Geographic Expansion and Banks' Risk:
Evidence from Jordan

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Abstract

This study investigates the impact of geographic expansion on banks' risk and loan quality in Jordan during the period from 2000 to 2014. Geographic expansion is measured by Shannon Entropy whereby the bank's risk is measured by standard deviation of ROA, standard deviation of ROE and Z-score. We find evidence that the banking industry in Jordan is highly concentrated and that although banks' risk decreased with geographic expansion, loan quality was not affected. In addition, the results point to an important issue, that banks in Jordan are only impacted positively by geographic diversification, despite being negatively affected by main economic sector diversification, and are not affected by diversification in the broader sector i.e., service sector. These results are robust using alternative concentration measures and different estimation methods.

Keywords: *Geographic Expansion, Banks, Shannon Entropy, Jordan, Risk.*

Introduction

Economic theories provide conflicting strategy decisions for lenders: should lenders geographically expand their activities as suggested by the traditional portfolio theory presented by Harry Markowitz (1952), or focus on expansion as introduced by modern corporate theory? A growing body of work, including that of Liang and Recichert (2006), indicates the major role of banks as key lenders in the financial system where a healthy and stable banking industry promotes the growth and stability of the economy (Levine and Zervos, 1998). This raises a key question, whether banks' risk activities (deposits, credit facilities, revenue) are affected by geographic expansion? In other words, a decision has to be made whether to follow diversification or specialization.

While some studies suggest that geographic expansion reduces risk because it decreases monitoring and financial distress costs (Diamond, 1984; Ramakrishnan and Thakor, 1984; Boyd and Prescott, 1986; Gropp et al. 2011; Goetz et al., 2016), others suggest that geographic expansion increases risk because it becomes more complex for banks to monitor and manage risk (Jensen, 1986; Berger and Ofek; 1996; Serves, 1996; Denis et al., 1997, Winston 1999; Brickley et al., 2003 and Berger et al., 2005).

Although major studies have been performed on developed banking industries (Archarya et al. (2006); Goetz et al. (2016), few empirical studies have been carried out in developing countries (Odesami and Wolfe 2007; Berger et al., 2010) including Jordan, where however, the banking industry represents an important

sector of the economy. In 2014 for instance, the financial services sector in Jordan represented 20% of GDP. Thirteen of the twenty-five banks operating in Jordan, are Jordanian conventional commercial banks, eight are foreign conventional commercial banks, three are Jordanian Islamic banks, and there is one foreign Islamic bank. With a total of 770branches, each branch served 8,669 people bank density[1] per branch (Central Bank of Jordan, 2014).

Furthermore, the credit facilities provided by banks reached JD 19.247 billion at the end of 2014. The banking industry is highly concentrated in terms of geographic expansion and provinces[2] whereby the majority of credit facilities are provided to the capital Amman, representing 83.22% of total credit facilities; second is Irbid province representing 3.96% of total credit facilities, then Zarqa province presenting 3.23% of total credit facilities, the remaining 9.59% is distributed over the other nine provinces. Also in terms of the number of branches, 61.8 % of the total number of branches is in Amman, 9.9 and 9.6 percent of the total number of branches are in Irbid and Zarqa respectively, and 18.7 percent of the total number of branches in the other provinces (Association of Banks in Jordan, 2014).

The number of bank employees in Jordan reached 19,433 at the end of 2014, where 83.9% were employed in the capital Amman, whereas 4.7, 3.7, 1.7, 1.3, and 1.2% were employed in Irbid, Zarqa, Balqa, Karak, and Aqaba, respectively, while the remaining 3.5% were employed in the other provinces. These figures clearly indicate a high concentration factor not only with regard to facilities but also of employees. (Association of Banks in Jordan, 2014).

Given the importance of the banking sector and its contribution to the Jordanian economy, one may be surprised that there is yet a lack of studies concerning the issue of diversification and its possible impact on bank risk in Jordan. The objective of this study, therefore, is to highlight the evidence available in Jordan with regard to this issue. To the best of our knowledge, this is the first study that evaluates the impact of geographic expansion of credit facilities portfolio on banks' risk in Jordan. Our data set covers an extensive and up-to-date period from 2000 to 2014, in order to reach valid and consistent findings. Prior research focused on diversification of credit facilities portfolio across main economic sectors, whereas our study contributes to the existing literature on how geographic expansion may increase or decrease bank risk using a dataset from a developing country, Jordan. Furthermore, we assess whether or not geographic expansion affects asset quality, specifically loan quality, because banks can increase their assets by monitoring their credit facilities (Goetz et al., 2016). On the other hand, geographic expansion increases distance and subsequently increases the cost of monitoring credit facilities (Winston, 1999). Moreover, to provide a complete analysis we include the effect of diversification across main economic sectors and the broader sector in Jordan in addition to the effect of geographic expansion.

