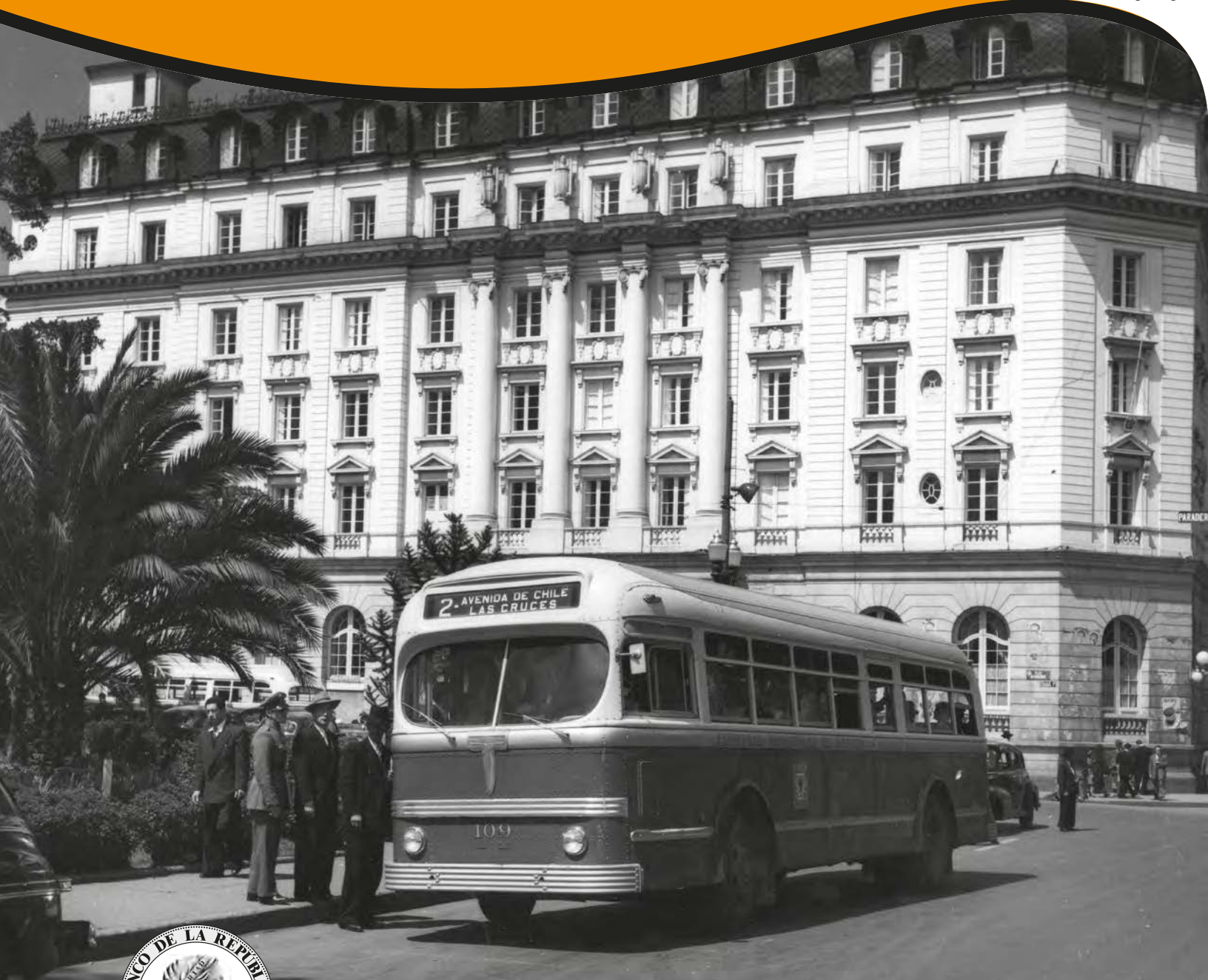


Borradores de ECONOMÍA

Does Geographical Complexity of Colombian Financial Conglomerates Increase Banks' Risk? The Role of Diversification, Regulatory Arbitrage and Funding Costs

By: Pamela Cardozo
Paola Morales-Acevedo
Andrés Murcia
Beatriz Pacheco

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Does Geographical Complexity of Colombian Financial Conglomerates Increase Banks' Risk? The Role of Diversification, Regulatory Arbitrage and Funding Costs*

Pamela Cardozo[†] Paola Morales-Acevedo[‡] Andrés Murcia[‡] Beatriz Pacheco[§]
pcardoor@banrep.gov.co amoralesacevedo@imf.org amurcipa@banrep.gov.co

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Abstract

During the last decade Colombian international financial conglomerates (IFC) expanded abroad, significantly increasing their geographical complexity. This paper analyzes the effect of this change in geographical complexity on the risk level of individual Colombian banks. We use monthly bank-level data on financial indicators and complexity measures for the period 2007- 2018. We use the Z-score as a measure of bank risk and the number of countries in which a Colombian IFC has foreign banks subsidiaries as a measure of geographical complexity. Our results suggest that complexity is associated with higher levels of individual bank risk, as a result of an expansion to countries with large GDP co-movements and lower regulatory qualities. In addition, we find that banks with access to international funding respond differently to monetary policy changes. In particular, during periods of domestic monetary policy tightening (loosening), individual banks of complex IFCs present higher (lower) levels of risk, suggesting that the monetary policy risk taking channel is affected by the level of geographical complexity.

Keywords: bank risk, geographical complexity, monetary policy.

JEL codes: E52; F65; G21; G28; G32

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** The authors are [†]Chief Officer for Monetary and International Investment Division at the Central Bank of Colombia, [‡]Financial Sector Expert at the Monetary and Capital Markets Department at the International Monetary Fund and [‡]Director of the International Affairs Unit at the Central Bank of Colombia. [§]Beatriz participated in this project when she was Advisor at the Financial Superintendence of Colombia. We are grateful to Alejandra Rosado, Mónica Rodríguez, Andrés Amaya and Nicolas Jiménez for their research assistance.

Efecto de la Complejidad Geográfica de Conglomerados Financieros en el Riesgo Bancario: papel de la diversificación, el arbitraje regulatorio y los costos de fondeo*

Pamela Cardozo[†] Paola Morales-Acevedo[‡] Andrés Murcia[‡] Beatriz Pacheco[§]
pcardoor@banrep.gov.co amoralesacevedo@imf.org amurcipa@banrep.gov.co

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Resumen

Durante la última década, los conglomerados financieros colombianos se han expandido internacionalmente aumentando significativamente su grado de complejidad geográfica. Aprovechando esta notoria expansión, este documento analiza el efecto de la complejidad geográfica de los Conglomerados Financieros Internacionales (CFI) en el nivel de riesgo de los bancos colombianos. Para el análisis, empleamos datos mensuales a nivel bancario sobre indicadores financieros y medidas de complejidad para el período 2007-2018. Utilizamos la métrica del Z-Score como una medida del riesgo bancario y el número de países en los que un CFI colombiano tiene filiales de bancos extranjeros como medida de complejidad geográfica. Nuestros resultados sugieren que una mayor complejidad geográfica está asociada con niveles más altos de riesgo bancario. Los canales por los cuales se da esta relación están asociados con unas altas correlaciones en el ciclo económico de los países a los cuales los CFI se expandieron, así como con menores niveles de calidad regulatoria en esos países. Además, encontramos que los bancos con acceso a fuentes internacionales responden de manera diferente a los cambios en la política monetaria. En particular, durante los períodos de endurecimiento (relajamiento) de la política monetaria interna, los bancos individuales de IFC más complejos presentan niveles de riesgo más altos (más bajos), lo que sugiere que el nivel de complejidad geográfica afecta el canal de toma de riesgos de la política monetaria.

Palabras clave: riesgo bancario, complejidad geográfica, política monetaria.

Códigos JEL : E52; F65; G21; G28; G32

* Este documento pertenece al Proyecto “Complexity in International Banking: Patterns and Implications for Risk” de la *International Banking Research Network* (IBRN). Este trabajo se benefició de los comentarios y sugerencias de Linda Goldberg; Claudia Buch; Bryan Hardy; Hernando Vargas y Cédric Tille.

** Los autores son [†]Subgerente Monetaria y de Inversiones Internacionales del Banco de la República, [‡]Experta en Sector Financiero del Departamento de Análisis Monetario y de Mercado de Capitales del Fondo Monetario Internacional y [‡]Director de la Unidad de Asuntos Internacionales del Banco de la República. [§] Beatriz participó en este Proyecto cuando era Asesora en la Superintendencia Financiera de Colombia. Se agradece la asistencia de Alejandra Rosado, Mónica Rodríguez, Andrés Amaya y Nicolas Jiménez.

1. Introduction

During the last decade Colombian financial conglomerates expanded abroad, significantly increasing their degree of geographical complexity. In a short period, three financial Colombian conglomerates became relevant players in the banking sectors of Panama, El Salvador, Costa Rica, Guatemala, Honduras, and Nicaragua. They absorbed the operation of local banks and of international subsidiaries of global groups, who left those countries after the Global Financial Crisis (GFC), in response to tighter international regulation or changes in internal business models.

Despite the important expansion of international financial conglomerates (IFC), in both advanced and emerging economies, there is scarce empirical research on the relationship between geographical complexity and bank risk. The literature has analyzed international and intra-national bank expansion, but results are mixed and in some sense contradictory. Some papers find that higher geographical complexity and a higher share of foreign subsidiaries increase banks' riskiness (e.g, Krause et al., 2017), and that geographically diversified Bank Holding Companies (BHCs) choose riskier loans (Demsetz and Strahan; 1997). Others find that bank risk falls as BHCs expand geographically, suggesting evidence of diversification gains through higher complexity (e.g. Goetz et al. (2016), Levine et al. (2015) and Faia et al. (2017)).

Colombia provides the right setting to study the relationship between complexity and bank risk, considering the notorious increase in geographical complexity. This paper addresses the following two questions: i) Does geographical complexity of IFCs have an effect on the level of risk of individual banks? ii) Does geographical complexity affect the sensitivity of bank risk to changes in domestic monetary policy? Answering them sheds light on the effects that complexity has on bank riskiness, helping policy makers to determine whether further regulations on IFC is needed.

The paper also attempts to identify the channels through which geographical complexity affects individual bank risk, focusing on the main channels highlighted by the literature. The first one is associated with higher asset diversification by means of an expansion into locations that have a low correlation with their business cycles (Goetz et al., 2016; Faia et al., 2017). The second one relates to the presence of regulatory arbitrage, by which BHCs expand towards countries with less strict regulation (Faia et al., 2017). The third one refers to gains in terms of lower funding costs, since the expansion of IFC allows managing liquidity on a global scale (Cetorelli et al., 2016).

We use monthly bank-level data on financial indicators and complexity measures for the period 2007-2018. The z-score is used as our measure of bank risk, in line with recent literature in banking (e.g. Altunbas et al., 2018, Krause et al., 2017). This variable is regressed on a measure of geographical complexity, defined as the number of the countries in which a Colombian IFC has foreign bank subsidiaries, together with a set of bank characteristics. Bank and time fixed effects are included to control for unobserved heterogeneity at a bank and time level.

Our results suggest that complexity is associated with higher levels of individual bank risk. In terms of the channels through which geographical complexity affects bank risk, we find that IFCs expanded to regions with highly correlated business cycles, suggesting that diversification gains were not significant. On the contrary, a large and positive correlation seems to increase the levels of individual bank risk. We also find that some IFCs exploited possible regulatory arbitrage opportunities by expanding the operations to countries with less strict regulations. Funding costs turned out to be another relevant transmission mechanism, showing that more complex entities reduced bank risk through lower funding costs and higher availability of resources. Reinforcing the funding cost mechanism, we also find that the duration of monetary policy cycles affects complex banking institutions differently. In particular we find the risk levels of complex institutions are especially affected by prolonged periods of monetary policy tightening, suggesting that the monetary policy risk taking channel depends on the level of geographical complexity. Our results survive a battery of controls and robustness tests.

This paper is divided in eight sections including this introduction. In the second, we present some related literature; in the third section we refer to the expansion of Colombian financial conglomerates in the region. In the next three sections we present the description of the data, the empirical strategy, and the main results, respectively. In the seventh section, we present some robustness checks and in the eighth section, we conclude.

