is a statistically and economically significant positive correlation between parents' and subsidiaries' distance to default. This finding is robust to the sample of banks considered and to the way we calculate the distance to default. Also, we find that certain subsidiary characteristics influence the correlation in the distance to default between

subsidiaries and parents. In particular, this correlation is lower for subsidiaries that have higher capital, deposit funding and profitability ratios and that are more independently managed from the parent. Finally, the regulatory system in place in the host country also influences the extent to which shocks to the parents distance to default influence subsidiaries. In particular, the correlation between the distance to default of the subsidiary and the parent is lower for subsidiaries operating in countries that impose higher capital, reserve, provisioning and disclosure requirements and tougher restrictions on bank activities.

From an individual host country's policy perspective, our findings indicate that tighter host banking regulations seem to help insulate foreign subsidiaries from changes in the default risk of parent banks during crises. However, it is important to note that this may not necessarily be optimal from a global perspective. First, ring fencing measures taken by authorities in one country could increase stress on the banking group's legal entities in other jurisdictions or for the banking group as a whole. Second, ring fencing may create inefficiencies in the allocation of capital and liquidity within multinational bank groups. These potential downsides from ring fencing practices by host regulators have been highlighted in the Basel Committee's *Report and Recommendations of the Cross-Border Bank Resolution Group* (CBBRG). Furthermore, in light of the concerns about ring fencing practices, the CBRG has called for the establishment of a credible framework for cooperation across national supervisors and for uniform mechanisms for the resolution of cross-border banking groups to help avoid unilateral and likely more costly solutions.

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Table 1: List of foreign bank parents and subsidiaries in the sample

This table lists the subsidiary banks, their host countries, their parents and the parents' home countries used in the analysis.

Parent Bank Name	Home Country	Subsidiary Bank Name	Host Country
Abu Dhabi Islamic Bank - Public Joint Stock Co.	UNITED ARAB EMIRATES	National Development Bank/Egyp	EGYPT
Albaraka Banking Group B.S.C.	BAHRAIN	Al Baraka Bank Egypt ESC	EGYPT
Albaraka Banking Group B.S.C.	BAHRAIN	Albaraka Turk Katilim Bankasi	TURKEY
Allied Irish Banks plc	IRELAND	Bulgarian American Credit Bank	BULGARIA
Arab Bank Plc	JORDAN	Arab Tunisian Bank	TUNISIA
Arab Banking Corporation BSC	BAHRAIN	Banco ABC Brasil SA	BRAZIL
Attijariwafa Bank	MOROCCO	Attijari Bank	TUNISIA
Australia & New Zealand Bankin	AUSTRALIA	Bank Pan Indonesia Tbk PT	INDONESIA
Australia and New Zealand Banking Group	AUSTRALIA	AMMB Holdings Bhd	MALAYSIA
Banco Bilbao Vizcaya Argentaria SA	SPAIN	Banco Bilbao Vizcaya Argentaria	CHILE
Banco Bilbao Vizcaya Argentaria SA	SPAIN	BBVA Banco Frances SA	ARGENTINA
Banco Bilbao Vizcaya Argentaria SA	SPAIN	BBVA Colombia SA	COLOMBIA
Banco Bilbao Vizcaya Argentaria SA	SPAIN	Banco Continental-BBVA Banco Continental	PERU
Banco Bilbao Vizcaya Argentaria SA	SPAIN	Banco Provincial	VENEZUELA
Banco Comercial Português S.A.	PORTUGAL	Bank Millennium	POLAND
Banco Santander SA	SPAIN	Banco Santander Rio S.A.	ARGENTINA
Banco Santander SA	SPAIN	Banco Santander (Brasil) S.A.	BRAZIL
Banco Santander SA	SPAIN	Banco Santander Brasil SA/Braz	BRAZIL
Banco Santander SA	SPAIN	Banco Santander Chile	CHILE
Banco Santander SA	SPAIN	Banco Santander Colombia SA	COLOMBIA
Banco Santander SA	SPAIN	Attijariwafa Bank	MOROCCO
Bank of East Asia Ltd	HONG KONG	Affin Holdings Bhd	MALAYSIA
Bank of New York Mellon	UNITED STATES	Wing Hang Bank Ltd	HONG KONG
Bank of Nova Scotia - Scotiabank	CANADA	Scotiabank Sud Americano	CHILE
Bank of Nova Scotia - Scotiabank	CANADA	Scotia Group Jamaica Ltd	JAMAICA
Bank of Nova Scotia - Scotiabank	CANADA	Scotiabank Peru SAA	PERU
Bank of Nova Scotia - Scotiabank	CANADA	Scotiabank Trinidad & Tobago Limited	TRINIDAD AND TOBAGO
BARCLAYS PLC	UNITED KINGDOM	Barclays Bank of Botswana	BOTSWANA
BARCLAYS PLC	UNITED KINGDOM	Barclays Bank of Kenya Ltd	KENYA
BARCLAYS PLC	UNITED KINGDOM	ABSA Group Limited	SOUTH AFRICA
BNP Paribas	FRANCE	Banque Internationale pour le Commerce et l'Industrie de la Côte d'Ivoire SA - BICICI	IVORY COAST
BNP Paribas	FRANCE	Bank of Nanjing	CHINA
BNP Paribas	FRANCE	Banque Marocaine pour le Commerce et l'Industrie BMCI	MOROCCO
BNP Paribas	FRANCE	Union Bancaire pour le Commerc	TUNISIA

Table 1: List of foreign bank parents and subsidiaries in the sample (continued)

Parent Bank Name	Home Country	Subsidiary Bank Name	Host Country
BNP Paribas	FRANCE	Turk Ekonomi Bankasi A.S.	TURKEY
BNP Paribas	FRANCE	BNP Paribas Bank Polska SA	POLAND
BTA Bank JSC	KAZAKHSTAN	Sekerbank TAS	TURKEY
Caixabank	SPAIN	Bank of East Asia Ltd	HONG KONG
Canadian Imperial Bank of Commerce	CANADA	FirstCaribbean International Bank Limited	BARBADOS
CIMB Group Holdings Bhd	MALAYSIA	Bank CIMB Niaga Tbk PT	INDONESIA
Citigroup Inc.	UNITED STATES	Banco de Chile	CHILE
Citigroup Inc.	UNITED STATES	Bank Handlowy w Warszawie S.A.	POLAND
Citigroup Inc.	UNITED STATES	Akbank TAS	TURKEY
Commerzbank AG.	GERMANY	BRE Bank SA	POLAND
Commerzbank AG.	GERMANY	Bank Forum	UKRAINE
Crédit Agricole S.A.	FRANCE	Credit Agricole Egypt	EGYPT
Crédit Agricole S.A.	FRANCE	Crédit du Maroc	MOROCCO
Deutsche Bank AG	GERMANY	Hua Xia Bank co., Limited	CHINA
Dexia	BELGIUM	Denizbank A.S.	TURKEY
Dubai Bank PJSC	UNITED ARAB EMIRATES	Bankislami Pakistan Ltd	PAKISTAN
Hang Seng Bank Ltd	HONG KONG	Industrial Bank Co Ltd	CHINA
HSBC Holdings Plc.	UNITED KINGDOM	Shenzhen Development Bank Co., Ltd	CHINA
HSBC Holdings Plc.	UNITED KINGDOM	Hang Seng Bank Ltd.	HONG KONG
HSBC Holdings Plc.	UNITED KINGDOM	Bank Ekonomi Raharja Tbk PT	INDONESIA
HSBC Holdings Plc.	UNITED KINGDOM	HSBC Bank Malta Plc	MALTA
ING Groep NV	NETHERLANDS	Bank of Beijing Co Ltd	CHINA
ING Groep NV	NETHERLANDS	ING Vysya Bank Ltd	INDIA
ING Groep NV	NETHERLANDS	ING Bank Slaski S.A. - Capital Group	POLAND
ING Groep NV	NETHERLANDS	TMB Bank PCL	THAILAND
Intesa Sanpaolo	ITALY	Privredna Banka Zagreb d.d-Privredna Banka Zagreb Group	CROATIA
Intesa Sanpaolo	ITALY	Vseobecna Uverova Banka a.s.	SLOVAKIA
Intesa Sanpaolo	ITALY	Banco Patagonia SA	ARGENTINA
Ithmaar Bank B.S.C.	BAHRAIN	Faysal Bank Ltd	PAKISTAN
KBC GROEP NV/ KBC GROUPE SA	BELGIUM	Kredyt Bank SA	POLAND
Malayan Banking Bhd	MALAYSIA	MCB Bank Ltd	PAKISTAN
Mitsubishi UFJ Financial Group Inc.	JAPAN	Chong Hing Bank Limited	HONG KONG
Mitsubishi UFJ Financial Group Inc.	JAPAN	Dah Sing Banking Group Limited	HONG KONG
National Bank of Greece SA	GREECE	Stopanska Banka a.d. Skopje	MACEDONIA FYROM
National Bank of Greece SA	GREECE	Finansbank A.S.	TURKEY
Nomura Holdings Inc	JAPAN	Silkbank Ltd	PAKISTAN
Nordea Bank AB (Publ)	SWEDEN	Nordea Bank Polska SA	POLAND