The study consists of five sections, apart from this introduction: Section two reviews empirical literature related to the study, Section three discusses the data and methodology used in the study, followed by the analysis of section three; Conclusions and Recommendations are stated in section five.

Literature Review

Recent decades have witnessed a number of key factors which have contributed to reshaping the banking and financial industry, such as Service Proliferation, Rising Competition, Government Deregulation, Globalization, Interest-sensitive mix of funds, Convergence, Geographic Expansion, Technological Changes and Automation, and Financial Crisis (Rose et al., 2010), which focus attention on the issue of Concentration versus Diversification in financial institutions.

(1)   Calculated by dividing total population by total number of branches
(2)   In Jordan, there are 12 provinces (Amman, Salt, Zarqa, Irbid, Aqaba, Mufraq, Taffileh, Maan, Karak, Jerash, Madabah, and Ajlun).

Specifically, this issue in banks attracted serious attention by regulators, academics and bank managers, taking into consideration that banks are highly levered firms (Berger et al., 2010). Study results differ between consistent and inconsistent with regard to diversification. For instance, Diamond (1984), Ramakrisan and Thakor (1984), Boyd and Prescot (1986), and Williamson (1987) implied that monitoring and screening costs will be cheaper through diversification and subsequently improve bank performance.

Boyd and Grahm (1988), and Templeton and Severiens (1992) indicated that when banks moved to non-bank product lines and other financial services respectively, this decreased banks' risk.

Also Boot and Schemits (2000) indicated that the probability of bankruptcy decreased as banks diversified through different services and economic sectors. More recently, studies by Iskandar-Dattaand and Mclaughlin (2005), and Chen et. al. (2013) indicated the benefits derived from diversification. Houston et al. (1997), De Hass and Van Lelyveld (2010) implied that diversification also enhanced the capital market. Berger and DeYoung (2001) indicated that diversification improved managerial skills in banks.

On the other hand, corporate finance theories {Jensen (1986), Jensen and Meckling (1976), Berger and Ofek (1996), Servas (1996) and Denis et al. (1997)} implied that diversification will raise the agency problem issue, which will increase the bank's risk and negatively affect loan quality, and that costs may exceed benefits, in addition to the complexity of monitoring all credit facilities, so banks are recommended to focus on those activities in which they have had experience(Winston, 1999).

In this context, the question of geographic expansion and bank risk was seriously debated and studied, resulting in mixed views. For instance, Akhigbe and Whyte (2003), Deng and Elyasiani (2008), and Gropp et. al. (2011) found that geographic expansion decreased banks' risk because the banks are less affected by the surrounding environment.

Archarya et al. (2006) examined Italian banks during the period from 1993-1999, finding that Italian banks benefitted from geographic expansion but not from economic and broader sector diversification. A recent study by Goetz et al. (2016) indicated that geographic expansion reduced banks' risk because of reduced effect of idiosyncratic local risk, but that geographic expansion did not improve loan quality. Similarly, Cortes and Straham (2016) and Levin et al. (2016) found that geographic expansion decreased banks' risk.

On the other hand, studies conducted by many other researchers imply that geographic expansion increased banks' risk because it becomes more difficult, costly and challenging to monitor (Liang and Rhoades (1988), Chong (1991), Morgan and Samolyk (2003), Brickley et al. (2003), Carlson (2004), Berger et al. (2005) and, Lieven et al. (2007).

Finally, Friedman and Schwartz (1963) studying the effect of geographic expansion on banks' stability, found it had a positive effect. Similarly, Grossman (1994), Wheelock (1995), Calomiris (2000), and Shiers (2002) found that geographic expansion enhanced banks' stability, whereas the opposite was found to be true in studies by Fuchs and Bosch (2009) which implied that geographic expansion negatively affected banks' stability.

Data and Methodology

The sample of this study includes all the Jordanian commercial banks operating inside Jordan during the period 2000-2014. The population was originally around 24 banks, but Islamic banks were excluded because they conduct their operations differently from commercial banks. In addition, foreign banks were also excluded since 71.38% of the total credit facilities are provided by Jordanian commercial banks. Islamic and foreign banks in Jordan only provide 21.84%, 6.78% of total credit facilities respectively. Our final sample therefore consists of 13 Jordanian commercial banks. Data collection regarding banks' credit facilities diversification was accessed from the annual reports of the Central Bank of Jordan where credit facilities are classified according to the main economic sectors and geographic locations. Furthermore, the financial

variables were extracted from the annual reports of the commercial banks, as well as data available on the Amman stock Exchange[1]website for the years 2000-2014.

For each bank in our sample, the data provided allowed the following credit facilities portfolio decompositions to be made:

1- A disaggregated geographical decomposition according to the credit facilities provided by each bank in the main 12 Jordanian provinces, including Amman, Salt, Zarqa, Irbid, Aquba, Mufraag, Taffeleh, Maan, Karaak, Jarash, Madabah, and Ajlun. This classification was adopted according to the formal administrative division in Jordan.