2. Literature Review

Both economic theory and empirical evidence provide conflicting views on the relation between geographic complexity and bank risk. The theoretical views, portfolio theory, predicts that geographic expansion could reduce bank risk if this process is accompanied by the inclusion of assets which are imperfectly correlated with existing assets (Diamond, 1984; Boyd and Prescott, 1986). On the other hand, the literature grounded on agency-based models suggests that banks could decide to expand geographically to gain

private benefits, probably ignoring the increase in individual bank risk. Agency costs tend to increase through higher monitoring costs affecting the incentives of the banks, and, consequently their risk profiles (Berger and Ofek, 1996; Servaes, 1996). Associated costs of monitoring an international group tend to be higher, and thus it is natural to expect that processes of geographical expansions of banks could be accompanied by some deterioration in their asset quality (Brickley et al., 2003; Berger et al. 2005) and some increases in their funding costs (Jensen (1986), Jensen and Meckling (1976), and Scharfstein and Stein (2000)).

In the empirical arena, Demsetz and Strahan (1997), Chong (1991), Acharya et al. (2006), and Krause et al. (2017) find that geographically diversified bank holding companies become riskier through less capital and riskier loans. In contrast, Goetz et al. (2016), Levine et al. (2015); Faia et al. (2017), Akhigbe and Whyte (2003), and Deng and Elyasiani (2008) find that bank risk falls as BHCs expand geographically suggesting the presence of diversification gains through higher complexity. The mixed and contradictory results in the empirical literature is even more surprising considering that many papers have focused on the case of United States. This might be due to different metrics for bank risk and geographical complexity, and identification strategies.

Krause et al. (2017) use alternative variables to measure bank complexity to explain the stability of bank's Z-score and the probability of requiring state aid between 2008 and 2014 for a set of countries.¹ The authors find that a greater geographical complexity and an increase in the proportion of foreign affiliates are associated with an increase in bank risk and with a higher probability of requesting state aid. Additionally, a greater proportion of non-banking subsidiaries significantly reduces the possibility of requesting state aid, suggesting that the effects of a geographical expansion process differ depending on the type of foreign subsidiaries.

In the same vein, Acharya et al. (2006) use some other measures of risk (doubtful and nonperforming loans/assets (DOUBT), the standard deviation of DOUBT, the ratio of loan loss provisions to assets, the monthly stock return volatility) and geographical diversification measures (based on Hirschman Herfindahl type of indexes) for the Italian bank industry in the nineties to show that a higher diversification is not always an optimal strategy for a bank. The study focuses on two empirical relationships: the one between bank returns and risk and the degree of bank diversification; and the other that analyses how the entry of banks via lending into new sectors could affect their risk profile. They find that

¹ Austria, Belgium, Germany, Cyprus, Spain, Finland, France, Greece, Ireland, Italy, Malta, Netherlands, Portugal, Slovenia and Slovakia.

when a bank expands into industries with a high degree of competition or a lack of prior lending, some losses by diversification could surge. These losses are transmitted through the worsening of credit quality and therefore a reduction in bank returns. Their results suggest that diversification could reduce bank returns while producing riskier loans for high-risk banks, and that diversification for low-risk banks tends to cause an inefficient risk-return trade-off.

Goetz, Laeven and Levine (2016) is one of the papers that find that a higher geographical complexity tends to decrease bank risk. They study the United States case and obtain that geographic expansion reduces the risk when the bank holding company expands towards metropolitan areas with asynchronous economic cycles. Another paper in the same line is Levine et al. (2015). They find that in the United States geographic expansion can reduce funding costs. The authors identify that the reduction of funding costs is higher in banks headquartered in states with lower macroeconomic covariance with the overall economy. The correlation of the business cycle appears as a key factor to explain how banking complexity affects bank risk.

Other papers have highlighted the role of funding costs as a key channel to understand the link between bank risk and geographical complexity. For instance, Cetorelli and Goldberg (2012) show that U.S. global banks can smooth the effects of a tighter monetary policy rate on their lending rate by drawing on subsidiary resources. For Asia, Lee and Bowdler (2019) find a strong evidence of the hampering of monetary policy transmission to loans interest rates through bank internationalization, and weaker evidence of hampering in transmission to lending quantities. Some recent contributions on the bank risk taking literature (in the spirit of Borio and Zhu (2012)) have reported that the duration of monetary cycles affects the risk levels of banks and firms. For example, Cecchetti et.al (2018) find that the leverage ratio and other measures of firm level vulnerability increase for banks and non-banks as domestic monetary policy easing periods persists. They find similar results on foreign financial sector firms when the U.S. eases policy. Their results are consistent with the suggestion that lower funding costs reduce agency problems, prompting banks to shift into riskier assets.

Faia et al. (2017) also find a negative correlation between the foreign expansion of banks and their risk. The authors analyze European G-SIBs. Based on individual risk measures (e.g. CDS spreads, bank provisions, standard deviation of profitability and the Z-Score) and systemic risk measures (conditional capital short-fall, long-run marginal expected shortfall, ΔCoVaR computed using either CDS prices or equity prices), the authors

conclude that geographical diversification reduce individual and systemic risks. They find some evidence that expansion to countries with looser regulations affects bank's risk.

In summary, despite the presence of mixed results, the literature highlights mainly three channels through which geographical complexity might affect individual bank risk. The first one is associated with gains in terms of asset diversification by means of an expansion into locations that have a low correlation with their business cycles (Goetz et al., 2016; Faia et al., 2017). The second one relates to the presence of regulatory arbitrage, by which BHCs expand towards countries with less strict regulation (Faia et al., 2017). The third one refers to gains in terms of lower funding costs since the expansion of IFC allows managing liquidity on a global scale (Cetorelli et al., 2016).

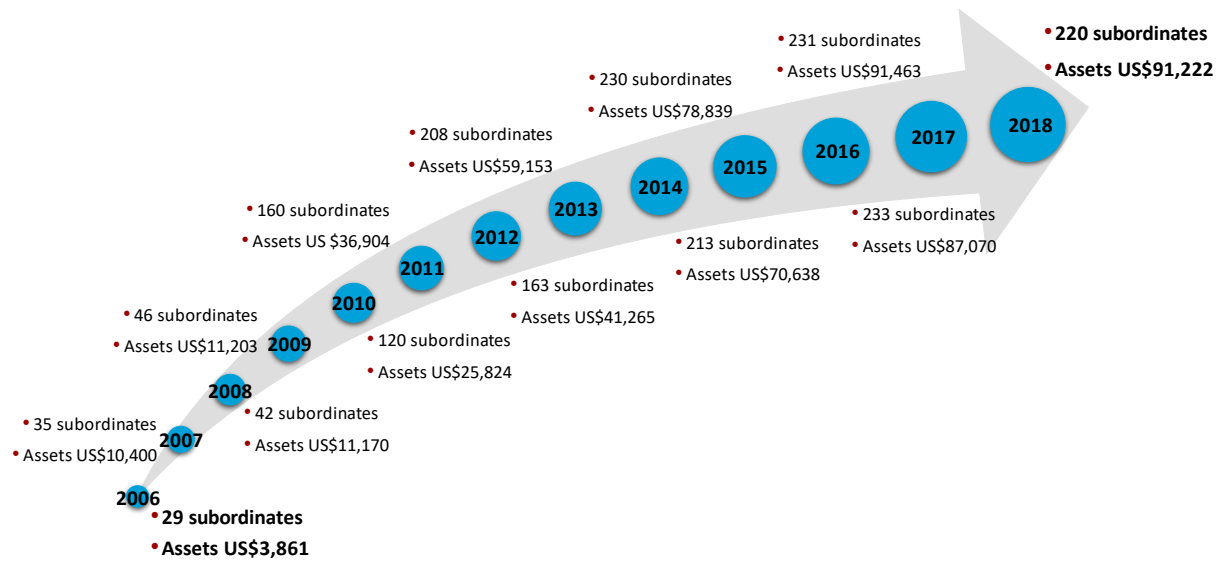
3. Geographic Complexity in Colombia

During the last decade, Colombian financial conglomerates expanded abroad, mainly to Central America, significantly increasing their geographical complexity. In 2006 these conglomerates had 29 foreign subordinates, with assets of USD 4 billion. By 2018, the number of foreign subordinates had risen to 220, with assets of USD 91 billion (Figure 1). These changes highlight the importance of the major geographical complexity over the last years. In contrast, the number of Colombian financial conglomerates' entities located in Colombia changed -1,85% during 2014-2018 (162 to 159).

Panama is the main location of foreign subordinates for the Colombian financial conglomerates, with 54 entities and a share of 27% of the total number of foreign subordinates. Panama is followed by other countries in Central America, i.e. El Salvador, Guatemala and Costa Rica, with an average of 24 entities. With smaller participations stand Mexico, Chile and Peru, with an average number of 13 entities (Figure 2).²

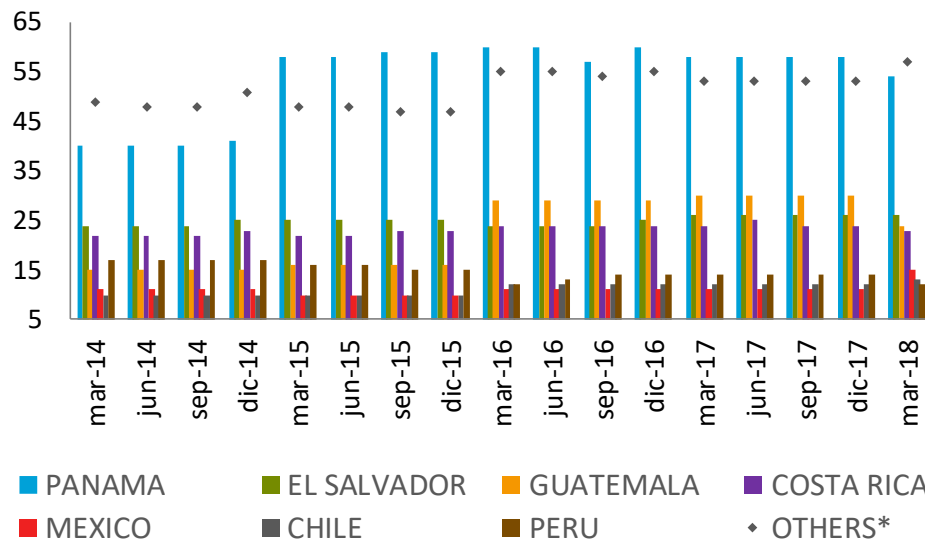
² Others refer to those countries with less than 10 foreign subordinates.

Figure 1. Foreign subordinates of Colombian financial conglomerates 2006 - 2018



Source: Financial Superintendency of Colombia. Assets correspond to the addition of individual entities' assets and expressed in USD million. Figures in 2018 until sep-18.

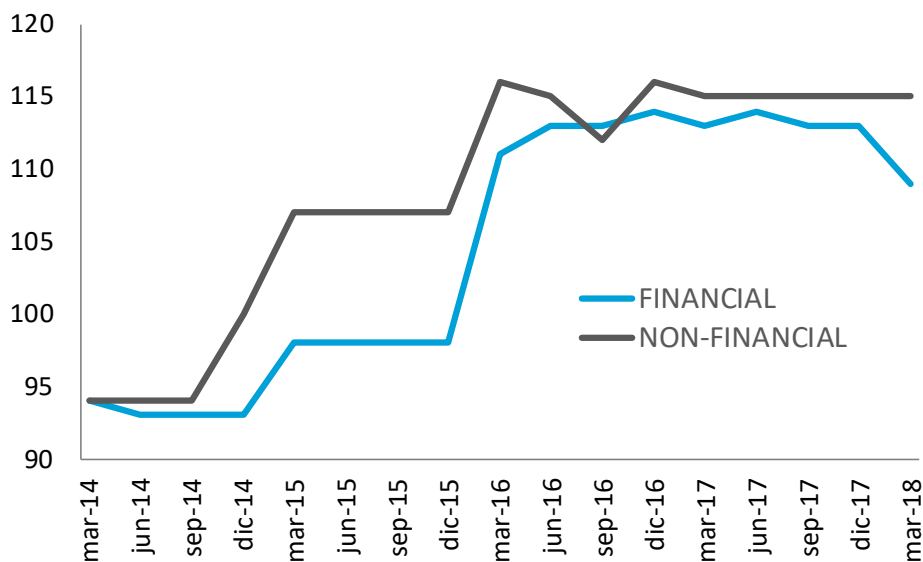
Figure 2. Number of entities located abroad by country



Source: Financial Superintendency of Colombia.

The expansion of Colombian financial conglomerates abroad began with the non-financial sector and it was rapidly followed by financial entities in order to meet their funding needs (Figure 3). In March 2018, banks represented 36% of the financial entities located abroad.

Figure 3. Number of entities located abroad by sector



Source: Financial Superintendency of Colombia.