Table 1: List of foreign bank parents and subsidiaries in the sample (continued)

Parent Bank Name	Home Country	Subsidiary Bank Name	Host Country
Oversea-Chinese Banking Corporation Limited OCBC	SINGAPORE	Bank of Ningbo	CHINA
Oversea-Chinese Banking Corporation Limited OCBC	SINGAPORE	Bank OCBC Nisp Tbk PT	INDONESIA
Raiffeisen Bank International AG	AUSTRIA	Raiffeisen Bank Aval	UKRAINE
Société Générale	FRANCE	Société Générale de Banques en Côte d'Ivoire - SGBCI	IVORY COAST
Société Générale	FRANCE	Komercni Banka	CZECH REPUBLIC
Société Générale	FRANCE	National Societe Generale Bank SAE	EGYPT
Société Générale	FRANCE	SG-SSB Limited	GHANA
Société Générale	FRANCE	Societe d'Equipement Domestique et Menager	MOROCCO
Société Générale	FRANCE	Ohridska Banka ad Ohrid	MACEDONIA FYROM
Société Générale	FRANCE	BRD-Groupe Societe Generale SA	ROMANIA
Société Générale	FRANCE	JSC Rosbank	RUSSIAN FEDERATION
Société Générale	FRANCE	Union Internationale de Banques	TUNISIA
Standard Chartered Plc.	UNITED KINGDOM	Standard Chartered Bank Botswana Ltd	BOTSWANA
Standard Chartered Plc.	UNITED KINGDOM	Bank Permata Tbk PT	INDONESIA
Standard Chartered Plc.	UNITED KINGDOM	Standard Chartered Bank Kenya	KENYA
Standard Chartered Plc.	UNITED KINGDOM	Standard Chartered Bank (Pakistan)	PAKISTAN
Standard Chartered Plc.	UNITED KINGDOM	Standard Chartered Bank Zambia Plc-SCBZ Plc	ZAMBIA
Unicredit Spa	ITALY	Zagrebacka Banka dd	CROATIA
Unicredit Spa	ITALY	Bank of Valletta PLC	MALTA
Unicredit Spa	ITALY	Bank Polska Kasa Opieki SA-Bank Pekao SA	POLAND
Unicredit Spa	ITALY	Yapi ve Kredi Bankasi AS	TURKEY
Unicredit Spa	ITALY	Joint-Stock Commercial Bank for Social Development - Ukrsotsbank	UKRAINE

Table 2: Variable definition and descriptive statistics

This table lists the definitions, sources and the summary statistics for the variables used in this study

Variable	Definition	Source	Mean	Standard deviation
Δdd_Subsidiary	Change in subsidiaries' Merton distance to default.	Authors' calculation using bank data from Bankscope and stock return information from Compustat/CSRP/Datastream	-0.0019	0.0266
Δdd_Parent	Change in parent banks' Merton distance to default.	Authors' calculation using bank data from Bankscope and stock return information from Compustat/CSRP/Datastream	-0.0057	0.0285
Δdd_Home	Change in home countries' average Merton distance to default. This country average includes all listed firms and banks except for the bank we are using.	Authors' calculation using bank data from Bankscope and stock return information from Compustat/CSRP/Datastream	-0.0018	0.0347
Δdd_Host	Change in host countries' average Merton distance to default. This country average includes all listed firms and banks except for the bank we are using.	Authors' calculation using bank data from Bankscope and stock return information from Compustat/CSRP/Datastream	-0.0026	0.0224
ΔDEF	Change in Bbb - Aaa spread	Interest rate data releases from the Federal Reserve Board	-0.0067	0.1413
ΔVIX	Change of the CBOE VIX index, implied volatility index on the S&P 500.	Chicago Board Options Exchange	-0.0006	0.0597
Size	Subsidiaries' assets to banking systems' assets ratio	Bankscope	0.0075	0.0239
Capital ratio	Subsidiaries' capital ratio	Bankscope	0.1484	0.0459
Equity assets	Subsidiaries' equity to total assets ratio	Bankscope	0.0929	0.0388
Dep. Funding	Subsidiaries' deposits to total funding ratio	Bankscope	0.8245	0.1229
Profitability	Subsidiaries' return on average assets (ROAA)	Bankscope	0.0157	0.0146
Liquidity	Subsidiaries' liquid assets to total assets ratio	Bankscope	0.2336	0.0998
Provisions	Subsidiaries' loan loss provision to total loans ratio	Bankscope	0.0082	0.0141
Geographical distance	Log of the distance between the capitals of the Parent and Subsidiary countries	CEPII	8.0759	0.9032
Cultural distance	Dummy=1 if home and host share a common language	CEPII	0.3653	0.4816
Reserve Requirements	Average reserve requirements	Data come from World Bank Regulation and Supervision Survey.	14.481	15.713
Disclosure requirements	Index variable that indicates whether the income statement includes accrued or unpaid interest or principal on nonperforming loans, whether banks are required to produce consolidated financial statements, and whether bank directors are legally liable if information disclosed is erroneous or misleading. The variable ranges from 0 to 3, with higher values indicating more informative bank accounts.	Data come from World Bank Regulation and Supervision Survey. Index is constructed following Barth, Caprio, and Levine (2001, 2013)	2.751	0.443
Activity restrictions	Index variable that ranges from 3 to 12, with 12 indicating the highest restrictions on bank activities such as securities, investment, and real estate. (For each type of activity: Unrestricted=1, Permitted=2, Restricted=3, and Prohibited=4).	Data come from World Bank Regulation and Supervision Survey. Index is constructed following Barth, Caprio, and Levine (2001, 2013)	8.417	2.344

Table 2: Variable definition and descriptive statistics (continued)