2- The main economic sectors were broken down according to the Central Bank reports, including governmental, agriculture, industrial and mining, general trade, construction, services, individual, and others.

3- In Jordan, the broadest sector is the service sector where the breakdown includes Transportation, Tourism, Financial, and Public Services and Facilities.

Diversification Measures:

In this study, we follow Tabak et al. (2011), Behr et al. (2007), Acharya et al. (2006) and use the conventional variables to measure concentration (or respectively diversification); the Shannon Entropy (SE) and the Herfindahl-Hirschman Index (HHI)[2]. Before explaining how these concentration measures are calculated, it is worth noting that the calculation of the relative exposure x_i of each bank under a given classification is as follows:

$$X_{(i)} = (\text{Nominal Exposure (i)}) / (\text{Total Exposure}) \quad \text{...............(1)}$$

The Shannon Entropy (SE) is a widely accepted measure that shows variety of distributions at a given point in time (Tabak et al. 2011)and is calculated as follows:

$$SE = -\sum_{i=1}^{n} (X_i * \ln(1/X_i)) \quad \text{...........(2)}$$

The Shannon Entropy value will equal zero in cases of maximum concentration i.e., all the bank credit facilities are provided only to one geographic region or one main economic sector or within service sector only, whereas $-\ln(n)$ value represents perfect diversification.

To check the results, another accepted concentration measure is used, the Hirschmann−Herfindahl Index (HHI), measured as the sum of the squares of exposures relative to total exposure for a given classification, where Hg is used to indicate the HHI for geographic diversification.

$$Hg = \sum_{i=1}^{n} (x_i|x)^2 \quad \text{.................. (3)}$$

Hirschmann−Herfindahl Index values range from 1/n when credit facilities are provided equally to all regions, economic sectors or to the broadest sector. Maximum concentration is represented by the value of one where all credit facilities are concentrated in one geographic region or one economic sector or only to the service sector.

Risk Measures:

Three risk measures were used for the banks in our sample over the period 2000-2014.

1- SDROA: standard deviation of the return on assets (Goetz, 2012)

2- SDROE: standard deviation of the return on equity (Goetz, 2012)

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(1) To access this webpage go to: www.ase.com
(2) We use this measure in the robustness check section.

3-   Z-score: Z-score indicates the distance from insolvency (Roy, 1952). Usually this measure stands for insolvency risk (See for example: Beltratti and Stulz, 2012; Houston et al. 2010; Laeven and Levine, 2009). In this study, we follow Laeven and Levine (2009) and use the following equation:

$$Ln \ (Z\text{-}score) = (ROA + CAR) \ / \ (SDROA) \ .... (4)$$

Where Ln (Z-score) is the natural logarithm of Z-score, ROA is the return on assets measured as the earnings before interest and tax divided by total assets. CAR is the capital assets ratio, found by taking the difference between total asset and total liability divided by total asset. (SDROA) is the standard deviation of return of assets. High values of Z-score indicate more stability therefore, 1/ln (Z-score) is used to reflect insolvency risk (Pathan, 2009). For short, we use Ln (Z-score) to reflect insolvency risk.

Control Variables: we control for cost efficiency by calculating ($Personnel_{it}$) as Personnel $Costs_{it}$/ Total $Assets_{it}$ (Acharya et al., 2006). Control for bank size is by using natural logarithm of total assets (Tabak, 2011). Return on assets is used to control for bank return and calculated as (Net income/Total assets). Finally, we control for bank equity as (Equity $Capital_{it}$/ Total $Assets_{it}$) (Acharya et. al. 2006; Tabak 2011).

Model Specification:

In this section, we investigate if geographic expansions affect bank risk taking. We follow Acharya et al. (2006) and Gotez et al. (2016) and run the regression using pooled OLS with robust standard error. To control for the change in macroeconomic conditions, time dummies are included for the year 2000 through 2014.

$$Risk_{it} = \beta_0 + \beta_1 SEg_{it} + SEi_{it} + SEs_{it} + \gamma^* v_{it} + \varepsilon_{it} .... (5)$$

Where risk is the dependent variable SDROA, SDROE or Ln (Z-score). SEg is Shannon Entropy for geographic concentration, SEi is Shannon Entropy for main economic sectors concentration, and SEs is Shannon Entropy for broader sector concentration. v_{it} is a vector of control variables including personnel, size, return and equity.