The expansion of Colombian banks abroad is mainly concentrated in Central America (92% of assets abroad in banks) and South America (4%), in countries where Spanish is the official language (as in Colombia). The vast expansion started in 2007 with Bancolombia, the biggest bank in the country, buying Bancoagricola in El Salvador (Figure 4)³. It continued with the purchase of BAC Credomatic by Banco de Bogotá (the second largest bank in Colombia) at the end of 2010.⁴ Between 2012 and 2013 Colombian banks bought HSBC's operations in Central and South America. Davivienda, the third largest bank in Colombia, took HSBC's operations in Central America (excluding Panama). Banco de Bogotá purchased Grupo Reformador in Guatemala and BBVA in Panama. Bancolombia bought 40% of Agromercantil Group, and an additional 20% in 2015.

³ The top three positions in the ranking by assets of Colombian banks remained unchanged for at least the last 10 years.

⁴ BAC Credomatic was a Central American financial conglomerate.

Figure 4. Main foreign acquisitions by Colombian banks since 2007

ACQUIRING	DATE	ACQUISITION	COUNTRY	PRICE (USD MILLION)
BANCOLOMBIA	jun-07	Banagrícola	Salvador	900
	oct-13	HSBC Panama	Panama	2233
	oct-13	Agromercantil*	Guatemala	256
BANCO DE BOGOTÁ	dec-10	Bac Credomatic	Central America	1920
	jun-13	Grupo Financiero Reformador	Guatemala	411
	dec-13	BBVA	Panama	490
DAVIVIENDA	nov-12	HSBC	Central America (without Panama)	801
GNB SUDAMERIS	oct-13	HSBC	Peru	165
	oct-13	HSBC	Paraguay	50

*USD 216 million in 2013 and USD 40 million in 2015.

Source: Financial Superintendency of Colombia.

Several reasons might explain this wave of expansion. First, it went hand in hand with the dynamics of foreign direct investment by Colombian businesses in Central America.⁵ Second, Colombia was experiencing high economic growth rates⁶, and Colombian banks had access to funding in the external markets. Third, Colombian banks wanted to diversify markets in order to find potential for growth. Central America was appealing because its banking industry was less developed than in Colombia. With these motivations and funding, Colombian banks bought large local banks in Central America in order to become important players. The desire of Colombian banks to expand into Spanish speaking countries with high Colombian foreign investment coincided with the retrenchment of European banks, who divested their small businesses to cut costs, raise funds, and offset the impact of a prolonged economic decline in Europe.⁷ The expansion also shows some herding behaviour: the biggest Colombian bank moving first, then the second, then the third largest.

In March 2018 the assets of foreign banks were 25% of the total assets of banking entities within Colombian financial conglomerates. Nowadays, Colombian banks are big players in the banking sector of Panama, El Salvador, Costa Rica, Guatemala, Honduras, and Nicaragua (Figure 5).

⁵ From 2002 to 2013 the stock of Colombian foreign direct investment in Central America, excluding banks' investments, grew on average 20% yearly.

⁶ The GDP in Colombia expanded 6,9% yoy in 2007, following a growth of 6,7% yoy in 2006.

⁷ In 2009, BBVA Panama had to restrict its operations to only serve residents in Panama, given that Panama was considered as an offshore financial center for the OECD and that Spain considered it a tax heaven.

Figure 5. Share of Colombian Ownership in the Banking System by Geographical Location

GEOGRAPHICAL LOCATION	ASSETS OF FOREIGN BANKING SUBORDINATES	ASSETS OF THE BANKING SYSTEM	SHARE IN THE BANKING SYSTEM
PANAMA	28,654	118,151	24%
EL SALVADOR	9,346	17,554	53%
COSTA RICA	8,957	17,913	50%
GUATEMALA	6,654	41,315	16%
HONDURAS	3,613	22,297	16%
NICARAGUA	1,617	7,346	22%
PERU	1,711	110,416	2%
PARAGUAY	1,033	20,752	5%

Source: Financial Superintendency of Colombia. Assets corresponds to the addition of individual entities' assets and expressed in USD million. Data as of end of September 2018.

4. Empirical Analysis

Our empirical analysis is divided in two parts. In the first part, we analyze how geographical complexity of domestic financial conglomerates affects the risk of local banks, and explore the channels that explain this relationship. In the second part, we examine if bank risk is affected by the interaction between geographical complexity and changes in monetary policy.

4.1 Does geographical complexity of IFCs have an effect on the level of risk of individual banks?

As mentioned, the literature has found contradictory results with respect to the effect that geographical complexity has on bank risk. Therefore, we examine what is the effect in the Colombian case by estimating the following equation:

$$-\ln(Z)_{it} = \alpha_0 + \alpha_1 \text{Span_Location}_{it} + \varphi \text{BankCharacteristics}_{it-1} + \theta_i + \theta_t + \varepsilon_{it} \quad (1)$$

where $-\ln(Z)_{it}$ denotes the inverse of natural logarithm of the Z-Score⁸ for local bank i in month t . We use the z-score as the risk measure, following Altunbas, Binici and Gambacorta (2018) and other recent papers in the literature. Under this definition, variables with a positive coefficient increase bank risk. As a measure of geographical complexity we use $\text{Span_Location}_{bt}$, which denotes the number of countries in which the financial conglomerate of local bank i has foreign bank subsidiaries. A positive (negative) coefficient

⁸ The Z-Score is defined as: $Z - \widehat{\text{Score}} = \frac{\overline{ROA} + \text{Capital Asset Ratio}}{\sigma(\text{ROA})}$. As the z-score is highly skewed, we use the natural logarithm of the Z-Score.

α_1 would indicate that a larger degree of geographical complexity decreases (increases) the distance to default, or in other words, increases (decreases) bank risk. We also include a set of lagged bank characteristics as controls that include bank size (measured by the natural logarithm of total assets), the deposits to assets ratio and the loan to assets ratio. In addition, we include different combinations of time and bank fixed effects to control for any observed or unobserved heterogeneity at a time and bank level.⁹

We then proceed to analyze which channels explain the relationship between geographical complexity and bank risk. We do so by analyzing the channels highlighted by the literature: assets diversification, regulatory quality and funding costs.

4.1.1 *Diversification*

The idea behind the diversification channel is that by expanding into locations with low GDP co-movement, conglomerates might be able to reduce risk (Goetz et al., 2016; Faia et al., 2017). On the other hand, expanding to locations with high business cycle co-movement might exacerbate common risk exposures. To examine the relevance of this channel, we estimate the following model.

$$\ln(Z)_{it} = \alpha_0 + \alpha_1 \text{Span_Location}_{it} + \alpha_2 \text{Span_Location}_{it} * \text{Diversification Proxy}_{it} + \alpha_3 \text{Diversification Proxy}_{it} + \boldsymbol{\varphi} \text{BankCharacteristics}_{it} + \boldsymbol{\theta}_i + \boldsymbol{\theta}_t + \varepsilon_{it} \quad (2)$$

where the coefficient α_2 indicates if the degree of diversification contributes to explain the relationship between geographical complexity and bank risk.

4.1.2 *Regulatory Arbitrage*

The regulatory arbitrage channel refers to the tendency of banks to expand towards countries with less strict regulation, which can lead to an increase in risk. To examine the role of regulatory environments in explaining the negative impact of geographical expansion on bank risk we include an interaction term with a measure of regulatory quality, as follows:

$$-\ln(Z)_{it} = \alpha_0 + \alpha_1 \text{Span_Location}_{it} + \alpha_2 \text{Span_Location}_{it} * \text{Regulatory Quality}_{it} + \alpha_3 \text{Regulatory Quality}_{it} + \boldsymbol{\varphi} \text{BankCharacteristics}_{it} + \boldsymbol{\theta}_i + \boldsymbol{\theta}_t + \varepsilon_{it} \quad (3)$$

⁹ Throughout the paper, the reported standard errors are heteroskedasticity robust and adjusted for clustering at a bank level.

where the coefficient α_2 indicates if regulatory quality in destination countries contributes to explain the relationship between geographical complexity and bank risk.

4.1.3 Funding Costs

The funding cost channel refers to the presence of gains in terms of lower funding costs for geographically complex financial conglomerates. Since the expansion of IFC allows managing liquidity on a global scale, funds are allocated across offices in different geographic locations based on relative needs (Cetorelli and Goldberg, 2011, 2012a, 2012b). At the same time, complex IFC might have more access to external capital markets. To analyze the relevance of this channel in explaining the relationship between geographical complexity and bank risk, we include an interaction term between geographical complexity and the natural logarithm of the foreign indebtedness of bank i in time t .

$$\begin{aligned}
 -\ln(Z)_{it} = & \alpha_0 + \alpha_1 \text{Span_Location}_{it} + \alpha_2 \text{Span_Location}_{it} * \ln(\text{foreign indebtedness})_{it} \\
 & + \alpha_3 \ln(\text{foreign indebtedness})_{it} + \boldsymbol{\varphi} \text{BankCharacteristics}_{it} + \boldsymbol{\theta}_i + \boldsymbol{\theta}_t \\
 & + \varepsilon_{it}
 \end{aligned} \tag{4}$$

4.2 Does geographical complexity affect the sensitivity of bank risk to changes in domestic monetary policy?

To answer this question, we start by examining the effects of a quarterly change in the domestic monetary policy rate by estimating the following model:

$$\begin{aligned}
 -\ln(Z)_{it} = & \alpha_0 + \alpha_1 \text{Span}_{\text{Location}_{bt}} + \alpha_2 \text{Span}_{\text{Location}_{bt}} * \Delta ir_{t-3} + \alpha_3 \Delta ir_{t-3} \\
 & + \boldsymbol{\varphi} \text{BankCharacteristics}_{it} + \boldsymbol{\theta}_i + \varepsilon_{it}
 \end{aligned} \tag{5}$$

In addition, we analyze if prolonged monetary policy easing has an effect on bank risk. We follow the approach of Cecchetti et al. (2017) by adding interactions with a measure of the duration of monetary policy easing.

$$\begin{aligned}
 -\ln(Z)_{it} = & \alpha_0 + \alpha_1 \text{Span_Location}_{bt} + \alpha_2 \text{Span_Location}_{bt} * \Delta ir_{t-1} + \alpha_3 \Delta ir_{t-1} \\
 & + \alpha_4 \text{Span_Location}_{bt} * \text{Duration}_{t-1} + \alpha_5 \text{Duration}_{t-1} \\
 & + \boldsymbol{\varphi} \text{BankCharacteristics}_{it} + \boldsymbol{\theta}_i + \varepsilon_{it}
 \end{aligned} \tag{6}$$

$Duration_t$ is defined in two different ways: 1) as the number of consecutive quarters of interest rates cuts based on the nominal short-term rate (equation (7)), and 2) as the extend of consecutive drops (equation (8))¹⁰.

$$Duration_t^1 = \begin{cases} Duration_{t-1}^1 + 1 & \text{if } MA_t < MA_{t-1} \\ 0 & \text{otherwise} \end{cases} \quad (7)$$

$$\text{where } MA_t = \frac{1}{8} \sum_{\tau=1}^8 i_{t-\tau+1}$$

$$Duration_t^2 = \begin{cases} Duration_{t-1}^2 + |MA_t - MA_{t-1}| & \text{if } MA_t < MA_{t-1} \\ 0 & \text{otherwise} \end{cases} \quad (8)$$

5 Data and Descriptive Statistics

This paper uses mainly two datasets. The first one contains monthly banks' financial statements collected by the *Superintendencia Financiera de Colombia* (SFC), the supervisor of Colombia's financial system. The information covers the period between 2007 and 2018 and includes 2999 observations of 29 local banks.

The second dataset comprises unique information on the international presence of Colombian financial conglomerates, on a monthly basis for the period 2007- 2018. In particular, our measure of geographical complexity is built using the information of the location of Colombian banks' foreign subsidiaries. The dataset includes more detailed information for the period comprised between 2014 and 2018. In particular, it contains information on other types of financial and non-financial entities, and on the exact amount of assets, liabilities, equity, deposits and loan portfolio of banks' foreign subsidiaries. The first part of the dataset (from 2007 to 2013) comes from public sources, while the second part (from 2014 to 2018) comes from the SFC.