Variable	Definition	Source	Mean	Standard deviation
Capital regulation	Index captures the amount of capital banks must hold and the stringency of regulations on the nature and source of capital. Ranges in value from 0 to 10, with higher values indicating greater stringency	Data come from World Bank Regulation and Supervision Survey. Index is constructed following Barth, Caprio, and Levine (2001, 2013)	5.359	2.099
Loan classification	Measures the actual minimum number of days beyond which a loan in arrears must be classified as sub-standard, doubtful, or loss.	Data come from World Bank Regulation and Supervision Survey. Index is constructed following Barth, Caprio, and Levine (2001, 2013)	475.722	164.39
Provisioning	Measures the minimum provisions (as a percentage of loans) required as a loan is successively classified as sub-standard, doubtful, and lastly as loss.	Data come from World Bank Regulation and Supervision Survey. Index is constructed following Barth, Caprio, and Levine (2001, 2013)	164.684	33.175
Diversification	An index variable that ranges from zero to two, with higher values indicating more diversification.	Data come from World Bank Regulation and Supervision Survey. Index is constructed following Barth, Caprio, and Levine (2001, 2013)	1.326	0.558
Supervisory powers	An index variable that ranges from zero to fourteen, with fourteen indicating the highest power of the supervisory authorities	Data come from World Bank Regulation and Supervision Survey. Index is constructed following Barth, Caprio, and Levine (2001, 2013)	11.939	2.566
Prompt corrective action	Measures the extent to which the law establishes predetermined levels of bank solvency deterioration that forces automatic enforcement actions such as intervention, and the extent to which supervisors have the requisite suitable powers to do so. The index ranges from 0 to 6 with higher values indicating more promptness in responding to problems.	Data come from World Bank Regulation and Supervision Survey. Index is constructed following Barth, Caprio, and Levine (2001, 2013)	2.436	2.636
Financial outflows restrictions	Average of the financial sectors that involve mostly controlling outflows: lending to non-residents, maintenance of account abroad, and investment regulations, abroad by banks for the year 2007.	Authors' calculation using data from IMF AREAR	0.630	0.331

Table 3: Correlations across variables

This table shows Pearson correlations of the variables use in this study. Panel A displays correlations of bank level subsidiary characteristics. Panel B displays correlations of host country regulations.

Panel A: Subsidiary characteristics

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Δdd_Subsidiary	1.000														
2	Δdd_Parent	0.500	1.000													
3	Δdd_Home	0.384	0.384	1.000												
4	Δdd_Host	0.500	1.000	0.384	1.000											
5	ΔDEF	-0.258	-0.340	-0.204	-0.340	1.000										
6	ΔVIx	-0.183	-0.224	-0.142	-0.224	0.207	1.000									
7	Size	0.012	-0.017	0.012	-0.017	-0.011	-0.010	1.000								
8	Capital ratio	-0.018	-0.003	-0.030	-0.003	0.010	0.017	-0.007	1.000							
9	Equity assets	-0.057	0.024	-0.031	0.024	-0.011	0.018	0.049	0.623	1.000						
10	Dep. Funding	-0.022	-0.022	0.009	-0.022	0.004	0.008	-0.173	0.141	0.029	1.000					
11	Profitability	-0.028	-0.036	-0.018	-0.036	0.015	0.025	0.053	0.327	0.347	0.204	1.000				
12	Liquidity	0.003	0.000	-0.013	0.000	0.016	0.009	-0.121	0.397	0.190	0.200	-0.042	1.000			
13	Geo. Distance	0.041	0.051	0.045	0.051	-0.003	-0.006	-0.128	0.037	-0.070	0.294	0.117	-0.123	1.000		
14	Cultural Prox.	0.019	-0.020	0.012	-0.020	0.009	0.013	-0.073	-0.033	-0.022	0.246	0.427	-0.157	0.368	1.000	
15	Provisions	0.032	0.062	0.039	0.062	-0.007	0.001	0.133	-0.156	0.110	-0.201	-0.088	-0.309	0.209	0.043	1.000

Panel B: Host country regulations

	Variable	1	2	3	4	5	6	7	8	9	10
1	Reserve requirement	1.000									
2	Disclosure	-0.061	1.000								
3	Financial outflows	-0.116	0.319	1.000							
4	Activity restrictions	0.105	0.058	0.201	1.000						
5	Capital regulation	0.083	0.091	0.176	0.662	1.000					
6	Loan classification	-0.209	0.092	0.471	0.273	0.276	1.000				
7	Provisioning stringency	0.213	0.537	0.131	0.058	0.183	-0.114	1.000			
8	Diversification	-0.414	0.100	-0.176	-0.280	-0.006	0.308	0.129	1.000		
9	Supervisory power	0.166	0.085	0.454	0.298	0.319	0.350	0.086	0.160	1.000	
10	Prompt corrective action	0.253	-0.092	0.290	0.273	0.030	0.165	0.115	0.125	0.506	1.000

Table 4: The association between parent banks' and subsidiaries' Merton's distance to default

Regression results for the model $\Delta ddSUB_{i,t} = \beta^0 + \beta^1 \Delta ddPARENT_{i,t} + \beta^2 \Delta ddCSUB_t + \beta^3 \Delta ddCPARENT_t + \beta^4 \Delta VIX_t + \beta^5 \Delta DEF + \gamma_i + \varepsilon_{i,t}$ are reported in this table. $\Delta ddSUB_{i,t}$ is the weekly change in distance-to-default of the subsidiary *i* in week *t*; $\Delta ddPARENT_{i,t}$ is the weekly change in distance-to-default of the parent of subsidiary *i*; $\Delta ddCSUB_t$ and $ddCPARENT_t$ are changes in average distance-to-defaults of all the publicy traded banks and companies in the host country and parent bank country (excluding the foreign subsidiary and parent banks in question), respectively. ΔVIX_t is the weekly change in the VIX volatility index. ΔDEF_t is the change in interest rate spread between Aaa and Bbb rated companies. Regressions also include subsidiary fixed effects, γ_i. Standard errors are reported below coefficient estimates in parentheses and are clustered at the host country level. ***, ** and * indicate the 1%, 5%, and 10% level of significance, respectively.

Variables	(4.1)	(4.2)	(4.3)	(4.4)	(4.5)
Δdd_Parent	0.446***	0.292***	0.276***	0.282***	0.271***
	(0.041)	(0.034)	(0.032)	(0.033)	(0.032)
Δdd_Home		0.188***	0.182***	0.182***	0.175***
		(0.051)	(0.048)	(0.049)	(0.047)
Δdd_Host		0.142***	0.136***	0.138***	0.135***
		(0.028)	(0.027)	(0.027)	(0.027)
ΔDEF			-0.013***		-0.011***
			(0.004)		(0.004)
ΔVIX				-0.0305*	-0.0270*
				(0.0152)	(0.0147)
Observations	3,786	3,663	3,581	3,581	3,581
Subsidiary fixed effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.216	0.276	0.285	0.285	0.288
Number of Subsidiaries	93	93	93	93	93

Table 5: The association between parent banks' and subsidiaries' Merton's distance to default excluding parents with multiple subsidiaries

Regression results for the model $\Delta ddSUB_{i,t} = \beta^0 + \beta^1 \Delta ddPARENT_{i,t} + \beta^2 \Delta ddCSUB_t + \beta^3 \Delta ddCPARENT_t + \beta^4 \Delta VIX_t + \beta^5 \Delta DEF + \gamma_i + \varepsilon_{i,t}$ are reported in this table. $\Delta ddSUB_{i,t}$ is the weekly change in distance-to-default of the subsidiary *i* in week *t*; $\Delta ddPARENT_{i,t}$ is the weekly change in distance-to-default of the parent of subsidiary *i*; $\Delta ddCSUB_t$ and $ddCPARENT_t$ are changes in average distance-to-defaults of all the publicy traded banks and companies in the host country and parent bank country (excluding the foreign subsidiary and parent banks in question), respectively. ΔVIX_t is the weekly change in the VIX volatility index. ΔDEF_t is the change in interest rate spread between Aaa and Bbb rated companies. Regressions also include subsidiary fixed effects, γ_i. Each column from 5.1 to 5.14 shows regression results excluding the bank specified in each corresponding column. Standard errors are reported below coefficient estimates in parentheses and are clustered at the host country level. ***, ** and * indicate the 1%, 5%, and 10% level of significance, respectively.