Then, we investigate if geographic expansions affect loan quality; the regression using generalized least square (GLS) random effect (Goetz et.al. 2016) is used.

$$Y_{it} = \beta_0 + \beta_1 SEg_{it} + \gamma^* v_{it} + \varepsilon_{it} .... (6)$$

Where Y_{it} is the dependent variable measured by PLL_{it}, which is the provision for loan losses divided by total loans, or Non-per.$_{it}$ is non-performing loans divided by total loans. SEg_{it} is Shannon Entropy for geographic concentration. v_{it} is a vector of control variables including Personnel, size, return and equity.

Descriptive Statistics

Table 1 presents the sample descriptive statistics. According to Table 1, the size of Jordanian banks looks comparable with an average of 20.8. More importantly, the geographic concentration measures indicate that Jordanian banks are highly concentrated with an average of Hg 77%. The literature shows that if Herfindahl-Hirschman Index (Hg) is close to (1) this means banks' credit facilities are highly concentrated. Similarly, the Shannon Entropy for geographic concentration also indicates high geographic concentration.

The SEg average is 0.105 indicating that most credit facilities in Jordanian banks are provided to limited geographic locations in Jordan. The Jordanian banks seem to be more diversified in providing credit facilities to several economic sectors; the Shannon Entropy for economic sectors concentration average is -1.582. While the Shannon Entropy average within service sector is -0.976, which reflects a moderate diversification.

A common test is run to check for multicollinearity in the literature i.e. variance inflation factor (VIF). As a rule of thumb, if the test provides a value of 10 or more this mean multicollinearity exists and therefore

the regression results may be inflated. Table 2 provides the test results including Tolerance, which is another accepted test for multicollinearity. Tolerance is computed as 1/VIF, and indicates a collinearity problem if its value is lower than 0.1. Figures in Table 2 show that our dataset is free from a multicollinearity problem as the average of VIF is 2.2, which is less than 10.

Empirical Results

Table 3 provides OLS estimation results on the relationship between banks' risk measured by standard deviation of ROA, standard deviation of ROE and Ln (Z-score) and concentration of credit facilities portfolio in geographic areas, main economic sectors and the broadest service sector. Our results indicate that there is a significant positive relationship between geographic concentration and bank risk (respectively, negative relationship between geographic expansion and banks' risk) when measured by SDROA, SDROE and Ln (Z-score) at 1, 5 and l0 percent confidence levels, respectively. Furthermore, there is a significant negative relationship between main economic sectors concentration and banks' risk either measured by SDROA or SDROE at 1 percent confidence level. However, there is no significant relationship between broader sector concentration and banks' risk either measured by SDROA, SDROE and Ln (Z-score).

These results indicate that as geographic diversification increases, the bank's risk will decrease as assessed by Shannon Entropy measure; this implies that geographic expansion in credit facilities portfolio will decrease bank risk. On the other hand, diversification in credit facilities portfolio in the case of main economic sectors will increase banks 'risk, but diversification in credit facilities portfolio in the case of the service sector was found to have no effect on banks' risk.

This means that banks in Jordan only benefit from geographic expansion because they will be least affected by the surrounding environment (Houston and James (1988), Houston et. al. (1997), Gatev et. al. (2009), and Cornett et. al. (2011)) due to reduced exposure to idiosyncratic local risks(Goetz et. al. 2016).

From another perspective, geographic expansion may increase customer trust and attract more deposits whereby banks can raise more funds at lower cost (Rose et. al. 2010) and with an increased number of customers, geographic expansion may provide new investment opportunities for the bank (Meslier-Crouzille et. al. 2015). In addition, expansion into different geographic areas may increase employment opportunities in these newly expanded areas.

Furthermore, geographic expansion facilitates customer access to the bank's services thereby saving time, effort and more importantly, cost, since Jordan suffers from transportation problems. Accordingly, these advantages may participate in enhancing the bank's reputation and therefore in reducing risk.

The results of this study are consistent with those of Akhigbe and Whyte (2003), Deng and Elyasiani (2008), and Gropp et al. (2011) who reported that geographic expansion leads to lower risk because banks are less affected by the surrounding environment, and are also consistent with the findings of Goetz et. al. (2016), Cortes and Straham (2016) and Levin et al. (2016). All the aforementioned recent studies support the conjecture that geographic expansion lower bank risk.

With respect to diversification across main economic sectors, when Jordanian banks diversify their credit facilities portfolio related to different economic sectors, the results of this study show that bank risk increases because of the diversity entailed in the various economic sectors, and the consequent lack in banks' specific and specialized information and experience in dealing with them, so that banks are subsequently faced with learning costs. These findings are consistent with Archarya et al. (2006) who report that Italian banks benefit only from geographic expansion but not from economic and broadest sector diversification.

As indicated above, results have shown that geographic expansion reduced risk, but is this an indication of an original result, or it is a subsequent result of improvement in loans quality? As indicated in Table 4, geographic expansion in Jordan does not improve loans quality either measured by provision for loan losses or non-performing loans, indicating that the decrease in bank risk is a pure result not a consequence of improvement in monitoring and assets quality. This result is consistent with the findings of Goetz et. al. (2016).