These two dataset are merged and for the local banks that do not belong to any domestic IFC our measure of geographical complexity takes the value of zero. Table 1 presents summary statistics of bank and IFC characteristics included in our regressions. $\ln(Z)_{it}$ has a mean of 4.41 with a standard deviation of 0.86. Our measure of geographical complexity has a mean value of 0.91, a minimum of zero and a maximum of 9. There is a large variation on the bank controls, with the average bank having a deposit to assets ratio of 67 percent,

¹⁰ When $Duration_t^2$ is used as a measure of duration, Δir_{t-1} is not included in the specification.

evidencing the high deposit dependency of Colombian banks, a loan to asset ratio of 70 percent and an equity ratio of 15 percent.

Finally, as macroeconomic controls we include the quarterly change in monetary policy rate and the quarterly change in the real GDP, that in the sample period averaged -0.05 percent and 0.91 percent, respectively. As additional measures of the fluctuations on the monetary policy rate we include the duration variables. During the sample period, the average period of consecutive drops (hikes) on the monetary policy interest rate was equal to 2.13 (2.91) quarters, while the accumulate drop (hike) on those periods was equivalent to 0.74 (0.60) basis points.

6 Empirical Results

6.1 *Geographical Complexity and Bank Risk*

Overall, our findings suggest that a larger geographical complexity increases bank risk and are consistent with the results in Demsetz and Strahan (1997), Chong (1991), Acharya et.al (2006) and Krause et al. (2017). Table 2 provides the regression results on the relationship between geographical complexity and bank risk (equation (1)). Columns I through IV report results of models that include $Span_Location_{bt}$ and various combination of bank and time fixed effects. In Columns V through VIII we add bank characteristics. The first two models provide a negative and non-statistically significant coefficient which would suggest the absence of an effect of geographical complexity on bank risk. However, when stronger specifications that incorporate bank fixed effects or other bank characteristics are used, we find a positive and statistically significant coefficient.

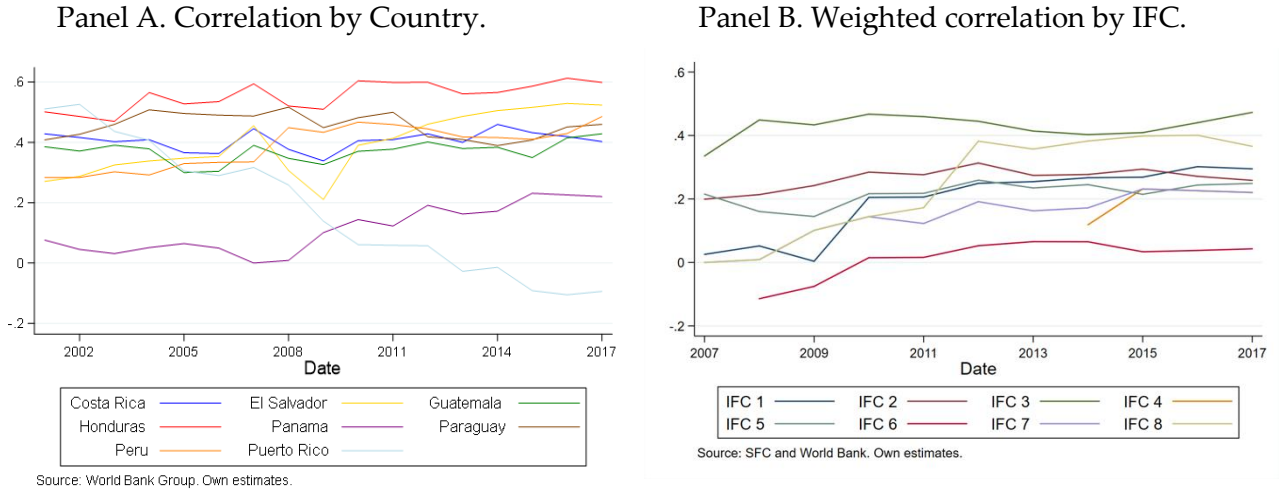
We then proceed to analyze which channels explain the negative relationship between geographical complexity and bank risk.

6.1.1 *Diversification*

To examine the relevance of this channel, we start by estimating the correlation of the Colombian business cycle with the business cycle of each of the countries, k , in which Colombian financial conglomerate have bank subsidiaries, using a rolling window of 30 years. The correlations between the Colombian business cycle and that of Honduras, Paraguay, Costa Rica, El Salvador, Guatemala and Peru seem to be relatively high as

presented in Figure 6 (Panel A)¹¹. This might be surprising at a first look, given that contrary to Colombia most of these countries are net commodity importers and variations in the oil price may affect them differently. Nonetheless, the correlations seem to reflect common exposures of Central and South America countries, e.g., a high exposure to the U.S. Therefore, we would not expect to find gains of diversifications in terms of “low” business cycle co-movement.

Figure 6. Correlation of Business Cycles with Colombia



With these individual correlations we built our first proxy for diversification, which corresponds to the weighted correlation for each financial conglomerate based on the number of bank subsidiaries they have in each country at every point in time^{12 13}, see Figure 6 (Panel B). The results from equation (2) are reported in Table 3 (Panel A) and suggest that large co-movements of business cycles increase bank risk. Indeed, when the interaction term is included the coefficient $Span_Location_{it}$ switches its sign to negative, indicating that these large business cycle co-movements are a key determinant of the positive relationship between geographical expansion and bank risk.

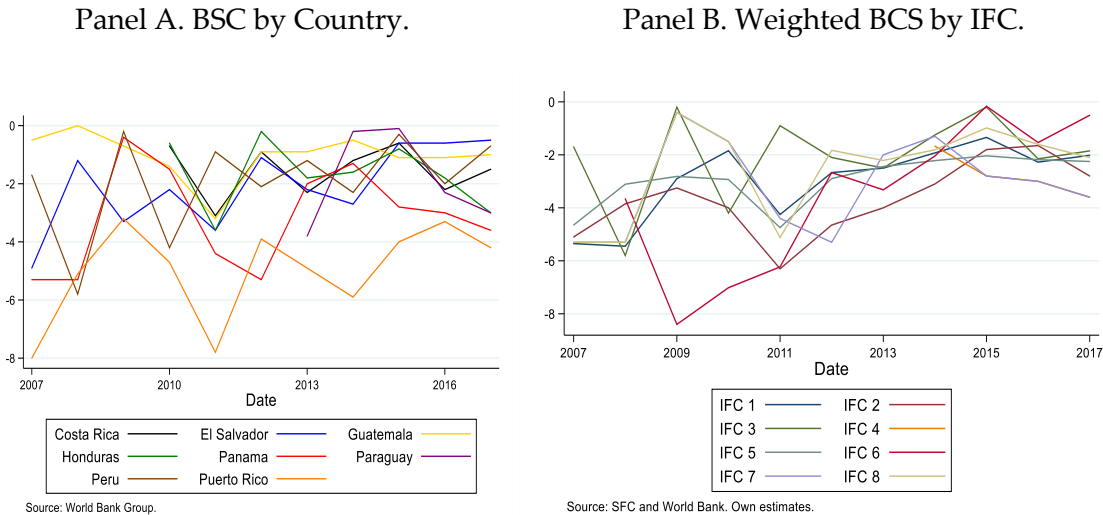
¹¹ The figure presents the business cycle correlations of the countries in which the Colombian IFCs have more presence in terms of bank subsidiaries’ assets.

¹² $Correlation\ Cycles_{it} = \frac{\sum_k Number\ of\ Subordinates_{ikt-1} * Corr_t(cycle^{COL}, cycle^k)}{Total\ Number\ of\ Subordinates_{it-1}}$.

¹³ For banks that do not belong to any of the financial conglomerates that expanded abroad, $Correlation\ Cycles_{it}$ is equal to one (i.e., there are not diversification gains). For banks that belong to a conglomerate that has bank subsidiaries in Colombia and abroad, $Correlation\ Cycles_{it}$ ponds the number of Colombian subsidiaries by one and the sum of foreign subsidiaries by the correlation with their respective countries.

As an alternative proxy for diversification we built an index based on the bilateral synchronization employed by Agrimon (2017) and Kalemli-Oskan et. al (2013). The synchronicity of business cycles is measured as the negative of the absolute difference between country k and country j's real GDP growth rates¹⁴. As it is highlighted by Agrimon (2017), a higher value of this measure (closer to zero) indicates a higher level of bilateral synchronization among countries¹⁵. This measure is preferable to the simple correlation measure, since it generates higher variability and it is not subject to the sample period (see Figure 7 (Panel A)).

Figure 7. Business Cycle Synchronization (BCS)



As it is done in Agrimon (2017), we built the index $BusinesscycleSynchronization_{it}$ as a weighted average of the bilateral synchronization indices. As before, the weights are calculated based on the number of bank subsidiaries of each IFC has in each country at every point in time¹⁶, see Figure 7 (Panel B).

Estimates for equation (2) using $BusinesscycleSynchronization_{it}$ as a proxy for diversification are reported in Table 3 (Panel B). Consistent with the results using business cycle correlation indices, we find that a higher degree of business synchronization (i.e., a

¹⁴ $\eta_{kjt} = -|\Delta Y_{kt} - \Delta Y_{jt}|$

¹⁵ Bilateral synchronization would be equal to zero for banks that do not belong to a conglomerate that has expanded abroad.

¹⁶ $BusinesscycleSynchronization_{it} = \frac{\sum_k \text{Number of Subordinates}_{ikt-1} * \eta_{COL,k,t}}{\text{Total Number of Subordinates}_{it-1}}$

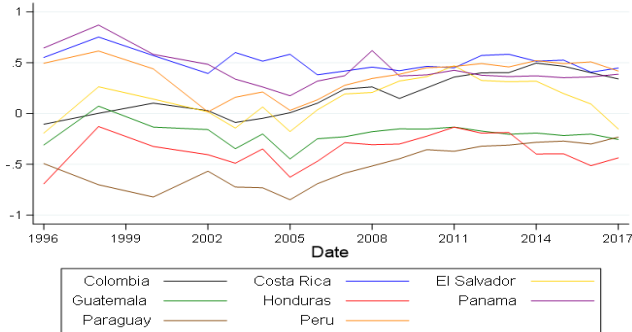
more negative level in the index) is associated with higher risk for banks that belong to a more complex conglomerate. This once again confirms that diversification plays an important role on the relationship between geographical expansion and bank risk.

6.1.2 Regulatory Arbitrage

To examine the role of the regulatory environments in explaining the negative impact of geographical expansion on bank risk we use the regulatory quality index of the World Bank, which captures perceptions on the ability of the government to formulate and implement sound policies and regulations. The regulatory quality index has been consistently lower than the Colombian one for Guatemala, Paraguay and Honduras. El Salvador, Panama and Bahamas also had some periods of lower regulatory quality during the sample period (2007-2018). On the contrary, Costa Rica, Peru, Barbados and Cayman Island tend to have higher regulatory quality index than Colombia, see Figure 8 (Panel A)¹⁷.

We built the *Regulatory Quality_{it}* index as a weighted average of the differences between the (host) countries’ regulatory qualities and Colombia’s regulatory quality. *Regulatory Quality_{it}* will be positive when the financial conglomerate is present mostly in countries with higher quality of regulation and negative when it is present mostly in countries with lower quality of regulation.¹⁸

Figure 8. Regulatory Quality Index¹⁹
Panel A. By Country.



Source: World Bank Group. Own estimates.

¹⁷ The figure presents the regulatory quality index of the countries in which Colombian IFCs have more presence in terms of bank subsidiaries’ assets.

¹⁸ $Regulatory\ Quality_{it} = \frac{\sum_{vk} Number\ of\ Subordinates_{ikt-1} * Regulatory\ Quality\ Difference_{kt}}{Total\ Number\ of\ Subordinates_{it-1}}$

The *Regulatory QualityDifference_{kt}* is positive when regulatory quality is greater in the host country than in Colombia and it is negative when it is lower.

¹⁹ Note that we exclude Bahamas, Barbados and Cayman Island from Panel A, due to their small participation in terms of assets, but take them into account for the weighted average presented in Panel B.

Results of estimating equation (3) are presented in Table 4. They suggest that the interaction between regulatory quality and geographical complexity increases the distance to default, or in other words, decreases bank risk. This implies that local banks, which belong to an IFC that expanded into countries with higher regulatory quality indexes, will experience less risk, compared to those that belong to an IFC that expanded to countries where the regulatory environment is less strict. These results contribute to explain the positive relationship between geographical complexity and bank risk.

6.1.3 Funding Costs

As mentioned, the funding cost channel refers to gains in terms of lower funding costs for geographically complex financial conglomerates. The results of equation (4) are presented in Table 5 and suggest that banks with larger amounts of foreign funding that belong to a more complex IFC are less risky (i.e., have a larger distance to default). These results would imply that the positive relationship between geographical complexity and bank risk is not explained by the foreign indebtedness of individual banks. On the contrary, banks without foreign funding that belong to a complex IFC tend to be riskier (notice that the magnitude of the coefficient of $Span_Location_{it}$ increased with respect to our main specification).