Variables	(5.1)	(5.2)	(5.3)	(5.4)	(5.5)	(5.6)	(5.7)	(5.8)	(5.9)	(5.10)	(5.11)	(5.12)	(5.13)	(5.14)
Bank Excluded	Banco Bilbao Vizcaya Argentaria SA	Banco Santander SA	Bank of Nova Scotia - Scotiabank	Barclays Plc	BNP Paribas	Citigroup INC	ING Groep NV	Societe Generale	Standard Chartered Plc	UniCredit SpA	Bank of East Asia Ltd	Mitsubishi UFJ Financial Group Inc-Kabu	National Bank of Greece SA	HSBC Holdings PLC
Δdd_Parent	0.276***	0.273***	0.270***	0.273***	0.259***	0.271***	0.266***	0.258***	0.287***	0.262***	0.272***	0.270***	0.270***	0.275***
	(0.0316)	(0.0331)	(0.0326)	(0.0326)	(0.0347)	(0.0321)	(0.0313)	(0.0336)	(0.0340)	(0.0327)	(0.0327)	(0.0323)	(0.0331)	(0.0338)
Δdd_Home	0.175***	0.175***	0.173***	0.180***	0.186***	0.176***	0.182***	0.166***	0.174***	0.175***	0.175***	0.164***	0.185***	0.166***
	(0.0485)	(0.0480)	(0.0486)	(0.0498)	(0.0491)	(0.0471)	(0.0510)	(0.0498)	(0.0523)	(0.0477)	(0.0481)	(0.0432)	(0.0484)	(0.0462)
Δdd_Host	0.136***	0.130***	0.139***	0.138***	0.131***	0.134***	0.132***	0.151***	0.147***	0.136***	0.136***	0.129***	0.132***	0.135***
	(0.0275)	(0.0265)	(0.0263)	(0.0265)	(0.0269)	(0.0265)	(0.0267)	(0.0310)	(0.0262)	(0.0273)	(0.0268)	(0.0265)	(0.0266)	(0.0277)
ΔDEF	-0.010***	-0.012***	-0.010**	-0.011***	-0.011***	-0.011***	-0.011***	-0.012***	-0.013***	-0.011***	-0.011***	-0.010**	-0.011***	-0.012***
	(0.00369)	(0.00367)	(0.00375)	(0.00384)	(0.00368)	(0.00364)	(0.00377)	(0.00371)	(0.00340)	(0.00364)	(0.00370)	(0.00375)	(0.00370)	(0.00376)
ΔVIX	-0.0232*	-0.0269*	-0.0329**	-0.0260	-0.0263*	-0.0270*	-0.0289*	-0.0297*	-0.0290*	-0.0253*	-0.0272*	-0.0261*	-0.0271*	-0.0294*
	(0.0137)	(0.0152)	(0.0140)	(0.0154)	(0.0142)	(0.0147)	(0.0148)	(0.0162)	(0.0154)	(0.0145)	(0.0150)	(0.0153)	(0.0146)	(0.0146)
Obs.	3,539	3,446	3,437	3,409	3,368	3,575	3,369	3,198	3,354	3,328	3,526	3,470	3,497	3,426
Subsidiary fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.291	0.288	0.292	0.289	0.284	0.288	0.283	0.283	0.308	0.278	0.288	0.278	0.289	0.283
Number of Subsidiaries	89	89	90	90	88	90	89	84	88	88	92	91	91	90

Table 6: The association between parent banks' and subsidiaries' simplified Merton's distance to default

Regression results for the model $\Delta ddSUB_{i,t} = \beta^0 + \beta^1 \Delta ddPARENT_{i,t} + \beta^2 \Delta ddCSUB_t + \beta^3 \Delta ddCPARENT_t + \beta^4 \Delta VIX_t + \beta^5 \Delta DEF + \gamma_i + \varepsilon_{i,t}$ are reported in this table. $\Delta ddSUB_{i,t}$ is the weekly change in distance-to-default of the subsidiary *i* in week *t*; $\Delta ddPARENT_{i,t}$ is the weekly change in distance-to-default of the parent of subsidiary *i*; $\Delta ddCSUB_t$ and $ddCPARENT_t$ are changes in average distance-to-defaults of all the publicy traded banks and companies in the host country and parent bank country (excluding the foreign subsidiary and parent banks in question), respectively. Distance-to-default is computed using the simplified approach outlined in the text in section 3. ΔVIX_t is the weekly change in the VIX volatility index. ΔDEF_t is the change in interest rate spread between Aaa and Bbb rated companies. Regressions also include subsidiary fixed effects, γ_i. Standard errors are reported below coefficient estimates in parentheses and are clustered at the host country level. ***, ** and * indicate the 1%, 5%, and 10% level of significance, respectively.

Variables	(6.1)	(6.2)	(6.3)	(6.4)	(6.5)
Δdd_Parent	0.335***	0.191***	0.196***	0.190***	0.190***
	(0.0271)	(0.0244)	(0.0247)	(0.0242)	(0.0243)
Δdd_Home		0.184***	0.187***	0.199***	0.202***
		(0.0283)	(0.0285)	(0.0273)	(0.0286)
Δdd_Host		0.142***	0.145***	0.148***	0.148***
		(0.0351)	(0.0352)	(0.0368)	(0.0363)
ΔDEF			0.00123		0.00116
			(0.00339)		(0.00337)
ΔVIX				0.0149*	0.0148*
				(0.00814)	(0.00812)
Observations	4,326	4,172	4,008	4,008	4,008
Subsidiary fixed effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.134	0.180	0.187	0.188	0.188
Number of Subsidiaries	87	87	87	87	87

Table 7: The association between parent banks' and subsidiaries' synthetic distance to default

Regression results for the model $\Delta ddSUB_{i,t} = \beta^0 + \beta^1 \Delta ddPARENT_{i,t} + \beta^2 \Delta ddCSUB_t + \beta^3 \Delta ddCPARENT_t + \beta^4 \Delta VIX_t + \beta^5 \Delta DEF + \gamma_i + \varepsilon_{i,t}$ are reported in this table. $\Delta ddSUB_{i,t}$ is the weekly change in distance-to-default of the subsidiary *i* in week *t*; $\Delta ddPARENT_{i,t}$ is the weekly change in distance-to-default of the parent of subsidiary *i*; $\Delta ddCSUB_t$ and $ddCPARENT_t$ are changes in average distance-to-defaults of all the publicy traded banks and companies in the host country and parent bank country (excluding the foreign subsidiary and parent banks in question), respectively. Distance-to-default is computed using the 'market comparable' approach of Falkenheim and Pennachi (2003) outlined in the text in section 3. ΔVIX_t is the weekly change in the VIX volatility index. ΔDEF_t is the change in interest rate spread between Aaa and Bbb rated companies. Regressions also include subsidiary fixed effects, γ_i. Standard errors are reported below coefficient estimates in parentheses and are clustered at the host country level. ***, ** and * indicate the 1%, 5%, and 10% level of significance, respectively.