Robustness Check

The results of this study reveal that geographic expansion leads to lower risk in banks. In this section, additional tests were conducted to confirm the main results. First, we repeat the analysis using Generalized Least Square (GLS) random effect. The benefits of using this estimation method are as follows: results are robust to first-order auto-regressive (AR (1)) disturbances (if any) within unbalanced-panels, and cross-sectional correlation and/or heteroskedasticity across panels (Pathan, 2009: 1343). Table 5 illustrates the results and confirms our main results, it being clearly evident from the table that all coefficients for geographic expansion are significant at 1% confidence level.

In the second test, the regression method used by Acharya et al. (2006) is followed for the concentration measures -and all other control variables- in year (t−1) on risk measures in year (t). The relationship between diversification and bank risk may be affected by factors that jointly affect bank risk and diversification, thus the use of lagged values assists in partially controlling for such endogeneity concerns. Table 6 confirms our main results. In the last test, analysis is repeated using an alternative geographic concentration measure i.e., (Herfindahl-Hirschman Index). As shown in Table 7, the main results are also upheld when using alternative measures of concentration.

Conclusions and Recommendations

This paper attempts to answer an important question, whether banks should expand in different geographic areas or just focus on a few regions. More precisely, we examine the link between the banks' risk and their credit facilities portfolio diversification across different geographical regions. Although our main concern in this study is geographic diversification, we also investigate how the bank risk is affected by diversification across different economic sectors and the broadest economic sector. Using a sample from all the Jordanian commercial banks over the period 2000-2014, evidence was found that geographic expansion reduces bank risk. However, diversification through different economic sectors increases risk, while no significant effect was found for the effect of diversification in the broader economic sector.

These results indicate that Jordanian banks benefit only from geographic diversification. This could be explained as banks are least affected by surrounding environment (Houston and James (1988), Houston et al. (1997), Gatev et al.(2009) and Cornett et al. (2011)) due to reduced exposure to idiosyncratic local risks (Goetz et al., 2016). Then the study addresses the effect of geographic diversification on banks' loan quality, where no significant effect was found. Banks' managers are recommended to expand their credit facilities portfolio across different Jordanian provinces since it was founded that geographic expansion decrease banks' risk.

In addition, they are recommended to concentrate on economic sectors that they are familiar with and have knowledge and experience with it.

Our findings are considered important for bank managers as well as policy makers and regulators in Jordan. Future research may consider alternative measures of diversification, as well as including more financial institutions.

References

- Acharya, V.; I. Hasan and A. Saunders. (2006). "Should Banks be Diversified? Evidence from Individual Bank Loan Portfolios", *Journal of Business*, 79: 1355 − 1411.

- Akhigbe, A. and A. M. Whyte. (2003). "Changes in Market Assessment of Bank Risk Following the Riegle-Neal Act of 1994", *Journal of Banking and Finance*, 27: 87−102.

- Association of Banks in Jordan. (2014). *Annual Report , Thirty-Six*.

- Behr, Andreas; Kamp Andreas; Memmel Christoph and Pfingsten Andreas. (2007). "*Diversification and the Banks' Risk-Return-Characteristics-Evidence from Loan Portfolios of German Banks*". Deutsche Bundesbank, Working Paper, 05:1-44

- 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, A. N.; R. DeYoung .(2001). "The Effects of Geographic Expansion on Bank Efficiency". *Journal of Financial Services Research*, 19: 163-184.

- Berger, Philip and Eli Ofek. (1996). "Bustup Takeovers of Value-destroying Diversified Firms". *Journal of Finance*, 51: 1175-1200.

- Boot, A. and A. Schmeits. (2000). "Market Discipline and Incentive Problems in Conglomerate Frms with Applications to Banking". *Journal of Financial Intermediation*, 9: 240−273.

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

- Boyd, J. H. and S. L. Graham. (1988). "The Profitability and Risk Effects of Allowing Bank Holding Companies to Merge with other FnancialFfirms: A Simulation Study", *Federal Reserve Bank of Minneapolis Quarterly Review*, 476−514.

- Brickley, J.; J. Linck and C. Jr. Smith. (2003). "Boundaries of the Firm: Evidence from the Banking Industry", *Journal of Financial Economics*, 70: 351 − 383.

- Calomiris, C. (2000). *U.S. Banking Regulation in Historical Perspective*. The Cambridge University Press.

- Carlson, M. (2004). "Are Branch Banks Better Survivor? Evidence from the Depression Era". *Economic Inquiry*, 42: 111-126.

- Central Bank of Jordan. (2014). *Annual Report*, Various Issues (2000-2014).

- Chen Yibing; Wei Xianhua and Zhang Lingling. (2013). "A New Measurement of Sectoral Concentration of Credit Portfolios", *International Conference on Information Technology and Quantitative Management (ITQM2013)*. 17: 1231 − 1240.