To further understand this potential channel, we evaluate if the level of foreign indebtedness of a bank depends on its degree of complexity, by estimating the following regression model:

$$\begin{aligned} \ln(\text{foreign indebtedness})_{it} &= \alpha_0 + \alpha_1 \text{Span_Location}_{it} + \boldsymbol{\varphi} \text{BankCharacteristics}_{it} + \boldsymbol{\theta}_t \\ &+ \varepsilon_{it} \end{aligned} \tag{9}$$

The results, presented in Panel A of Table 6, suggest that banks that belong to a more complex conglomerate have a higher foreign indebtedness. What is more, by estimating a similar specification using loan level data, we can confirm that complex banks receive higher loan amounts from foreign banks that belong to the same financial conglomerate (Panel B). This is consistent with the important role of internal capital markets and also of intragroup funding activities.

To evaluate the effects of local monetary policy we analyze if the level of foreign indebtedness of complex conglomerates is sensitive to changes in domestic monetary policy (Table 7. Panel A). By estimating Equation (10), we find that banks that belong to a complex conglomerate tend to increase (decrease) their foreign indebtedness when domestic monetary policy is tighten (soften). On the other hand, the interest rate charged to complex banks is higher, but it decreases (increases) when monetary policy is tightened (soften), in particular for loans granted by a foreign bank that belongs to the same conglomerate (see Table 7. Panel B). These results provide evidence that complex banks are able to get larger amounts of foreign funds, at a lower cost, especially during periods of monetary policy tightening. In other words, we find some evidence that banks can substitute domestic by external funds when the internal cost of capital increases.

$$\begin{aligned} \ln(\text{foreign indebtedness})_{it} & \\ &= \alpha_0 + \alpha_1 \text{Span_Location}_{bt} + \alpha_2 \text{Span_Location}_{bt} * \Delta ir_{t-3} + \alpha_3 \Delta ir_{t-3} \\ &+ \varepsilon_{it} \end{aligned} \quad (10)$$

6.2 Geographical Complexity and Monetary Policy²⁰

At a first look, changes in domestic monetary policy do not seem to affect banks' risk, nor have a particular effect over the banks that belong to a complex IFC, as suggested by the results presented in Table 8. However, when we incorporate the duration of monetary policy easing in the model, we find that bank risk tends to decrease during periods of monetary policy loosening, especially for banks that belong to a complex IFC. This effect also depends on the degree of geographical complexity. These results are robust to the two definitions of duration (see Table 9, Panels A and B).

We also analyze if the interaction of geographical complexity and monetary policy is symmetrical during periods of monetary policy tightening. For this, we re-define the duration variables based on consecutive periods of interest rate hikes. The results are presented in Table 10 (Panels A and B) and suggest that bank risk increases during periods of monetary policy tightening, especially for banks that belong to a complex IFC, and the effect depends on the degree of geographical complexity. The magnitude of the coefficients, however, are significantly higher with respect to the case of monetary policy loosening, indicating that the risk of banks that belong to complex IFC is more sensitive to periods of monetary policy tightening.

²⁰ The results presented in this section are robust to the different definitions of duration based on the nominal two-year and 10-year sovereign yields.

These results could be driven by the selections of borrowers of banks that belong to a more complex conglomerate. These banks might focus on more risky borrowers at home (which are expected to be more sensitive to changes in monetary policy), hoping that the diversification benefits of an expansion to other credit markets will neutralize their losses. If this is the case, we should observe a larger deterioration on the credit quality of the portfolio of more complex banks during periods of monetary policy tightening. This will also be consistent with an asymmetric effect of changes in monetary policy. To analyze if this is the case, we estimate the regression model presented in equation (11), where $Doubtful\ Loans_{it}$ is defined as the ratio of doubtful loans to total loan portfolio. This variable is regressed on our measure of geographical complexity and the duration of monetary policy tightening and easing.

$$\begin{aligned}
Doubtful\ Loans_{it} &= \alpha_0 + \alpha_1 Span_Location_{bt} + \alpha_2 Span_Location_{bt} * Duration_{t-1}^2 \\
&+ \alpha_3 Duration_{t-1}^2 + \varepsilon_{it}
\end{aligned} \tag{11}$$

The results, presented in Table 11, suggest that there is a substantial increase on the doubtful loans ratio for complex banks during periods of monetary policy tightening (Panel A). Although the increase in doubtful loans is generalized for all banks (i.e., α_3 is positive and statistically significant), the increase is higher for banks that belong to a complex IFC. On the other hand, during periods of monetary policy loosening (Panel B) there seems to be a general decrease on the doubtful loans ratio, but there is not a differential effect for the banks that belong to a complex IFC (i.e., α_2 is not statistically significant).

7 Robustness

We do two types of robustness checks. First, we present the results of the main estimations only for those Colombian financial conglomerates that absorbed the operations of international subsidiaries, who left those countries after the Global Financial Crisis (GFC), in response of tighter international regulation or changes in internal business models. The objective of these additional estimations is to evaluate a group of banks whose reasons for expansion were purely exogenous. The results are presented in Tables 12, 13 and 14. As it can be observed, the overall results remain unchanged in terms of the sign and the significance of the coefficients, while the magnitude of the coefficients increase. These results provide confidence that our results are not being driven by an endogeneity issue.

As a second robustness check, we match the group of banks that expanded abroad with banks that have similar characteristics but did not expand.²¹ We do so in order to control for possible confounding bias. The results, presented in Tables 15 to 17, are consistent with our main results, the sign and significance of the coefficients remain unaffected, while their magnitude is at times larger. This provides confidence that the effects on risks are certainly explained by the increase of bank complexity and not by other confounding factors.

8 Conclusions

Colombia represents an interesting case study to evaluate the effects of an exogenous international expansion of local financial conglomerates. Several Colombian IFC expanded to Central America and the Caribbean, as a result of the retrenchment of international subsidiaries of global groups that left those countries after the Global Financial Crisis (GFC) in response to tighter international regulation or changes in internal business models.

In this paper, we use this exogenous variation to evaluate the effect that changes in the degree of geographical complexity of Colombian IFC have had on the level of risk of domestic banks. Our findings suggest that an increase in geographical complexity is associated with an increase of individual bank risk. This positive correlation is explained mainly by two channels: i) a lower asset diversification through an expansion to locations with a high business cycle synchronization; and ii) the potential presence of regulatory arbitrage, through an expansion into countries with less strict regulatory frameworks. On the contrary, we find that those banks with more access to foreign funding, at a lower cost, exhibited a decrease on bank risk. These results are strong and survive a battery of controls and robustness tests.

Finally, this paper finds evidence that banks that belong to a more complex IFC are more sensitive to changes in local monetary policy. In particular, during periods of monetary policy tightening (loosening) these banks experience higher (lower) levels of risk. These changes on the level of individual risk seem to be associated with a more prominent risk taking from this type of institutions, which is evidenced by a larger deterioration of their loan portfolio during periods of monetary policy tightening.

²¹ We perform the matching using the percentiles of various financial indicators (e.g. capital ratio, profitability).

9 References

Acharya, V.V., I. Hasan, and A. Saunders (2006). Should banks be diversified? Evidence from individual bank loan portfolios. *The Journal of Business* 79 (3): 1355–1412.

Agrimon, I. (2017). Decentralized Multinational Banks and Risk Taking: The Spanish Experience in the Crisis. Banco de España.

Akhigbe, A. and A. M. Whyte (2003). Changes in market assessments of bank risk following the Riegle-Neal Act of 1994. *Journal of Banking & Finance* 27: 87-102.

Altunbas, Y., M. Binici and L. Gambacorta (2018) Macroprudential policy and bank risk. *Journal of International Money and Finance* 81(C): 203-220.

Berger, A., N. Miller, M. Petersen, R. Rajan and J. Stein (2005). Does function follow organizational form? Evidence from the lending practices of large and small banks. *Journal of Financial Economics* 76: 237 – 269.

Berger, P. and E. Ofek (1995). Diversification's effect on firm value. *Journal of Financial Economics* 37: 39 – 65.

Brickley, J., J. Linck, and C. Smith Jr. (2003). Boundaries of the firm: evidence from the banking industry. *Journal of Financial Economics* 70: 351 – 383.

Borio, C. and H Zhu (2012). Capital regulation, risk-taking and monetary policy: A missing link in the transmission mechanism? *Journal of Financial Stability*.

Boyd, J.H. and E .C. Prescott (1986). Financial intermediary-coalitions. *Journal of Economic Theory* 38: 211-232.

Carmassi, J. and R. Herring (2016). The Corporate Complexity of Global Systemically Important Banks. *Journal of Financial Services Research* vol. 49 nos. 2-3 (June): 175-202.

Cecchetti, S.G., T. Mancini-Griffoli, M. Narita and R. Sahay (2018). U.S. or Domestic Monetary Policy: Which Matters More for Financial Stability?

Cetorelli, N. and L.S. Goldberg (2012). Banking globalization and monetary transmission. *J. Finance* 67 (5), 1811–1843.

Cetorelli, N. and L. Goldberg (2016). Organizational Complexity and Balance Sheet Management in Global Banks. NBER Working Paper 22169. Cambridge MA.

Chong, B.S. (1991). The effects of interstate banking on commercial banks' risk and profitability. *Review of Economics and Statistics* 73: 78-84.

Demsetz, R. S., P. E. Strahan (1997). Diversification, size, and risk at bank holding companies. *Journal of Money, Credit, and Banking* 29, 300 – 313.

Deng, S. and E. Elyasiani (2008). Geographic diversification, bank holding company value, and risk. *Journal of Money, Credit and Banking* 40(6): 1217–1238.

Diamond, D (1984). Financial Intermediation and Delegated Monitoring. *Review of Economic Studies* LI: 393-414.

Faia, E., G. Ottaviano, and I. S. Arjona (2017). International Expansion and Riskiness of Banks. Centre for European Policy Research. Discussion Paper 11951. London.

Goetz, M. R., L. Laeven, and R. Levine (2016). Does the geographic expansion of banks reduce risk? *Journal of Financial Economics* 120: 346-362.

Jensen, M.C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *American Economic Review* 76: 332 – 329.

Jensen, M.C. and W.H. Meckling (1976). Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* 3: 305-360.

Kalemli-Ozcan, S., E. Papaioannou and J.L. Peydró (2013). Financial regulation, financial globalization, and the synchronization of economic activity. *Journal of Finance* 68: 1179-1228.

Krause, T., T. Sondershaus, and L. Tonzer (2017). Complexity and Bank Risk during the Financial Crisis. *Economic Letters* 150: 118-121.

Levine, R., Lin, C. and W. Xie, (2015). Geographic Diversification and Banks' Funding Costs. Mimeo.

Lee, S. and C. Bowdler (2019). Banking sector globalization and monetary policy transmission: Evidence from Asian countries. *Journal of International Money and Finance* 93: 101-116

Scharfstein, D.S. and J.C. Stein (2000). The dark side of internal capital markets: divisional rentseeking and inefficient investment. *Journal of Finance* 55: 2537-2564.

Servaes, H. (1996). The value of diversification during the conglomerate merger wave. *Journal of Finance* 51: 1201 – 1225.

Levine, R., Lin, C. and W. Xie, (2015). Geographic Diversification and Banks' Funding Costs. Mimeo.

TABLE 1. Descriptive Statistics of variables used in the regression

The table provides the definition of bank and IFC characteristics. The mean, median, standard deviation, min and max are presented for every variable.