Variables	(7.1)	(7.2)	(7.3)	(7.4)	(7.5)
Δdd_Parent	0.188***	0.087***	0.088***	0.097***	0.096***
	(0.0194)	(0.019)	(0.019)	(0.019)	(0.019)
Δdd_Home		0.052**	0.055**	0.057**	0.059**
		(0.022)	(0.022)	(0.022)	(0.022)
Δdd_Host		0.522***	0.521***	0.518***	0.518***
		(0.053)	(0.053)	(0.053)	(0.052)
ΔDEF			-0.013***		-0.009***
			(0.003)		(0.002)
ΔVIX				-0.0378***	-0.0317***
				(0.008)	(0.008)
Observations	17,170	16,702	16,702	16,702	16,702
Subsidiary fixed effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.086	0.278	0.280	0.280	0.281
Number of Subsidiaries	310	310	310	310	310

Table 8: The impact of subsidiaries' characteristics on the association between foreign subsidiaries and parents' distance to default

Regression results for the model $\Delta ddSUB_{i,t} = \beta^0 + \beta^1 \Delta ddPARENT_{i,t} + \beta^2 \Delta ddCSUB_t + \beta^3 \Delta ddCPARENT_t + \beta^4 \Delta VIX_t + \beta^5 \Delta DEF + \beta^6 X_i \times \Delta ddPARENT_{i,t} + \gamma_i + \varepsilon_{i,t}$. $\Delta ddSUB_{i,t}$ is the weekly change in distance-to-default of the subsidiary *i* in week *t*; $\Delta ddPARENT_{i,t}$ is the weekly change in distance-to-default of the parent of subsidiary *i*; $\Delta ddCSUB_t$ and $ddCPARENT_t$ are changes in average distance-to-defaults of all the publicy traded banks and companies in the host country and parent bank country, respectively. ΔVIX_t is the weekly change in the VIX volatility index. ΔDEF_t is the change in interest rate spread between Aaa and Bbb rated companies. X_i are foreign subsidiary characteristics computed as of December 2006. These variables are described in detail in Table 2. Regressions also include subsidiary fixed effects, γ_i. Standard errors are reported below coefficient estimates in parentheses and are clustered at the host country level. ***, ** and * indicate the 1%, 5%, and 10% level of significance, respectively.

Variables	(8.1)	(8.2)	(8.3)	(8.4)	(8.5)	(8.6)	(8.7)	(8.8)	(8.9)	(8.10)
Δdd_Parent	0.279***	0.479***	0.357***	0.781***	0.343***	0.207***	0.325***	0.771***	0.342***	1.179***
	(0.0376)	(0.115)	(0.0804)	(0.221)	(0.0476)	(0.0684)	(0.0399)	(0.268)	(0.0417)	(0.294)
Δdd_Home	0.171***	0.168***	0.172***	0.163***	0.166***	0.172***	0.156***	0.176***	0.176***	0.168***
	(0.0484)	(0.0577)	(0.0476)	(0.0491)	(0.0506)	(0.0484)	(0.0482)	(0.0473)	(0.0465)	(0.0583)
Δdd_Host	0.129***	0.124***	0.127***	0.129***	0.130***	0.127***	0.126***	0.135***	0.135***	0.128***
	(0.0268)	(0.0321)	(0.0267)	(0.0260)	(0.0262)	(0.0266)	(0.0266)	(0.0263)	(0.0256)	(0.0305)
ΔDEF	-0.0126***	-0.0130***	-0.0124***	-0.0128***	-0.0128***	-0.0130***	-0.0116***	-0.0113***	-0.0116***	-0.0243
	(0.00384)	(0.00433)	(0.00386)	(0.00380)	(0.00369)	(0.00398)	(0.00371)	(0.00371)	(0.00357)	(0.0164)
ΔVIX	-0.0274*	-0.0227	-0.0278*	-0.0292*	-0.0271*	-0.0263*	-0.0239	-0.0269*	-0.0291*	-0.0143***
	(0.0154)	(0.0154)	(0.0150)	(0.0156)	(0.0149)	(0.0152)	(0.0141)	(0.0148)	(0.0147)	(0.00438)
Size×Δdd_Parent	-1.080									
	(1.704)									
Capital ratio×Δdd_Parent		-1.124*								-0.859*
		(0.608)								(0.454)
Equity assets×Δdd_Parent			-0.908							
			(0.702)							
Cust. Dep./Fund.× Δdd_Parent				-0.602**						-0.579*
				(0.262)						(0.316)
Profitability×Δdd_Parent					-3.597*					-0.171
					(2.011)					(2.654)
Liquidity×Δdd_Parent						0.294				
						(0.344)				
Provisions×Δdd_Parent							-4.271			
							(2.912)			
Geo. distance×Δdd_Parent								-0.0620*		-0.0234
								(0.0327)		(0.0305)
Cultural Prox.×Δdd_Parent									-0.194***	-0.190***
									(0.0574)	(0.0617)
Observations	3,411	2,708	3,396	3,372	3,352	3,380	3,337	3,581	3,581	2,622
R-squared	0.287	0.304	0.288	0.294	0.293	0.295	0.292	0.298	0.292	0.326
Number of subsidiaries	88	66	87	87	86	87	86	93	93	64

Table 9: Exploring threshold effects in the subsidiary characteristics' impact on the association between subsidiary and parent distance to default

Regression results for the model $\Delta ddSUB_{i,t} = \beta^0 + \beta^1 \Delta ddPARENT_{i,t} + \beta^2 \Delta ddCSUB_t + \beta^3 \Delta ddCPARENT_t + \beta^4 \Delta VIX_t + \beta^5 \Delta DEF + \beta^6 X_i \times \Delta ddPARENT_{i,t} + \gamma_i + \varepsilon_{i,t}$ are reported in this table. $\Delta ddSUB_{i,t}$ is the weekly change in distance-to-default of the subsidiary *i* in week *t*; $\Delta ddPARENT_{i,t}$ is the weekly change in distance-to-default of the parent of subsidiary *i*; $\Delta ddCSUB_t$ and $ddCPARENT_t$ are changes in average distance-to-defaults of all the publicy traded banks and companies in the host country and parent bank country (excluding the foreign subsidiary and parent banks in question), respectively. ΔVIX_t is the weekly change in the VIX volatility index. ΔDEF_t is the change in interest rate spread between Aaa and Bbb rated companies. X_i are foreign subsidiary characteristics computed as of December 2006. These variables are described in detail in Table 2. Instead of using continuous variables, this table reports regression results using dummy variables which equal one for those affiliates whose characteristics rank above the median. Regressions also include subsidiary fixed effects, γ_i. Standard errors are reported below coefficient estimates in parentheses and are clustered at the host country level. ***, ** and * indicate the 1%, 5%, and 10% level of significance, respectively..

Variables	(9.1)	(9.2)	(9.3)	(9.4)	(9.5)	(9.6)	(9.7)	(9.8)
Δdd_Parent	0.288***	0.374***	0.332***	0.344***	0.315***	0.233***	0.363***	0.329***
	(0.0459)	(0.0519)	(0.0496)	(0.0448)	(0.0411)	(0.0318)	(0.0470)	(0.0491)
Δdd_Home	0.170***	0.167***	0.175***	0.164***	0.169***	0.171***	0.156***	0.174***
	(0.0487)	(0.0584)	(0.0479)	(0.0498)	(0.0501)	(0.0487)	(0.0474)	(0.0477)
Δdd_Host	0.129***	0.124***	0.126***	0.128***	0.130***	0.128***	0.124***	0.134***
	(0.0267)	(0.0319)	(0.0264)	(0.0258)	(0.0265)	(0.0265)	(0.0266)	(0.0262)
ΔDEF	-0.0127***	-0.0129***	-0.0120***	-0.0130***	-0.0126***	-0.0131***	-0.0115***	-0.0112***
	(0.00380)	(0.00424)	(0.00383)	(0.00376)	(0.00376)	(0.00394)	(0.00377)	(0.00368)
ΔVIX	-0.0282*	-0.0227	-0.0277*	-0.0297*	-0.0270*	-0.0266*	-0.0235	-0.0270*
	(0.0152)	(0.0158)	(0.0149)	(0.0158)	(0.0149)	(0.0152)	(0.0142)	(0.0149)
H_Size×Δdd_Parent	-0.0324							
	(0.0600)							
H_Capital×Δdd_Parent		-0.125*						
		(0.0659)						
H_Equity×Δdd_Parent			-0.124*					
			(0.0628)					
H_Funding×Δdd_Parent				-0.133**				
				(0.0600)				
H_Profitability×Δdd_Parent					-0.0699			
					(0.0577)			
H_Liquidity×Δdd_Parent						0.0823		
						(0.0642)		
H_Provisioning×Δdd_Parent							-0.142**	
							(0.0678)	
H_Geo. Distance×Δdd_Parent								-0.116*
								(0.0644)
Observations	3,411	2,708	3,396	3,372	3,352	3,380	3,337	3,581
R-squared	0.287	0.305	0.291	0.294	0.291	0.296	0.295	0.292
Number of subsidiaries	88	66	87	87	86	87	86	93