- Chong, B. S. (1991). "Interstate Banking on Commercial Banks' Risk and Profitability", *The Review of Economics and Statistics*, 73: 78−84.

- De Haas, Ferreira; Ralph Taci and Anita Daniel. (2010). "What Determines the Composition of Banks' Loan Portfolios? Evidence from Transition Countries", *Journal of Banking and Finance*, 34: 389-398.

- Deng, S. and E. Elyasiani. (2008). "Geographic Diversification, Bank Holding Company Value, and Risk", *Journal of Money, Credit and Banking*, 40: 1217−1238.

- Denis, D. J.; D. K. Denis and A. Sarin. (1997). "Agency Problems, Equity Ownership, and Corporate Diversification". *Journal of Finance*, 52:135 − 160.

-   Diamond, D. W. (1984). "Financial Intermediation and Delegated Monitoring", *Review of Economic Studies*, 51: 393—414.

-   Friedman, M. and A. Schwartz. (1963). *A Monetary History of the United States, 1867-1960*. Princeton University Press.

-   Fuchs, J. and BoschT. A. . (2009). *Why are Banks Failing?*. Central Banker.

-   Gatev, E.; T. Schuermann and P. E. Strahan. (2009). "Managing Bank Liquidity Risk: How Deposit-Loan Synergies Vary with Market Conditions", *Review of Financial Studies*, 22: 995-1020.

-   Goetz, M. R.; L. Laeven and R. Levine. (2016). "Does the Geographic Expansion of Banks Reduce Risk?", *Journal of Financial Economics*, 120: 346-362.

-   Gropp, R.; H. Hakenes and I. Schnabel. (2011). "Competition, Risk-shifting, and Public Bail-out Policies", *Review of Financial Studies*, 24: 2084 — 2120.

-   Grossman, R. (1994). "The Shoe That Didn't Drop: Explaining Bank Stability in the Great Depression", *Journal of Economic History*, 54: 654-682.

-   Houston, J.; C. James and D. Marcus. (1997). "Capital Market Frictions and the Role of Internal Capital Markets in Banking", *Journal of Financial Economics*, 46: 135-164.

-   Houston, J. and C. James. (1998). "Do Bank Internal Capital Markets Promote Lending?", *Journal of Banking and Finance*: 899-918.

-   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.

-   Levine, R.; C. Lin and W. Xie W. (2016). "Geographic Diversification and Banks' Funding Costs". *NBER Working Paper* 22544.

-   Levine, R. and S. Zervos. (1998). "Stock Markets, Banks, and Economic Growth". *American Economic Review*, 88: 537—558.

-   Liang, Hshin-Yu and Alan Reichert. (2006). "The Relationship between Economic Growth and Banking Sector Development", *Banks and Bank Systems*, 1, No. 2: 19-35

-   Liang, N. and S. Rhoades. (1988). "Geographic Diversification and Risk in Banking", *Journal of Economics and Business*, 40, No. 4: 271-284.

-   Lieven, Baele; Olivier D. Jonghe and V. Vennet Rudi. (2007). "Does the Stock Market Value Bank Diversification?", *Journal of Banking and Finance*, 31, No. 7: 1999-2023.

-   Markowitz, H. (1952). "Portfolio Selection", *The Journal of Finance*, 7, No. 1: 77-91.

-   Meslier-Crouzille C´eline; Donald P. Morgan; Katherine Samolyk and Amine Tarazi. (2015). *The Benefits of Geographic Diversification in Banking*. <hal-01155170>.

-   Morgan, Donald P. and Katherine Samolyk. (2003). "Geographic Diversification in Banking and its Implications for Bank Portfolio Choice and Performance," *Working Paper*, Federal Reserve Bank of New York.

-   Odesanmi, S. and S. Wolfe. (2007). "Can Revenue Diversification Reduce Systemic Risk? Empirical Evidence from Banks in Emerging Economies", *Working Paper*, University of Southampton.

-   Ramakrishnan, R. and A. Thakor. (1984). "Information Reliability and a Theory of Fnancial Intermediation". *Review of Economic Studies*, 51: 415—432.

- Rose, Peter S. and Sylvia C. Hudgins. (2013). **Bank Management and Financial Services**. 9th ed. McGraw-Hill, Irwin Publishing. (BKM). PP. 515-516.

- Roy, A. D. (1952). "Safety First and the Holding of Assets", **Econometrica**, 20, No., 3: 431-449.

- Servaes, H. (1996). "The Value of Diversification During the Conglomerate Merger Wave", **Journal of Finance**, 51: 1201 − 1225.

- Shiers, A. F. (2002). "Branch Banking, Economic Diversity and Bank Risk", **The Quarterly Review of Economics and Finance**, 42: 587−587.