Variables	Units	Definition	N	Mean	St. Dev	Median	Min	Max
Dependent Variable								
ln (Z)	-	Monthly natural logarithm of the Z-score.	2'999	4.41	0.86	4.50	1.70	6.56
IFC characteristic								
Span location		Number of countries in which the financial conglomerate has foreign subsidiaries.	2'999	0.91	2.02	0.00	0.00	9.00
Bank-specific characteristics								
Bank size	-	Log of total assets.	2'999	22.72	1.62	23.13	18.24	25.75
Deposits/Assets	%	Ratio of total depositos to total assets.	2'999	67.40	16.16	71.68	0.00	89.30
Loans/Assets	%	Ratio of total loans to total assets.	2'999	70.69	15.03	71.90	5.24	97.00
Macroeconomic variables								
$\Delta i(t-3)$	%	Quarterly change in the monetary policy rate.	2'999	-0.05	0.00	0.69	-3.00	1.00
Gdp growth (t-3)	%	Quarterly change in the real GDP.	2'999	0.91	0.85	0.89	-2.67	2.43

TABLE 2. Effect of Geographical Complexity on Bank Risk

The table reports regression results from specification (1). The dependent variable is the inverse of natural logarithm of the Z-Score. Columns (I-IV) report results of a model that includes Span Location (the number of countries in which the bank subsidiaries of the conglomerate are active), as a measure of geographical complexity and different combinations of bank and time fixed effects. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in Table 1. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable	-ln (Z Score)							
	I	II	III	IV	V	VI	VII	VIII
Models								
Geographical Complexity								
Span_location_b	-0.043 (0.035)	-0.039 (0.038)	0.070** (0.026)	0.109*** (0.032)	0.064 (0.040)	0.068 (0.046)	0.117*** (0.028)	0.110*** (0.032)
Bank Characteristics								
Bank size (t-1)					-0.270** (0.108)	-0.263** (0.116)	-0.330* (0.185)	-0.198 (0.226)
Deposits/Assets (t-1)					0.944 (0.803)	0.709 (0.853)	-0.204 (0.410)	-0.997** (0.460)
Loans/Assets (t-1)					-1.704*** (0.547)	-1.523** (0.570)	0.204 (0.507)	-0.320 (0.578)
Observations	2,861	2,861	2,861	2,861	2,861	2,861	2,861	2,861
Adjusted R-squared	0.009	0.018	0.516	0.544	0.162	0.168	0.528	0.551
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Bank FE	No	No	Yes	Yes	No	No	Yes	Yes
Time FE	No	Yes	No	Yes	No	Yes	No	Yes

TABLE 3. Geographical Complexity & Diversification

The table reports regression results from specification (2). The dependent variable is the inverse of the natural logarithm of the Z-Score. Columns (I-IV) report results of a model that includes Span Location as a measure of geographical complexity, the diversification proxy; and the interaction between the two variables. Different combination of bank and time fixed effects are also included. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in Table 1. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Panel A. Measure of diversification: weighted business cycle correlation for the conglomerate.

Dependent Variable	-ln (Z Score)							
Models	I	II	III	IV	V	VI	VII	VIII
Geographical Complexity & Diversification								
Span_location_b	-0.085 (0.108)	-0.068 (0.117)	-0.205* (0.104)	-0.146 (0.108)	0.020 (0.183)	0.051 (0.183)	-0.294** (0.118)	-0.199* (0.111)
Weighted Correlation (l.gdp)*Span_location_b	0.162 (0.317)	0.132 (0.336)	0.840*** (0.296)	0.765** (0.315)	0.051 (0.521)	-0.037 (0.523)	1.179*** (0.363)	0.931** (0.341)
Weighted Correlation (l.gdp)	0.033 (0.361)	0.080 (0.392)	-0.247 (0.216)	-0.284 (0.290)	-0.375 (0.388)	-0.352 (0.394)	-0.517 (0.432)	-0.540 (0.418)
Bank Characteristics								
Bank size (t-1)					-0.292** (0.115)	-0.289** (0.120)	-0.368* (0.201)	-0.391 (0.232)
Deposits/Assets (t-1)					0.837 (0.824)	0.777 (0.851)	-0.435 (0.445)	-0.864* (0.484)
Loans/Assets (t-1)					-1.747*** (0.556)	-1.770*** (0.530)	0.329 (0.648)	-0.085 (0.640)
Observations	2,634	2,634	2,634	2,634	2,634	2,634	2,634	2,634
Adjusted R-squared	0.008	-0.013	0.547	0.549	0.174	0.156	0.558	0.557
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Bank FE	No	No	Yes	Yes	No	No	Yes	Yes
Time FE	No	Yes	No	Yes	No	Yes	No	Yes

Panel A. Measure of diversification: weighted business cycle synchronization for the conglomerate.

Dependent Variable	-ln (Z Score)							
Models	I	II	III	IV	V	VI	VII	VIII
Geographical Complexity & Diversification								
Span_location_b	0.067 (0.063)	0.101 (0.070)	0.231*** (0.039)	0.255*** (0.050)	0.188** (0.080)	0.207** (0.089)	0.275*** (0.054)	0.264*** (0.058)
Business Cycle Synchronization *Span_location_b	0.047* (0.023)	0.057* (0.028)	0.055** (0.022)	0.056** (0.022)	0.062* (0.035)	0.069* (0.038)	0.064** (0.023)	0.058** (0.023)
Business Cycle Synchronization	-0.023 (0.070)	-0.012 (0.078)	-0.101** (0.046)	-0.094* (0.051)	-0.093 (0.082)	-0.089 (0.088)	-0.101* (0.050)	-0.099* (0.054)
Bank Characteristics								
Bank size (t-1)					-0.284** (0.114)	-0.280** (0.119)	-0.252 (0.191)	-0.302 (0.231)
Deposits/Assets (t-1)					0.826 (0.824)	0.743 (0.855)	-0.262 (0.456)	-0.823 (0.508)
Loans/Assets (t-1)					-1.658** (0.614)	-1.564** (0.639)	0.093 (0.757)	-0.382 (0.711)
Observations	2,634	2,634	2,634	2,634	2,634	2,634	2,634	2,634
Adjusted R-squared	0.015	0.001	0.541	0.547	0.179	0.162	0.547	0.554
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Bank FE	No	No	Yes	Yes	No	No	Yes	Yes
Time FE	No	Yes	No	Yes	No	Yes	No	Yes

TABLE 4. Geographical Complexity & Regulatory Quality

The table reports regression results from specification (3). The dependent variable is the inverse of the natural logarithm of the Z-Score. Columns (I-IV) report results of a model that includes Span Location as a measure of geographical complexity, the weighted regulatory quality of the conglomerate and the interaction between the two variables. Different combinations of bank and time fixed effects are also included. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in Table 1. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable	-ln (Z Score)							
Models	I	II	III	IV	V	VI	VII	VIII
Geographical Complexity & Regulatory Quality								
Span_location_b	-0.064** (0.030)	-0.065* (0.032)	0.066** (0.029)	0.085** (0.037)	0.045 (0.051)	0.045 (0.054)	0.075** (0.034)	0.088** (0.037)
Regulatory quality*Span_location_b	-0.523*** (0.099)	-0.588*** (0.131)	-0.388*** (0.104)	-0.372*** (0.119)	-0.457*** (0.101)	-0.474*** (0.119)	-0.392*** (0.104)	-0.349*** (0.123)
Regulatory quality	0.788* (0.407)	0.720 (0.510)	0.591 (0.585)	0.431 (0.665)	1.146** (0.455)	1.147** (0.501)	0.249 (0.645)	0.324 (0.705)
Bank Characteristics								
Bank size (t-1)					-0.267** (0.114)	-0.264** (0.119)	-0.309 (0.262)	-0.278 (0.297)
Deposits/Assets (t-1)					0.766 (0.824)	0.695 (0.856)	-0.279 (0.449)	-0.798 (0.516)
Loans/Assets (t-1)					-1.754*** (0.543)	-1.699*** (0.537)	0.121 (0.732)	-0.326 (0.707)
Observations	2,634	2,634	2,634	2,634	2,634	2,634	2,634	2,634
Adjusted R-squared	0.035	0.024	0.543	0.550	0.190	0.174	0.551	0.555
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Bank FE	No	No	Yes	Yes	No	No	Yes	Yes
Time FE	No	Yes	No	Yes	No	Yes	No	Yes

TABLE 5. Geographical Complexity & Access to Foreign Funding

The table reports regression results from specification (4). The dependent variable is the inverse of the natural logarithm of the Z-Score. Columns (I-IV) report results of a model that includes Span Location as a measure of geographical complexity, the foreign funding of the bank and the interaction between the two variables. Different combination of bank and time fixed effects are also included. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in the Table 1. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable	-ln (Z Score)							
	I	II	III	IV	V	VI	VII	VIII
Geographical Complexity & Foreign Funding								
Span_location_b	0.071 (0.050)	0.074 (0.051)	0.181*** (0.044)	0.215*** (0.048)	0.221*** (0.062)	0.206*** (0.060)	0.226*** (0.046)	0.214*** (0.048)
ln(foreign indebtedness)*Span_location_b	-0.011*** (0.004)	-0.010*** (0.003)	-0.011*** (0.002)	-0.010*** (0.002)	-0.015*** (0.004)	-0.014*** (0.003)	-0.010*** (0.003)	-0.010*** (0.003)
ln(foreign indebtedness)	0.011 (0.019)	0.001 (0.020)	0.014 (0.011)	0.019 (0.014)	0.031 (0.019)	0.030 (0.020)	0.004 (0.013)	0.017 (0.014)
Bank size (t-1)					-0.316** (0.119)	-0.309** (0.126)	-0.367* (0.190)	-0.201 (0.231)
Deposits/Assets (t-1)					0.833 (0.770)	0.638 (0.828)	-0.183 (0.409)	-0.909* (0.446)
Loans/Assets (t-1)					-1.477** (0.594)	-1.375** (0.624)	0.133 (0.499)	-0.292 (0.573)
Observations	2,861	2,861	2,861	2,861	2,861	2,861	2,861	2,861
Adjusted R-squared	0.029	0.034	0.530	0.556	0.204	0.204	0.545	0.562
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Bank FE	No	No	Yes	Yes	No	No	Yes	Yes
Time FE	No	Yes	No	Yes	No	Yes	No	Yes

**TABLE 6. Geographical Complexity & Access to Foreign Funding
(Bank Level Data)**

Panel A.

The table reports regression results from specification (9). The dependent variable is the inverse of the natural logarithm of the foreign indebtedness of bank *i* in time *t*. Column II and IV include time fixed effects and Columns (III-IV) add bank characteristics. Definitions of the variables can be found in the Table 3. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable	ln(foreign indebtedness)			
Models	I	II	III	IV
Geographical Complexity & Monetary Policy				
Span_location_b	1.449*** (0.368)	1.499*** (0.339)	0.656* (0.383)	0.751** (0.336)
Bank Characteristics				
Bank size (t-1)			1.444*** (0.391)	1.358*** (0.356)
Deposits/Assets (t-1)			3.000 (2.090)	3.759* (2.105)
Loans/Assets (t-1)			-7.732* (3.881)	-4.090 (4.025)
Observations	2,861	2,861	2,861	2,861
Adjusted R-squared	0.198	0.381	0.391	0.538
Cluster	Bank	Bank	Bank	Bank
Bank FE	No	No	No	No
Time FE	No	Yes	No	Yes

**TABLE 6. Geographical Complexity & Access to Foreign Funding
(Bank Level Data)**

Panel B.

The table reports regression results from specifications (9) estimated using loan-level data. The dependent variable is the monthly change in the natural logarithm of the foreign indebtedness of bank *i* with foreign bank *j* in time *t*. Columns (I-IV) report results of a model that includes Span Location, an indicator variable that takes the value of one if the loan was granted by a foreign bank that belongs to the same financial conglomerate as the bank receiving the loan; and the interaction between these two components of foreign funding and Span Location. Different combination of lender and time fixed effects are also included. Definitions of the variables can be found in the Table 3. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable	ln(foreign indebtedness)					
	I	II	III	IV	V	VI
Geographical Complexity & Monetary Policy						
Span_location_b	0.008*	0.008*	0.008**	0.007*	0.007*	0.007**
	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)
Same Conglomerate * Span_location_b				0.016	0.115***	0.149***
				(0.011)	(0.040)	(0.045)
Same Conglomerate				-0.021	-0.069	-0.064
				(0.026)	(0.055)	(0.098)
Observations	11,355	11,339	7,198	11,355	11,339	7,198
Adjusted R-squared	0.000	0.036	0.342	0.000	0.036	0.342
Cluster	Bank	Bank	Bank	Bank	Bank	Bank
Lender FE	NO	YES	NO	NO	YES	NO
Time FE	NO	YES	NO	NO	YES	NO
Lender X Time FE	NO	NO	YES	NO	NO	YES

TABLE 7. Geographical Complexity & Access to Foreign Funding

Panel A.

