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The effect of revenue diversification on bank profitability and risk during the COVID-19 pandemic

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ABSTRACT

Banks can potentially reduce the variability of their revenue by diversifying beyond traditional lending activities into noninterest revenue sources. We investigate the effect of the COVID-19 pandemic on the relation between the use of noninterest income and bank profit and risk. The economic effect of the pandemic resulted in tightened credit standards and reduced demand for many types of loans. We find that noninterest revenue sources are positively related to performance but inversely related to risk. These results are consistent with a beneficial diversification effect during the pandemic from banks expanding beyond traditional lending sources of revenue.

1. Introduction

An important principle of modern finance theory is the concept of diversification. Finance textbooks typically have a statement such as: “…some of the riskiness associated with individual assets can be eliminated by forming portfolios. The process of spreading an investment across assets (and thereby forming a portfolio) is called diversification. The principle of diversification tells us that spreading an investment across many assets will eliminate some of the risk” (Ross et al., 2016). Banks can potentially reduce the variability of their revenue streams by altering the geographic and loan-type mix of their loan portfolios. Alternatively, banks can diversify by expanding beyond traditional lending activities into a variety of noninterest revenue sources (e.g., service charges, trading account revenue, fiduciary activities, etc.).

Over the past fifteen to twenty years, a growing body of literature examines the effect of diversification of banks’ revenue sources on their profitability and stability. The investigation of this issue is important, given that in 2019 approximately one third of U.S. banks’ net operating revenue came from a variety of noninterest sources.\textsuperscript{1}

In this paper, we investigate the relation between the use of noninterest revenue sources and bank profit and risk, in the context of the economic crisis brought on by the COVID-19 pandemic. The COVID-19 disease, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first reported on 31 December 2019 in Wuhan, China and declared a pandemic by the World Health

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Organization on 11 March 2020. The economic effect of the disease in the U.S. has been severe with real GDP plunging by almost 33% by the end of the second quarter of 2020 and the unemployment rate reaching 14.7% in April 2020. The economic impact of the pandemic was felt in the banking industry. The Fed’s July survey of senior loan officers found a large percentage of banks reported tightening credit standards for most loan types and weaker demand for commercial and industrial (C&I), commercial real estate, and consumer loans, although there was a modest increase in demand for residential mortgages.

Given tightened standards and reduced demand for most loans, a relevant question to investigate is whether banks benefitted, in terms of performance and risk, if they had more diversified revenue streams. In this paper, we examine a sample of U.S. banks to determine whether banks with greater levels of noninterest income have better performance and greater risk. Our results suggest a positive relation between performance, as measured by return on assets and return on equity, and noninterest income. Additionally, we find evidence that the use of noninterest income is associated with lower levels of risk. Taken together, these results provide evidence of a beneficial diversification effect from the use of noninterest revenue sources, at least during early 2020 as COVID-19 was spreading and affecting the economy.

The fact that our results differ from earlier studies may reflect the effect of financial innovation that has occurred over the past two to three decades in the banking sector. Fintech, which includes digital and online technologies used in the financial services industry, is transforming the many aspects of banking (see Frame et al., 2019 and Thakor, 2020). While fintech can make traditional banking activities more efficient, it also allows banks to reach new customers and market segments, producing new sources of fee income. Blaney (2020) reports that digital payments are one of the largest fintech products, accounting for approximately 25% of the fintech market. In 2020, 90% of users made payments with their smartphones; by 2022 mobile transactions will account for 88% of all banking transactions. (Blaney, 2020). Clearly, fintech has transformed the banking sector and will continue to do so.

This paper proceeds as follows: Section 2 provides a review of the existing literature regarding income diversification and profitability and risk. In Section 3, we include a discussion of the data we use in this study and the hypotheses we test. We report our empirical results in Section 4 and Section 5 contains a summary of our results and concluding remarks.