- Tabak, B. M.; D.M. Fazio and D.O. Cajueiro. (2011). "The Effects of Loan Portfolio Concentration on Brazilian Banks' Return and Risk", **Journal of Banking and Finance**, 35: 3065-3076.

- Wheelock, D. (1995). "Regulation, Market Structure, and the Bank Failures of the Great Depression", **Federal Reserve Bank of St. Louis Review**, 77, 27-38.

- Williamson, Stephen D. (1987). "Costly Monitoring, Loan Contracts and Equilibrium Credit Rating", **The Quarterly Journal of Economics**, 102, No.1:135-146.

- Winton, A. (1999). **Don't Put All Your Eggs in One Basket? Diversification and Specialization in Lending**. Mimeo: University of Minnesota.

Table 1 - Summary Statistics

This table presents the summary statistics of all the variables used in the analysis. SD ROA is the standard deviation of return on assets, SD ROE is the standard deviation of return of equity, Ln (Z-score) is the natural logarithm of 1/Z-score, Hg is the Herfindahl-Hirschman Index for geographic concentration, SEg is the Shannon Entropy for geographic concentration, SEi is the Shannon Entropy for economic sectors concentration, SEs is the Shannon Entropy for service sector concentration, EQ is the Equity Capital / Total Assets, Size is the ln (Total Assets), RE is the Net income / Total assets, Pr is the Personnel Costs / Total Assets.

Variables	Mean	SD	Min.	Max.
SD ROA 0.005		0.006	0	0.033
SD ROE	0.062	0.052	0.009	0.213
Ln(Z-score)	-4.016	1.339	-7.159	-0.230
Hg	0.771	0.199	0	1
SEg	0.105	2.292	-1.422	8.985
SEi	-1.582	0.423	-1.900	-0.065
SEs	-0.976	0.302	-1.364	-0.230
EQ	0.132	0.090	-0.136	0.467
Size	20.806	1.265	18.015	23.926
RE	0.016	0.0116	-0.027	0.059
Pr	0.011	0.006	0.003	0.1543

Table 2 - Variance Inflation Factor

This table reports the results of Variance Inflation Factor test to check for multicollinearity. SEg is the Shannon Entropy for geographic concentration, Hg is the Herfindahl-Hirschman Index for geographic concentration, SEi is the Shannon Entropy for economic sectors concentration, SEs is the Shannon Entropy for service sector concentration, EQ is the Equity Capital / Total Assets, Size is the ln (Total Assets), RE is the Net income / Total assets, Pr is the Personnel Costs / Total Assets.

Variable	VIF	1/VIF
SEg	1.14	0.87
Hg	1.30	0.76
SEi	1.83	0.54
SEs	1.22	0.81
EQ	3.94	0.25
Size	2.51	0.39
RE	4.25	0.24
Pr	1.58	0.63
Mean	2.2	0.56

Table 3 - Main OLS Estimation

This table presents the results of pooled OLS for model (5) using standard deviation of the return on assets, standard deviation of the return on equity and Ln (Z-score) as proxies for bank risk. SDROA is the standard deviation of return on assets, SDROE is the standard deviation of return of equity, Ln (Z-score) is the natural logarithm of 1 / Z-score, SEg is the Shannon Entropy for geographic concentration, SEi is the Shannon Entropy for economic sectors concentration, SEs is the Shannon Entropy for broader sector concentration, Pr is the Personnel Costs / Total Assets, Size is the ln (Total Assets),EQ is the Equity Capital/ Total Assets, RE is the Net income / Total assets. P-values are reported in parentheses. All t-statistics are based on robust standard errors. ***;**;* represent significance at the 1%, 5% and 10% level.

Dependent Variable	SD ROA	SD ROE	Ln (Z-score)	
Intercept	0.00477**	0.086	-2.417	
	(0.039)	(0.266)	(0.241)	
SEg	0.00557**	0.021***	0.071*	
	(0.039)	(0.000)	(0.070)	
SEi	-0.0028***	-0.021***	-0.088	
	(0.001)	(0.000)	(0.584)	
SEs	0.0039	- 0.002	0.233	
	(0.143)	(0.992)	(0.691)	
Pr	0.193**	1.640***	2.290*	
	(0.038)	(0.009)	(0.089)	
Size	0.0002*	-0.005	-0.169***	
	(0.072)	(0.797)	(0.000)	
EQ	0.009	0.129*	4.731***	
	(0.443)	(0.066)	(0.006)	
RE	-0.199*	-1.853***	-1.495***	
	(0.061)	(0.002)	(0.000)	
R²	0.599	0.775	0.390	
Number	195	195	195	

Table 4 - Impact of Geographic Expansion on Loan Quality

This table presents the GLS estimation for model (6) where the dependent variables are Non-performing Loans / Total Loans and Provisions for Loan Loss/ Total Loans. The independent variables are the Shannon Entropy for geographic concentration in addition to the bank control variables.