Table 10: The impact of subsidiaries' characteristics controlling for host country dummies-parent distance to default interaction

Regression results for the model $\Delta ddSUB_{i,t} = \beta^0 + \beta^1 \Delta ddPARENT_{i,t} + \beta^2 \Delta ddCSUB_t + \beta^3 \Delta ddCPARENT_t + \beta^4 \Delta VIX_t + \beta^5 \Delta DEF + \beta^6 X_i \times \Delta ddPARENT_{i,t} + \beta^7 \gamma_i \times \Delta ddPARENT_{i,t} + \varepsilon_{i,t}$ $\Delta ddSUB_{i,t}$ is the weekly change in distance-to-default of the subsidiary *i* in week *t*; $\Delta ddPARENT_{i,t}$ is the weekly change in distance-to-default of the parent of subsidiary *i*; $\Delta ddCSUB_t$ and $ddCPARENT_t$ are changes in average distance-to-defaults of all the publicly traded banks and companies in the host country and parent bank, respectively. ΔVIX_t is the weekly change in the VIX volatility index. ΔDEF_t is the change in interest rate spread between Aaa and Bbb rated companies. X_i are foreign subsidiary characteristics computed as of December 2006. These variables are described in detail in Table 2. Regressions also include host country dummies and parent distance to default interactions, $\gamma_i \times \Delta ddPARENT_{i,t}$, which are included but not reported. Standard errors are reported below coefficient estimates in parentheses and are clustered at the host country level. ***, ** and * indicate the 1%, 5%, and 10% level of significance, respectively.

Variables	(10.1)	(10.2)	(10.3)	(10.4)	(10.5)	(10.6)	(10.7)	(10.8)	(10.9)
Δdd_Parent	0.411***	-0.139	0.553***	0.959***	-0.0680	0.349***	0.473***	0.602	0.365***
	(0.0265)	(0.121)	(0.198)	(0.248)	(0.0715)	(0.112)	(0.0627)	(0.396)	(0.0730)
Δdd_Home	0.168***	0.166***	0.171***	0.166***	0.166***	0.168***	0.155***	0.171***	0.172***
	(0.0508)	(0.0597)	(0.0499)	(0.0512)	(0.0525)	(0.0508)	(0.0508)	(0.0490)	(0.0488)
Δdd_Host	0.115***	0.110***	0.115***	0.116***	0.115***	0.116***	0.113***	0.123***	0.123***
	(0.0247)	(0.0297)	(0.0252)	(0.0249)	(0.0248)	(0.0250)	(0.0246)	(0.0251)	(0.0250)
ΔDEF	-0.0136***	-0.0148***	-0.0136***	-0.0134***	-0.0136***	-0.0141***	-0.0128***	-0.0128***	-0.0125***
	(0.00364)	(0.00392)	(0.00370)	(0.00369)	(0.00365)	(0.00387)	(0.00362)	(0.00352)	(0.00350)
ΔVIX	-0.0324**	-0.0270	-0.0318**	-0.0329**	-0.0308*	-0.0313**	-0.0287*	-0.0325**	-0.0319**
	(0.0155)	(0.0161)	(0.0153)	(0.0155)	(0.0153)	(0.0153)	(0.0143)	(0.0147)	(0.0148)
Size×Δdd_Parent	1.703***								
	(0.547)								
Capital ratio×Δdd_Parent		0.354							
		(0.638)							
Equity assets×Δdd_Parent			-0.915						
			(1.208)						
Cust. deposits/Funding×Δ dd_Parent				-0.658**					
				(0.293)					
Profitability×Δdd_Parent					-1.222				
					(1.857)				
Liquidity× Δdd_Parent						0.115			
						(0.210)			
Provisions× Δdd_Parent							-2.203		
							(1.975)		
Geographic distance×Δdd_Parent								-0.0423	
								(0.0497)	
Cultural Proximity× Δdd_Parent									-0.113*
									(0.0601)
Host Country Dummy xΔ dd_Parent	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Observations	3,411	2,708	3,396	3,372	3,352	3,380	3,337	3,581	3,581
R-squared	0.331	0.346	0.331	0.335	0.334	0.339	0.335	0.332	0.333
Number of subsidiaries	88	66	87	87	86	87	86	93	93

Table 11: The impact of host countries' regulations on the association between foreign subsidiaries' and parents' distance to default

Regression results for the model $\Delta ddSUB_{i,t} = \beta^0 + \beta^1 \Delta ddPARENT_{i,t} + \beta^2 \Delta ddCSUB_t + \beta^3 \Delta ddCPARENT_t + \beta^4 \Delta VIX_t + \beta^5 \Delta DEF + \beta^6 M_c \times \Delta ddPARENT_{i,t} + \gamma_i + \varepsilon_{i,t}$ are reported in this table. $\Delta ddSUB_{i,t}$ is the weekly change in distance-to-default of the subsidiary *i* in week *t*; $\Delta ddPARENT_{i,t}$ is the weekly change in distance-to-default of the parent of subsidiary *i*; $\Delta ddCSUB_t$ and $ddCPARENT_t$ are changes in average distance-to-defaults of all the publicy traded banks and companies in the host country and parent bank country (excluding the foreign subsidiary and parent banks in question), respectively. ΔVIX_t is the weekly change in the VIX volatility index. ΔDEF_t is the change in interest rate spread between Aaa and Bbb rated companies. M_c are subsidiary host country regulations measured as of December, 2006. These variables are described in detail in table 2. Regression also includes subsidiary fixed effects, γ_i. Standard errors are reported below coefficient estimates in parentheses and are clustered at the host country level. ***, ** and * indicate the 1%, 5%, and 10% level of significance, respectively.