The table reports regression results from specification (10). The dependent variable is the natural logarithm of the foreign indebtedness of bank *i* in time *t*. Columns (I-IV) report results of a model that includes Span Location, the quarterly change in the monetary policy rate; and the interaction between the two variables. Different combination of bank and time fixed effects are also included. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in the Table 3. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable	ln(foreign indebtedness)			
	V	VI	VII	VIII
Geographical Complexity & Monetary Policy				
Span_location_b	1.449*** (0.383)	1.503*** (0.350)	0.653 (0.398)	0.752** (0.345)
$\Delta i(t-3)*Span_location_b$	56.926*** (12.156)	51.133*** (11.380)	58.135*** (12.863)	53.496*** (10.806)
$\Delta i(t-3)$	38.145 (28.420)		48.759* (26.665)	
Bank Characteristics				
Bank size (t-1)			1.445*** (0.395)	1.366*** (0.356)
Deposits/Assets (t-1)			3.166 (2.134)	3.786* (2.117)
Loans/Assets (t-1)			-7.821* (3.905)	-3.962 (4.023)
Observations	2,861	2,861	2,861	2,861
Adjusted R-squared	0.218	0.391	0.415	0.549
Cluster	Bank	Bank	Bank	Bank
Bank FE	No	No	No	No
Date FE	No	Yes	No	Yes

TABLE 7. Geographical Complexity & Access to Foreign Funding

Panel B.

The table reports regression results from specifications (10) estimated using loan-level data. The dependent variable is the interest rate of the loans of bank i with foreign bank j in time t . Columns (I-IV) report results of a model that includes Span Location, the quarterly change of the domestic interest rate, an indicator variable that takes the value of one if the loan was granted by a foreign bank that belongs to the same financial conglomerate as the bank receiving the loan; and the interaction between these variables. Different combination of lender and time fixed effects are also included. Definitions of the variables can be found in the Table 1. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable	Interest Rate Foreign Indebtedness					
	I	II	III	IV	V	VI
Geographical Complexity & Monetary Policy						
Span_location_b	0.421 (0.349)	0.792* (0.389)	0.922** (0.437)	0.892** (0.354)	1.067*** (0.362)	-0.160 (0.421)
$\Delta i(t-3)*Span_location_b$				-0.520* (0.264)	-0.720* (0.401)	-0.720* (0.401)
$\Delta i(t-3)*Span_location_b*Same\ Conglomerate$						-6.491* (3.523)
$\Delta i(t-3)*Same\ Conglomerate$						1.567 (0.980)
Observations	11,355	11,339	7,198	11,339	7,198	7,198
Adjusted R-squared	0.021	0.270	0.336	0.277	0.349	0.350
Cluster	Bank	Bank	Bank	Bank	Bank	Bank
Lender FE	NO	YES	NO	YES	NO	NO
Time FE	NO	YES	NO	YES	NO	NO
Lender X Time FE	NO	NO	YES	NO	YES	YES

TABLE 8. Geographical Complexity & Monetary Policy

The table reports regression results from specification (5). The dependent variable is the natural logarithm of the Z-Score. Columns (I-IV) report results of a model that includes Span Location, the quarterly change in the monetary policy rate; and the interaction between the two variables. Different combination of bank and time fixed effects are also included. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in the Table 1. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable	ln (Z Score)							
	I	II	III	IV	V	VI	VII	VIII
Geographical Complexity & Monetary Policy								
Span_location_b	-0.048 (0.029)	-0.046 (0.032)	0.028** (0.011)	0.067*** (0.021)	0.079** (0.037)	0.078* (0.040)	0.061*** (0.020)	0.070*** (0.019)
$\Delta i(t-3)*Span_location_b$	0.793 (1.049)	0.957 (1.070)	-0.014 (1.170)	-0.088 (1.177)	0.135 (1.275)	0.209 (1.277)	0.056 (1.283)	-0.283 (1.202)
$\Delta i(t-3)$	2.437 (4.827)		3.814 (4.911)		2.906 (4.967)		3.384 (4.813)	
Bank Characteristics								
Bank size (t-1)					-0.315*** (0.106)	-0.304** (0.113)	-0.245 (0.178)	-0.127 (0.232)
Deposits/Assets (t-1)					-0.304 (0.656)	-0.502 (0.732)	-0.519 (0.376)	-1.187** (0.484)
Loans/Assets (t-1)					-1.439** (0.540)	-1.325** (0.570)	0.046 (0.507)	-0.375 (0.553)
Equity/Assets (t-1)					-3.844** (1.685)	-3.662* (1.882)	-1.257 (1.326)	0.153 (1.652)
Observations	2,860	2,860	2,860	2,860	2,860	2,860	2,860	2,860
Adjusted R-squared	0.013	0.024	0.512	0.537	0.198	0.198	0.521	0.545
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Bank FE	No	No	Yes	Yes	No	No	Yes	Yes
Date FE	No	Yes	No	Yes	No	Yes	No	Yes

TABLE 9. Geographical Complexity & Duration of Monetary Policy Loosening

Panel A. Duration 1

The table reports regression results from specification (6). The dependent variable is the natural logarithm of the Z-Score. Columns (I-IV) report results of a model that includes Span Location, the quarterly change in the monetary policy rate, the duration of monetary policy easing (using the definition of Duration 1); and the interaction between the last two variables and Span Location. Different combination of bank and time fixed effects are also included. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in the Table 0. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable	ln (Z Score)							
	I	II	III	IV	V	VI	VII	VIII
Geographical Complexity & Duration of Monetary Policy								
Span_location_b	-0.022 (0.028)	-0.020 (0.031)	0.051*** (0.011)	0.090*** (0.022)	0.112** (0.042)	0.111** (0.045)	0.089*** (0.022)	0.095*** (0.022)
$\Delta i(t-3)*Span_location_b$	2.469** (1.147)	2.602** (1.164)	1.335 (1.193)	1.280 (1.221)	2.072 (1.297)	2.123 (1.303)	1.589 (1.376)	1.062 (1.290)
Duration 1*Span_location_b	-0.012*** (0.002)	-0.011*** (0.003)	-0.009*** (0.002)	-0.010*** (0.002)	-0.013*** (0.003)	-0.013*** (0.003)	-0.011*** (0.002)	-0.009*** (0.003)
$\Delta i(t-3)$	-1.677 (4.634)		1.513 (4.786)		-0.156 (4.635)		1.713 (4.604)	
Duration 1	0.030** (0.012)		0.016* (0.009)		0.022* (0.012)		0.012 (0.009)	
Bank Characteristics								
Bank size (t-1)					-0.320*** (0.105)	-0.309** (0.112)	-0.262 (0.182)	-0.164 (0.240)
Deposits/Assets (t-1)					-0.277 (0.666)	-0.483 (0.736)	-0.466 (0.397)	-1.145** (0.481)
Loans/Assets (t-1)					-1.403** (0.543)	-1.308** (0.570)	0.074 (0.502)	-0.350 (0.540)
Equity/Assets (t-1)					-3.843** (1.668)	-3.682* (1.870)	-1.453 (1.296)	-0.122 (1.638)
Observations	2,860	2,860	2,860	2,860	2,860	2,860	2,860	2,860
Adjusted R-squared	0.023	0.030	0.517	0.542	0.208	0.207	0.526	0.549
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Bank FE	No	No	Yes	Yes	No	No	Yes	Yes
Date FE	No	Yes	No	Yes	No	Yes	No	Yes

**TABLE 9. Geographical Complexity & Duration of Monetary Policy
Loosening**

Panel B. Duration 2

The table reports regression results from specification (6). The dependent variable is the natural logarithm of the Z-Score. Columns (I-IV) report results of a model that includes Span Location, the duration of monetary policy easing (using the definition of Duration 2); and the interaction between these two variables. Different combination of bank and time fixed effects are also included. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in the Table 1. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable	ln (Z Score)							
Models	I	II	III	IV	V	VI	VII	VIII
Geographical Complexity & Duration of Monetary Policy								
Span_location_b	-0.030 (0.027)	-0.028 (0.030)	0.046*** (0.011)	0.086*** (0.022)	0.103** (0.041)	0.102** (0.044)	0.086*** (0.022)	0.090*** (0.023)
Duration 2*Span_location_b	-2.091*** (0.752)	-2.137*** (0.746)	-1.675*** (0.569)	-1.803*** (0.583)	-2.422*** (0.727)	-2.473*** (0.761)	-1.883*** (0.655)	-1.687** (0.644)
Duration 2	4.302 (3.087)		0.815 (2.142)		1.941 (2.854)		-0.679 (2.164)	
Bank Characteristics								
Bank size (t-1)					-0.321*** (0.105)	-0.309** (0.112)	-0.282 (0.178)	-0.160 (0.241)
Deposits/Assets (t-1)					-0.297 (0.675)	-0.467 (0.736)	-0.666 (0.438)	-1.128** (0.476)
Loans/Assets (t-1)					-1.419** (0.544)	-1.308** (0.571)	0.029 (0.499)	-0.332 (0.536)
Equity/Assets (t-1)					-3.877** (1.669)	-3.658* (1.859)	-1.499 (1.301)	-0.086 (1.642)
Observations	2,860	2,860	2,860	2,860	2,860	2,860	2,860	2,860
Adjusted R-squared	0.020	0.030	0.516	0.542	0.206	0.207	0.527	0.549
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Bank FE	No	No	Yes	Yes	No	No	Yes	Yes
Date FE	No	Yes	No	Yes	No	Yes	No	Yes

TABLE 10. Geographical Complexity & Duration of Monetary Policy Tightening

Panel A. Duration 1

The table reports regression results from specification (6). The dependent variable is the natural logarithm of the Z-Score. Columns (I-IV) report results of a model that includes Span Location, the quarterly change in the monetary policy rate, the duration of monetary policy tightening (adapting the definition of Duration 1); and the interaction between the last two variables and Span Location. Different combination of bank and time fixed effects are also included. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in the Table 1. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable	ln (Z Score)							
	I	II	III	IV	V	VI	VII	VIII
Geographical Complexity & Duration of Monetary Policy								
Span_location_b	-0.108*** (0.030)	-0.109*** (0.033)	-0.024 (0.019)	0.014 (0.023)	0.016 (0.035)	0.014 (0.036)	0.012 (0.017)	0.025 (0.020)
$\Delta i(t-3)*Span_location_b$	5.904*** (1.714)	6.330*** (2.003)	4.568*** (1.530)	4.698*** (1.620)	6.015*** (1.579)	6.222*** (1.817)	5.336*** (1.705)	4.567*** (1.645)
Duration 1*Span_location_b	0.021*** (0.004)	0.022*** (0.005)	0.019*** (0.004)	0.020*** (0.004)	0.024*** (0.005)	0.025*** (0.005)	0.022*** (0.004)	0.020*** (0.004)
$\Delta i(t-3)$	-2.938 (5.360)		1.132 (4.830)		-1.902 (4.898)		1.694 (4.591)	
Duration 1	-0.024 (0.016)		-0.011 (0.011)		-0.021 (0.016)		-0.007 (0.012)	
Bank Characteristics								
Bank size (t-1)					-0.329*** (0.104)	-0.317*** (0.111)	-0.336* (0.189)	-0.238 (0.253)
Deposits/Assets (t-1)					-0.242 (0.657)	-0.443 (0.740)	-0.377 (0.372)	-1.006** (0.480)
Loans/Assets (t-1)					-1.412** (0.545)	-1.272** (0.568)	-0.009 (0.473)	-0.299 (0.530)
Equity/Assets (t-1)					-3.894** (1.685)	-3.704* (1.868)	-1.550 (1.255)	-0.612 (1.599)
Observations	2,860	2,860	2,860	2,860	2,860	2,860	2,860	2,860
Adjusted R-squared	0.013	0.024	0.512	0.537	0.198	0.198	0.521	0.545
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Bank FE	No	No	Yes	Yes	No	No	Yes	Yes
Date FE	No	Yes	No	Yes	No	Yes	No	Yes

TABLE 10. Geographical Complexity & Duration of Monetary Policy Tightening

Panel B. Duration 2

The table reports regression results from specification (6). The dependent variable is the natural logarithm of the Z-Score. Columns (I-IV) report results of a model that includes Span Location, the duration of monetary policy tightening (adapting the definition of Duration 2); and the interaction between these two variables. Different combination of bank and time fixed effects are also included. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in the Table 1. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable	ln (Z Score)							
	I	II	III	IV	V	VI	VII	VIII
Geographical Complexity & Duration of Monetary Policy								
Span_location_b	-0.084*** (0.029)	-0.084** (0.032)	0.002 (0.013)	0.038* (0.022)	0.039 (0.036)	0.038 (0.037)	0.038** (0.018)	0.046** (0.019)
Duration 2*Span_location	6.479*** (1.878)	6.662*** (1.954)	6.427*** (1.986)	6.634*** (2.044)	7.909*** (2.282)	7.910*** (2.355)	7.051*** (2.109)	6.513*** (2.069)
Duration 2	-5.688 (5.661)		-3.176 (4.972)		-5.670 (6.167)		-2.625 (5.089)	
Bank Characteristics								
Bank size (t-1)					-0.325*** (0.104)	-0.314*** (0.112)	-0.291 (0.181)	-0.187 (0.240)
Deposits/Assets (t-1)					-0.279 (0.655)	-0.451 (0.734)	-0.542 (0.382)	-1.095** (0.477)
Loans/Assets (t-1)					-1.440** (0.544)	-1.322** (0.572)	0.009 (0.470)	-0.352 (0.531)
Equity/Assets (t-1)					-3.899** (1.682)	-3.694* (1.871)	-1.487 (1.258)	-0.339 (1.550)
Observations	2,860	2,860	2,860	2,860	2,860	2,860	2,860	2,860
Adjusted R-squared	0.026	0.038	0.525	0.552	0.218	0.219	0.537	0.559
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Bank FE	No	No	Yes	Yes	No	No	Yes	Yes
Date FE	No	Yes	No	Yes	No	Yes	No	Yes