Dependent Variable	Non-performing Loans / Total Loans	Provisions for Loan Loss / Total Loans
SEg	-0.00035	-0.003
	(0.934)	(0.295)
Banks Control	Included	Included
R²	49%	60%
Number of observations	195	193

Table 5 - GLS Estimation

This table presents the results of GLS estimation using standard deviation of the return on assets, standard deviation of the return on equity and Ln (Z-score) as proxies for bank risk. SDROA is the standard deviation of return on assets, SDROE is the standard deviation of return of equity, Ln (Z-score) is the natural logarithm of 1/Z-score, SEg is the Shannon Entropy for geographic concentration, SEi is the Shannon Entropy for economic sectors concentration, SEs is the Shannon Entropy for service sector concentration, Pr is the Personnel Costs/Total Assets, Size is the ln (Total Assets), EQ is the Equity Capital/ Total Assets, RE is the Net income/Total assets. P-values are reported in parentheses. All t-statistics are based on robust standard errors. ***;**;* represent significance at the 1%, 5% and 10% level.

Dependent Variable	SD ROA	SD ROE	Ln(Z-score)	
Intercept	0.01377	0.086	-2.417	
	(0.202)	(0.266)	(0.241)	
SEg	0.00051***	0.004***	0.075***	
	(0.000)	(0.000)	(0.000)	

Dependent Variable	SD ROA	SD ROE	Ln(Z-score)	
SEi	-0.00101	-0.014*	-0.105	
	(0.384)			
		(0.077)	(0.544)	
SEs	0.007**	- 0.027	0.231	
	(0.014)	(0.166)	(0.682)	
Pr	0.206*	1.755 **	27.170**	
	(0.062)	(0.021)	(0.012)	
Size	-0.0002	-0.003	-0.067	
	0.600	(0.364)	(0.437)	
EQ	-0.002	0.134**	4.414***	
	(0.684)	(0.015)	(0.003)	
RE		-1.584***	-4.495***	
		(0.005)	(0.001)	
R²	0.31	0.407	0.361	
Number	195	195	195	

Table 6 - Lagged Values for all Explanatory Variables

This table presents the results of pooled OLS using standard deviation of the return on assets, standard deviation of the return on equity and Z score as proxies for bank risk. SDROA is the standard deviation of return on assets, SDROE is the standard deviation of return of equity, Ln (Z-score) is the natural logarithm of 1/Z-score, SEg is the Shannon Entropy for geographic concentration, SEi is the Shannon Entropy for economic sector concentration, SEs is the Shannon Entropy for service sector concentration, Pr is the Personnel Costs / Total Assets, Size is the ln (Total Assets), EQ is the Equity Capital / Total Assets, RE is the Net income / Total assets. P-values are reported in parentheses. All t-statistics are based on robust standard errors. ***;**;* represent significance at the 1%, 5% and 10% level.

Dependent Variable	SD ROA	SD ROE	Ln(Z-score)	
Intercept	0.00477**	0.086	-2.417	
	(0.025)	(0.266)	(0.241)	
SEg$_{t-1}$	0.0051**	0.005**	0.082**	
	(0.025)	(0.007)	(0.045)	
SEi$_{t-1}$	0.001	-0.004	0.168	
	(0.246)			
		(0.583)	(0.472)	
SEs$_{t-1}$	0.002*	0.018	0.857***	
	(0.094)	(0.118)	(0.005)	
Pr$_{t-1}$	0.142	0.951*	34.016**	
	(0.156)	(0.100)	(0.018)	
Size$_{t-1}$	-0.001**	-0.008***	-0.121	
	(0.026)	(0.009)	(0.269)	
EQ$_{t-1}$	-0.012	0.127*	-2.58***	
	(0.106)	(0.061)	(0.320)	
RE$_{t-1}$		-1.810***	5.860	
		(0.001)	(0.673)	
R²	0.62	0.79	0.390	
Number	195	195	195	

Table 7 - Alternative Concentration Measure

This table presents the results of pooled OLS using standard deviation of the return on assets. Hg is the Herfindahl-Hirschman Index for geographic concentration, Pr is the Personnel Costs/Total Assets, Size is the ln (Total Assets), EQ is the Equity Capital/ Total Assets, RE is the Net income/Total assets. P-values are reported in parentheses. All t-statistics are based on robust standard errors. ***;**;* represent significance at the 1%, 5% and 10% level.

Dependent Variable	SD ROA
Intercept	0.01377
	(0.202)
Hg	0.026**
	(0.046)
Pr	1.89***
	(0.002)
Size	-0.0002
	0.903
EQ	0.133*
	(0.066)
RE	-1.74***
	(0.006)
R^2	0.74
Number	195