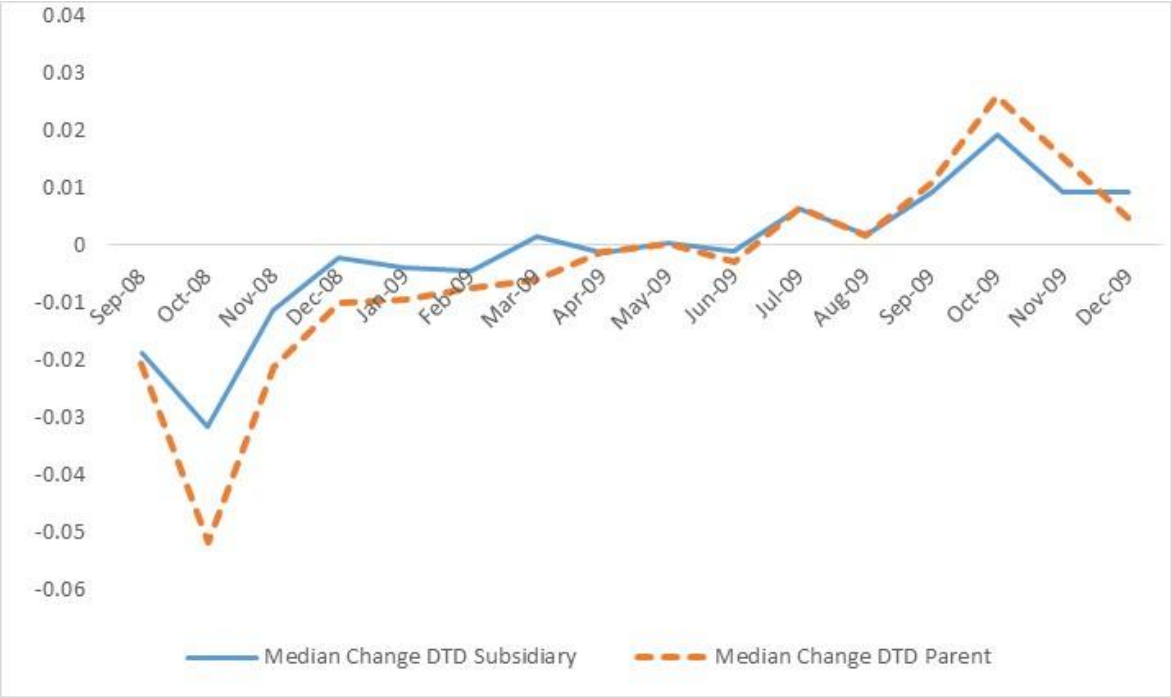
Variables	(11.1)	(11.2)	(11.3)	(11.4)	(11.5)	(11.6)	(11.7)	(11.8)	(11.9)	(11.10)	(11.11)
Δdd_Parent	0.778***	0.616***	0.435***	0.484***	0.481***	0.650***	0.282***	0.330	0.312***	0.303***	0.277***
	(0.239)	(0.106)	(0.0774)	(0.1000)	(0.155)	(0.106)	(0.0890)	(0.208)	(0.0499)	(0.0612)	(0.0792)
Δdd_Home	0.179***	0.200***	0.188***	0.197***	0.161**	0.174***	0.175***	0.186***	0.178***	0.230***	0.176***
	(0.0475)	(0.0557)	(0.0530)	(0.0563)	(0.0622)	(0.0544)	(0.0472)	(0.0522)	(0.0499)	(0.0392)	(0.0468)
Δdd_Host	0.133***	0.125***	0.136***	0.129***	0.127***	0.125***	0.134***	0.138***	0.127***	0.108***	0.134***
	(0.0269)	(0.0300)	(0.0307)	(0.0303)	(0.0444)	(0.0380)	(0.0269)	(0.0312)	(0.0269)	(0.0364)	(0.0263)
ΔDEF	-0.011***	-0.0110***	-0.0117***	-0.0106**	-0.0123**	-0.0124**	-0.0118***	-0.0115***	-0.0111***	-0.0111**	-0.0111***
	(0.00362)	(0.00400)	(0.00387)	(0.00411)	(0.00504)	(0.00447)	(0.00358)	(0.00387)	(0.00378)	(0.00464)	(0.00364)
ΔVIX	-0.0278*	-0.0180	-0.0280*	-0.0196	-0.0392**	-0.0258	-0.0281*	-0.0265	-0.0218	-0.0393**	-0.0270*
	(0.0140)	(0.0157)	(0.0154)	(0.0148)	(0.0179)	(0.0177)	(0.0148)	(0.0160)	(0.0141)	(0.0182)	(0.0147)
Disclosure×Δdd_Parent	-0.183**										
	(0.0852)										
Activity Restr.× Δdd_Parent		-0.0407***									
		(0.0115)									
Capital Stringency× Δdd_Parent			-0.0529**								
			(0.0198)								
Capital Regulation× Δdd_Parent				-0.0402**							
				(0.0162)							
Loan Classification×Δ dd_Parent					-0.000432						
					(0.000306)						
Provisioning × Δdd_Parent						-0.00236***					
						(0.000666)					
Diversification× Δdd_Parent							-0.00545				
							(0.0579)				
Supervisory Powers× Δdd_Parent								-0.00530			
								(0.0157)			
Prompt Corrective×Δdd_Parent									-0.0125		
									(0.0131)		
Reserves Req.× Δ dd_Parent										-0.00374*	
										(0.00189)	
Financial Outflows×Δ dd_Parent											-0.00935
											(0.105)
Obs.	3,576	3,073	3,319	3,073	2,158	2,512	3,555	3,319	3,309	2,414	3,581
R-squared	0.294	0.294	0.300	0.291	0.273	0.275	0.291	0.293	0.285	0.313	0.288
Number subsidiaries	92	77	84	77	55	62	91	84	84	62	93

Table 12: The impact of host countries' regulations and subsidiaries' characteristics combined

Regression results for the model $\Delta ddSUB_{i,t} = \beta^0 + \beta^1 \Delta ddPARENT_{i,t} + \beta^2 \Delta ddCSUB_t + \beta^3 \Delta ddCPARENT_t + \beta^4 \Delta VIX_t + \beta^5 \Delta DEF + \beta^6 X_i \times \Delta ddPARENT_{i,t} + \beta^7 M_c \times \Delta ddPARENT_{i,t} + \gamma_i + \varepsilon_{i,t}$ are reported in this table. $\Delta ddSUB_{i,t}$ is the weekly change in distance-to-default of the subsidiary *i* in week *t*; $\Delta ddPARENT_{i,t}$ is the weekly change in distance-to-default of the parent of subsidiary *i*; $\Delta ddCSUB_t$ and $ddCPARENT_t$ are changes in average distance-to-defaults of all the publicy traded banks and companies in the host country and parent bank country (excluding the foreign subsidiary and parent banks in question), respectively. ΔVIX_t is the weekly change in the VIX volatility index. ΔDEF_t is the change in interest rate spread between Aaa and Bbb rated companies. X_i are foreign subsidiary characteristics (size, liquidity, funding structure, capital, etc.) computed as of December, 2006. M_c are subsidiary host country regulations measured as of December, 2006. These variables are described in detail in table 2. Regression also includes subsidiary fixed effects, γ_i. Standard errors are reported below coefficient estimates in parentheses and are clustered at the host country level. ***, ** and * indicate the 1%, 5%, and 10% level of significance, respectively.

Variables	(12.1)	(12.2)	(12.3)	(12.4)	(12.5)	(12.6)	(12.7)	(12.8)	(12.9)	(12.10)	(12.11)
Δdd_Parent	1.269***	1.090***	0.928***	1.019***	1.048**	1.275***	0.711***	1.125***	0.891***	0.865***	0.871***
	(0.366)	(0.296)	(0.231)	(0.281)	(0.409)	(0.275)	(0.249)	(0.308)	(0.285)	(0.293)	(0.282)
Δdd_Home	0.171***	0.189***	0.171***	0.182***	0.134*	0.151**	0.165***	0.170***	0.172***	0.214***	0.167***
	(0.0575)	(0.0647)	(0.0601)	(0.0643)	(0.0698)	(0.0612)	(0.0561)	(0.0594)	(0.0590)	(0.0415)	(0.0563)
Δdd_Host	0.124***	0.114***	0.124***	0.117***	0.117**	0.111**	0.126***	0.123***	0.119***	0.0916**	0.124***
	(0.0305)	(0.0335)	(0.0341)	(0.0338)	(0.0514)	(0.0419)	(0.0301)	(0.0345)	(0.0307)	(0.0361)	(0.0300)
ΔDEF	-0.014***	-0.0130**	-0.0131***	-0.0126**	-0.0144**	-0.0144**	-0.0140***	-0.0131***	-0.0135***	-0.0138**	-0.0137***
	(0.00421)	(0.00467)	(0.00430)	(0.00473)	(0.00623)	(0.00537)	(0.00422)	(0.00432)	(0.00465)	(0.00533)	(0.00426)
ΔVIX	-0.0274*	-0.0145	-0.0263	-0.0160	-0.0344*	-0.0232	-0.0270*	-0.0261	-0.0172	-0.0396*	-0.0262
	(0.0155)	(0.0150)	(0.0158)	(0.0145)	(0.0176)	(0.0176)	(0.0157)	(0.0159)	(0.0144)	(0.0191)	(0.0158)
Disclosure ×Δdd_Parent	-0.170*										
	(0.0881)										
Activity Restrictions×Δdd_Parent		-0.0349***									
		(0.00568)									
Capital Stringency×Δdd_Parent			-0.0467***								
			(0.0148)								
Capital Regulation×Δdd_Parent				-0.0374**							
				(0.0140)							
Loan Classification×Δdd_Parent					-0.000215						
					(0.000224)						
Provisioning ×Δdd_Parent						-0.00202***					
						(0.000681)					
Diversification×Δdd_Parent							0.0689				
							(0.0721)				
Supervisory Powers×Δdd_Parent								-0.0179			
								(0.0105)			
Prompt Corrective×Δdd_Parent									-0.0154		
									(0.0120)		
Reserves Req.× Δdd_Parent										-0.00309*	
										(0.00153)	
Financial Outflows×Δdd_Parent											-0.0403
											(0.120)
Capital ratio×Δdd_Parent	-0.553	-0.755	-0.368	-0.268	-1.294**	-0.606	-1.034*	-0.889*	-0.790	-0.965**	-1.071**
	(0.477)	(0.520)	(0.532)	(0.616)	(0.533)	(0.460)	(0.510)	(0.498)	(0.487)	(0.352)	(0.459)
Cust. deposits/Funding×Δdd_Parent	-0.409	-0.341	-0.412	-0.460	-0.405	-0.570*	-0.315	-0.456	-0.405	-0.381	-0.365
	(0.293)	(0.377)	(0.270)	(0.335)	(0.465)	(0.330)	(0.313)	(0.335)	(0.352)	(0.390)	(0.321)
Cultural Proximity×Δdd_Parent	-0.207***	-0.200***	-0.195***	-0.206***	-0.241**	-0.176**	-0.222***	-0.242***	-0.221***	-0.215**	-0.213***
	(0.0637)	(0.0545)	(0.0494)	(0.0512)	(0.0934)	(0.0838)	(0.0639)	(0.0602)	(0.0588)	(0.0930)	(0.0623)
Obs.	2,669	2,363	2,597	2,363	1,620	1,873	2,669	2,597	2,435	1,837	2,669
R-squared	0.326	0.325	0.332	0.322	0.296	0.297	0.322	0.330	0.312	0.354	0.322
Number of subsidiaries	65	56	62	56	39	44	65	62	59	44	65