2. Literature Review

It may seem a straight-forward proposition that diversification into non-interest sources of income should result in greater stability of income and reduced risk for banks, particularly if non-interest sources of revenue are not highly correlated with traditional lending sources of income. However, DeYoung and Roland (2001) argue that there are three primary reasons why noninterest income may be less stable than traditional banking activities, and thus lead to an increase in the volatility of bank earnings: First, while traditional lending relationships with banks are typically stable, fee-based relationships are more volatile due to low information costs and competition. Second, expansion into fee-based lines of business may entail extra labor fixed costs, resulting in increased operating leverage. Third, because banks are not required to hold regulatory capital against many fee-based revenue sources, banks may have greater financial leverage, and thus greater earnings volatility as they increase their returns to equity by taking advantage of non-interest income sources of revenue.

Stiroh (2004a, 2004b) finds that increased dependence on noninterest income is related to greater bank risk and lower risk-adjusted profits. He comments that a potential dark side to diversification is that banks may enter businesses where they have little experience or comparative advantage. The stock market offers another avenue to investigate the effects of noninterest activities. How do market participants value diversification of a bank’s revenue sources? To address this issue, Stiroh (2006) uses a portfolio framework to investigate the effect of increased noninterest income on equity market risk and return measures for U.S. bank holding companies. His results suggest that banks most reliant on noninterest lines of business do not earn higher average equity returns but are riskier.

DeYoung and Torna (2013) investigate the relationship between nontraditional banking activities and bank failures during the financial crisis. They find that not all noninterest revenue sources have the same impact of the likelihood of failure. Instead they find the probability of failure declined with activities, such as insurance sales and securities brokerage, while venture capital, asset securitization, and investment banking increased the probability of failure. They also find that banks taking greater risk in nontraditional activities also tended to take greater risks in their traditional activities.

While the research on U.S. banking organizations is largely unanimous that noninterest income sources do not provide expected diversification benefits (DeYoung and Torna, 2013 being a notable exception). However, research on banks outside of the U.S. provides a somewhat contradictory and perhaps more nuanced view of how noninterest income sources affect bank risk and performance.

Using a sample of small European banks, Mericqea et al. (2007) find no direct benefits from diversification within and across business lines. Further, they find an inverse relation between bank performance and noninterest income. They argue these results are due to small European banks entering lines of business in which they lack expertise and experience. However, Köhler (2015) investigates bank stability in 15 EU countries and finds that banks are significantly more stable and profitable if they increase their share of noninterest income sources. Köhler concludes that there are substantial benefits from income diversification. Chiorazzo et al. (2008)
find the income diversification increases risk-adjusted returns for a sample of Italian banks. Finally, Maudos (2017) addresses the relation between the use of noninterest income and risk and profitability for European banks during the 2002–2012 period. He finds that an increase in noninterest income has a negative effect on profitability but is associated with an increase in risk.

Berger et al. (2010) find that diversification is associated with reduced profits and higher costs for Chinese banks over the period of 1996–2006. Lee et al. (2014) find a positive association between the use of noninterest income sources and risk and profitability for a sample of banks from 22 Asian countries over the period of 1995–2009. However, they do not find an increase in profitability. For banks in the Philippines, Meslier et al. (2014) find that an increased focus on noninterest activities increases risk-adjusted profits. In a study of South Asian banks, Edirisuriya et al. (2015) find that as banks diversify from traditional lending activities into noninterest business lines they realize improved solvency and higher market-to-book valuations. However, beyond a certain level, higher diversification is negatively related to these indicators. Nisar et al. (2018) investigate the effect of revenue diversification on the profitability and stability of South Asian banks. The authors find that increased revenue diversification into noninterest income sources increases the profitability and stability of South Asian banks.

3. Data and methodology

In this research, we investigate the relation between net noninterest income (NNII) and bank profitability or bank risk by estimating the following equations:

\[
\pi_{i,t} = \alpha_0 + \alpha_1 \pi_{i,t-1} + \alpha_2 \text{NNII}_{i,t} + \alpha_3 \text{Control Variables}_{i,t} + \epsilon_{i,t}
\]

\[
\text{Risk}_{i,t} = \beta_0 + \beta_1 \text{Risk}_{i,t-1} + \beta_2 \text{NNII}_{i,t} + \beta_3 \text{Control Variables}_{i,t} + \mu_{i,t}
\]

where:
\[\pi_{i,t} = \text{bank profitability, measured by return on assets (ROA) or return on equity (ROE)},\]
\[\text{Risk}_{i,t} = \text{bank risk, measured by the standard deviation of ROA (SDROA) or the standard deviation of ROE (SDROE)},\]
\[\text{NNII} = \text{ratio of net noninterest income to net operating income, and}\]
\[\epsilon_{i,t}, \mu_{i,t} = \text{error terms}.\]