TABLE 11. Doubtful Loans. Geographical Complexity & Duration of Monetary Policy

Panel A. Monetary Policy Tightening

The table reports regression results from specification (6). The dependent variable is the ratio of doubtful loans over the total loan portfolio. Columns (I-IV) report results of a model that includes Span Location, the duration of monetary policy tightening (adapting the definition of Duration 2); and the interaction between these two variables. Different combination of bank and time fixed effects are also included. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in the Table 1. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable	Doubtful Loans							
	I	II	III	IV	V	VI	VII	VIII
Geographical Complexity & Duration of Monetary Policy								
Span_location_b	-0.146 (0.136)	-0.124 (0.144)	-0.262 (0.177)	-0.144 (0.188)	0.041 (0.307)	0.080 (0.311)	-0.190 (0.213)	-0.042 (0.177)
Duration 2*Span_location_b	10.246** (4.722)	9.156* (4.747)	11.255** (5.042)	10.018** (4.584)	11.967* (6.108)	11.078* (6.037)	13.624** (5.325)	13.328** (5.454)
Duration 2	59.937*** (20.437)		57.826*** (20.321)		56.563*** (16.973)		48.501** (17.954)	
Bank Characteristics								
Bank size (t-1)					-0.423 (0.827)	-0.448 (0.846)	-0.374 (0.943)	-1.087 (2.819)
Deposits/Assets (t-1)					-1.082 (5.427)	-1.854 (5.754)	6.610** (3.208)	5.245** (2.207)
Loans/Assets (t-1)					1.694 (4.975)	1.910 (5.812)	0.102 (3.010)	0.904 (3.345)
Equity/Assets (t-1)					-8.737 (8.379)	-10.277 (9.463)	-5.409** (2.469)	-7.779 (4.666)
Observations	2,995	2,995	2,995	2,995	2,989	2,989	2,989	2,989
Adjusted R-squared	0.022	0.011	0.592	0.610	0.049	0.046	0.628	0.645
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Bank FE	No	No	Yes	Yes	No	No	Yes	Yes
Date FE	No	Yes	No	Yes	No	Yes	No	Yes

TABLE 11. Doubtful Loans. Geographical Complexity & Duration of Monetary Policy

Panel B. Monetary Policy Loosening

The table reports regression results from specification (11). The dependent variable is the ratio of doubtful loans over the total loan portfolio. Columns (I-IV) report results of a model that includes Span Location, the duration of monetary policy easing (using the definition of Duration 2); and the interaction between these two variables. Different combination of bank and time fixed effects are also included. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in the Table 0. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable	Doubtful Loans							
	I	II	III	IV	V	VI	VII	VIII
Geographical Complexity & Duration of Monetary Policy								
Span_location_b	0.117 (0.131)	0.096 (0.142)	0.239 (0.152)	0.129 (0.183)	-0.083 (0.342)	-0.119 (0.350)	0.149 (0.182)	-0.000 (0.155)
Duration 2*Span_location_b	-3.302 (2.652)	-2.657 (2.851)	-3.127 (2.246)	-2.581 (2.748)	-2.591 (2.484)	-1.917 (2.778)	-1.618 (1.846)	-0.904 (1.857)
Duration 2	22.361 (13.435)		24.989* (12.501)		23.341* (12.028)		15.960 (11.220)	
Bank Characteristics								
Bank size (t-1)					0.411 (0.824)	0.432 (0.847)	0.270 (0.965)	0.995 (2.793)
Deposits/Assets (t-1)					1.381 (5.474)	1.962 (5.734)	-6.338** (2.786)	-5.002** (2.175)
Loans/Assets (t-1)					-1.770 (4.981)	-1.895 (5.790)	-0.594 (3.004)	-0.856 (3.343)
Equity/Assets (t-1)					9.112 (8.428)	10.303 (9.439)	5.473** (2.486)	7.755 (4.825)
Observations	2,995	2,995	2,995	2,995	2,989	2,989	2,989	2,989
Adjusted R-squared	0.007	0.011	0.579	0.609	0.035	0.044	0.613	0.642
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Bank FE	No	No	Yes	Yes	No	No	Yes	Yes
Date FE	No	Yes	No	Yes	No	Yes	No	Yes

TABLE 12. Effect of Geographical Complexity on Bank Risk for Conglomerates that Absorbed the Operations of International Subsidiaries

The table reports regression results from specification (1). The dependent variable is the inverse of natural logarithm of the Z-Score. Columns (I-IV) report results of a model that includes Span Location (the number of countries in which the bank subsidiaries of the conglomerate are active), as a measure of geographical complexity and different combinations of bank and time fixed effects. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in the Table 1. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable		
Models	IV	VIII
Geographical Complexity		
Span_location_b	0.019*** (0.000)	0.282*** (0.000)
Bank Characteristics		
Bank size (t-1)		6.425*** (0.000)
Deposits/Assets (t-1)		0.651*** (0.000)
Loans/Assets (t-1)		-3.335*** (0.000)
Observations	256	256
Adjusted R-squared	-0.284	0.065
Cluster	Bank	Bank
Bank FE	Yes	Yes
Time FE	Yes	Yes

TABLE 13. Geographical Complexity & Diversification for Conglomerates that Absorbed the Operations of International Subsidiaries

The table reports regression results from specification (2). The dependent variable is the inverse of the natural logarithm of the Z-Score. Columns (I-IV) report results of a model that includes Span Location as a measure of geographical complexity, the diversification proxy; and the interaction between the two variables. Different combination of bank and time fixed effects are also included. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in the Table 1. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Measure of diversification: weighted business cycle synchronization for the conglomerate.

Dependent Variable		
Models	IV	VIII
Geographical Complexity & Diversification		
Span_location_b	0.379*** (0.000)	0.385*** (0.000)
Business Cycle Synchronization *Span_location_b	0.179*** (0.000)	0.121*** (0.000)
Business Cycle Synchronization	-0.426*** (0.000)	-0.281*** (0.000)
Bank Characteristics		
Bank size (t-1)		7.508*** (0.000)
Deposits/Assets (t-1)		-1.183*** (0.000)
Loans/Assets (t-1)		-1.809*** (0.000)
Observations	248	248
Adjusted R-squared	-0.046	0.174
Cluster	Bank	Bank
Bank FE	Yes	Yes
Time FE	Yes	Yes

TABLE 14. Geographical Complexity & Regulatory Quality for Conglomerates that Absorbed the Operations of International Subsidiaries

The Table reports regression results from specification (3). The dependent variable is the inverse of the natural logarithm of the Z-Score. Columns (I-IV) report results of a model that includes Span Location as a measure of geographical complexity, the weighted regulatory quality of the conglomerate and the interaction between the two variables. Different combinations of bank and time fixed effects are also included. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in the Table 1. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable		
Models	IV	VIII
Geographical Complexity & Regulatory Quality		
Span_location_b	0.001*** (0.000)	0.224*** (0.000)
Regulatory quality*Span_location_b	0.120*** (0.000)	-0.602*** (0.000)
Regulatory quality	0.650*** (0.000)	2.789*** (0.000)
Bank Characteristics		
Bank size (t-1)		10.264*** (0.000)
Deposits/Assets (t-1)		-1.291*** (0.000)
Loans/Assets (t-1)		-3.827*** (0.000)
Observations	248	248
Adjusted R-squared	-0.285	0.223
Cluster	Bank	Bank
Bank FE	Yes	Yes
Time FE	Yes	Yes

TABLE 15. Effect of Geographical Complexity on Bank Risk for Grouped Banks with Similar Characteristics

The Table reports regression results from specification (1). The dependent variable is the inverse of natural logarithm of the Z-Score. Columns (I-IV) report results of a model that includes Span Location (the number of countries in which the bank subsidiaries of the conglomerate are active), as a measure of geographical complexity and different combinations of bank and time fixed effects. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in the Table 1. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable		
Models	IV	VIII
Geographical Complexity		
Span_location_b	0.208*** (0.056)	0.281*** (0.060)
Bank Characteristics		
Bank size (t-1)		-2.697*** (0.830)
Deposits/Assets (t-1)		-0.546 (1.243)
Loans/Assets (t-1)		0.519 (1.704)
Observations	338	338
Adjusted R-squared	0.343	0.476
Cluster	Bank	Bank
Bank FE	Yes	Yes
Time FE	Yes	Yes

TABLE 16. Geographical Complexity & Diversification for grouped banks with similar characteristics

The table reports regression results from specification (2). The dependent variable is the inverse of the natural logarithm of the Z-Score. Columns (I-IV) report results of a model that includes Span Location as a measure of geographical complexity, the diversification proxy; and the interaction between the two variables. Different combination of bank and time fixed effects are also included. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in the Table 1. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Panel A. Measure of diversification: weighted business cycle correlation for the conglomerate

Dependent Variable		
Models	IV	VIII
Geographical Complexity & Diversification		
Span_location_b	-0.797*** (0.156)	-0.648*** (0.128)
Weighted Correlation (l.gdp)*Span_location_	3.005*** (0.430)	2.650*** (0.309)
Weighted Correlation (l.gdp)	-7.528*** (1.755)	-5.185*** (1.420)
Bank Characteristics		
Bank size (t-1)		-2.368*** (0.508)
Deposits/Assets (t-1)		0.180 (0.915)
Loans/Assets (t-1)		-0.592 (0.955)
Observations	335	335
Adjusted R-squared	0.487	0.592
Cluster	Bank	Bank
Bank FE	Yes	Yes
Time FE	Yes	Yes

Panel B. Measure of diversification: weighted business cycle synchronization for the conglomerate.

Dependent Variable		
Models	IV	VIII
Geographical Complexity & Diversification		
Span_location_b	0.366** (0.143)	0.368*** (0.072)
Business Cycle Synchronization *Span_location_b	0.063 (0.056)	0.044** (0.017)
Business Cycle Synchronization	-0.347 (0.341)	-0.144 (0.147)
Bank Characteristics		
Bank size (t-1)		-2.704*** (0.834)
Deposits/Assets (t-1)		-0.276 (1.226)
Loans/Assets (t-1)		-0.342 (1.719)
Observations	335	335
Adjusted R-squared	0.342	0.476
Cluster	Bank	Bank
Bank FE	Yes	Yes
Time FE	Yes	Yes

TABLE 17. Geographical Complexity & Regulatory Quality for Grouped Banks with Similar Characteristics

The table reports regression results from specification (3). The dependent variable is the inverse of the natural logarithm of the Z-Score. Columns (I-IV) report results of a model that includes Span Location as a measure of geographical complexity, the weighted regulatory quality of the conglomerate and the interaction between the two variables. Different combinations of bank and time fixed effects are also included. Columns (V-VIII) add bank characteristics. Definitions of the variables can be found in the Table 1. Coefficients are listed in the first row, robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses, and the corresponding significance levels are in the adjacent column. Note: *** Significant at 1%, ** significant at 5%, * significant at 10%.

Dependent Variable		
Models	IV	VIII
Geographical Complexity & Regulatory Quality		
Span_location_b	0.079 (0.056)	0.082 (0.078)
Regulatory quality*Span_location_b	-0.929*** (0.248)	-0.733*** (0.166)
Regulatory quality	3.478*** (0.592)	0.990 (0.979)
Bank Characteristics		
Bank size (t-1)		-2.720*** (0.503)
Deposits/Assets (t-1)		0.694 (1.274)
Loans/Assets (t-1)		-0.910 (1.428)
Observations	335	335
Adjusted R-squared	0.429	0.544
Cluster	Bank	Bank
Bank FE	Yes	Yes
Time FE	Yes	Yes