Figure 1: Change in the mean distance to default across all multinational parent banks and across foreign subsidiaries



Appendix 1: The synthetic distance to default a la Falkenheim and Pennachi (2003)

We model market leverage (*mktlev*), and standard deviation of asset returns ($sigmaV_A$) as a linear function of accounting variables. Market leverage is total liabilities divided by the market value of assets computed from the Merton model (V_A /X) described above. Similarly, the standard deviation of asset returns are computed from the Merton model (s_A), using market equity data. For each weekly observation in our sample, we run a cross-sectional regression of *mktlev* and $sigmaV_A$ on a number of accounting variables. The explanatory variables we use are similar to those described in Falkenheim and Pennachi (2003). We make some modifications as our sample includes international banks operating in a number of different countries. We use book value of leverage (*Asset / Liabilities*) to proxy for market leverage. Given the significant impact earnings have on equity prices, we use three variables to capture their effects on market leverage and asset volatility. In particular, we use net income scaled by liabilities (*Net Income / Liabilities*), net income ratio squared $(Net\ Income\ /\ Liabilities)^2$, and the quadratic term multiplied by a dummy variable set equal to one if net income is positive and zero if it is negative ($Dummy*(Net\ Income\ /\ Liabilities)^2$). The quadratic terms allow for potential non-linearities in the relationship between net income and market leverage and asset volatility. We use standard deviation of earnings and standard deviation of liabilities growth to proxy for volatility of market value of assets.[1] Loan loss provisions (*Loan loss provisions / Liabilities*) capture differences in asset quality, net loans (*Net loans / Liabilities*) capture differences in business model, and deposits ratio (*Deposits / Liabilities*) capture differences in funding structure. We include bank size (*log(Assets)*) and a dummy variable set equal to one (*BHC dummy*) if the institution is a bank holding company, to distinguish large holding companies from smaller more independent banks. Large banks and holding companies may have more

[1] Liabilities growth for a given bank is measured as: $\log(Liabilities_t / Liabilities_{t-1})$

market power, greater brand recognition, and charter values. They may also be more complex, diversified and may have greater economies of scale. They are also more likely to engage in greater securitization and use of derivative products. Finally we include eight region dummies to take into account geographical differences.[2]

We run cross-sectional regressions each week over the years 2008 and 2009 using lagged values of accounting variables and region dummies to explain market leverage and asset volatility. We then use the weekly estimated coefficients on the lagged explanatory variables for non-publicly traded banks to create 'synthetic' market leverage and asset volatility measures for these banks. These 'sytnthetic' measures are then used to compute weekly distance-to-default measures.[3] Appendix Table A.1 reports Fama-Macbeth regression results for the time period used to estimate weekly credit risk measures.[4] The results are qualitatively similar to those reported in Falkenheim and Pennachi (2003).

[2] The region coefficients capture relative effects for each of the regions (***) with respect to the Africa region which is not included to avoid perfect multi-colliniearity.

[3] We plug in the estimated values for market leverage and standard deviation of asset returns to compute weekly distance-to-default: $dd = \frac{log(\widehat{mktlev}) + \left(m - d - \frac{\widehat{sigmaVA}^2}{2}\right)T}{\widehat{sigmaVA}^2 \sqrt{T}}$

[4] The standard errors for the coefficient estimates are based on the time series variability of the cross-sectional estimates, incorporating a Newey-West (1987) correction with three lags to account for possible autocorrelation in the estimates.

Appendix Table A.1. Synthetic credit risk scores

This table reports results from weekly Fama-MacBeth (1973) regressions of market leverage (*mktlev*) and asset return volatility (*sigmaVA*) on lagged accounting variables. *mktlev* is total liabilities divided by the market value of assets computed from the Merton model *sigmaVA* is standard deviation of asset returns computed from the Merton model. The explanatory accounting variables are described in detail in the text. The time period is from September 2008 to December 2009. We report Fama-MacBeth regression coefficients as well as their corresponding Newey-West (1987) three lag corrected standard errors in parentheses. *** (**) (*) indicates significance at 1% (5%) (10%) level, respectively.

VARIABLES	mktlev	$sigmaV_A$
log(Assets)	-0.016***	-0.001***
	(0.001)	(0.000)
Asset / Liabilities	0.138***	0.074***
	(0.053)	(0.003)
Net loans / Liabilities	-0.084***	-0.011***
	(0.007)	(0.001)
Loan loss provisions / Liabilities	1.950***	0.074***
	(0.133)	(0.021)
Deposits / Liabilities	-0.020***	-0.002
	(0.008)	(0.001)
Net Income / Liabilities	5.584***	0.518***
	(0.189)	(0.028)
(Net Income / Liabilities)^2	0.659*	-0.405***
	(0.345)	(0.036)
Dummy×(Net Income / Liabilities)^2	25.271***	4.137***
	(1.431)	(0.238)
Std Deviation (Net Income / Liabilities)	0.437***	0.091***
	(0.127)	(0.012)
Std Deviation (Liabilities growth)	0.127***	0.020***
	(0.019)	(0.002)
BHC dummy	0.007***	-0.000
	(0.003)	(0.000)
Central Asia & Eastern Europe dummy	-0.260***	-0.028***
	(0.012)	(0.002)
East Asia and Pacific dummy	-0.189***	-0.028***
	(0.013)	(0.002)
Japan dummy	-0.252***	-0.060***
	(0.012)	(0.002)
Latin America & Caribbean dummy	-0.214***	-0.021***
	(0.013)	(0.002)
Middle East & North Africa dummy	-0.121***	-0.004**
	(0.012)	(0.002)
North America dummy	-0.255***	-0.033***
	(0.012)	(0.002)
South Asia dummy	-0.243***	-0.025***
	(0.011)	(0.002)
Western Europe dummy	-0.221***	-0.054***
	(0.013)	(0.002)
Constant	1.650***	0.022***
	(0.067)	(0.005)
Observations	95,840	95,840
R-squared	0.638	0.462