The control variables used in this investigation include:

- LnTA = the natural logarithm of total assets,
- ΔTA = the growth rate of total assets,
- Loans = the ratio of loans to total assets,
- Deposits = the ratio of deposits to total assets,
- Equity = the ratio of equity to total assets, and
- LLP = the ratio of loan loss provisions to total assets.

Table 1 summarizes the descriptions of the variables used in this study.

The data used in this analysis are taken from the Compustat Bank Fundamentals Quarterly database. Table 2 reports the mean, standard deviation, median, and the 25th percentile and 75th percentile break points.

We estimate Eqs. (1) and (2) to investigate the effect of noninterest on bank profitability and risk. Specifically, we test the following null hypotheses:

- H1: noninterest income does not affect bank profitability, measured by return on assets (ROA) and return on equity (ROE), during the COVID-19 pandemic period.
- H2: noninterest income does not affect bank risk, measured by the standard deviation of ROA and ROE, during the COVID-19 pandemic period.

Consistent with DeYoung and Roland (2001), prior empirical research of U.S. banks does not find evidence of a diversification effect from the use of noninterest income sources. However, the sudden decline in demand for loans, due to economic conditions brought on

| Table 1 | Variable definitions. |
|---------|-----------------------|
| Variable | Definition            |
| TA      | Total assets in $ millions |
| LnTA    | Natural logarithm of total assets. |
| ROA     | Return on assets. |
| ROE     | Return on equity. |
| SDROA   | Standard deviation of return on assets. |
| SDROE   | Standard deviation of return on equity. |
| NNII    | Ratio of noninterest income to net operating income. |
| LOANS   | Ratio of loans to total assets. |
| DEPOSITS| Ratio of deposits to total assets. |
| EQUITY  | Ratio of equity to total assets. |
| LLP     | Ratio of loan loss provisions to total assets. |
by the COVID-19 pandemic, may have benefitted those banks with revenue sources not highly correlated with lending. For this reason, the pandemic may have produced the conditions such that those banks with greater reliance on non-lending revenue sources may have experienced superior risk/return performance. Additionally, financial innovation may have affected the relationship between traditional and nontraditional income sources. On balance, this is an empirical question to be addressed.

4. Empirical Results

Tables 3 and 4 present the results of our analysis. We first perform univariate analysis by comparing financial performance (ROA and ROE) and risk (SDROA and SDROE) for banks with high levels of noninterest income with those having low level of noninterest income. Table 3 reports the means for performance and risk by NNII quintile. In general, the mean values for the quintiles, shown in Table 3, suggest that financial performance, as measured by ROA and ROE, increases with greater levels of noninterest income, while risk, as measured by the standard deviations of ROA and ROE, decreases.

Next, we perform a t-test of difference in means between the top quintile and the bottom quintile for financial performance and risk. Table 3 reports the results of the t-tests. The mean ROA (ROE) for the top quintile is 2.2% (4.0%) compared to 0.1% (0.9%) for the bottom quintile. The differences between the means for both ROA and ROE are significantly different from zero at better than the one-percent level. With respect to risk, the mean standard deviation of ROA (ROE) for the top quintile is 0.4% (0.9%), while the mean standard deviation of ROA (ROE) for the bottom quintile is 1.7% (3.4%). The differences between the means for the risk measures are also significant at better than the one-percent level. These results suggest that banks most involved with noninterest revenue sources are more profitable and less risky. However, due to a variety of factors that may affect bank performance and risk, it is necessary to consider multivariate tests.

We report the results of the estimation of Eqs. (1) and (2) in Table 4. For bank profitability measures, the estimated coefficients for NNII are positive and statistically significant. This suggests that reliance on noninterest revenue sources increases bank profitability. Further, for bank risk measures, the estimated coefficients for NNII are negative and statistically significant at the one-percent level. These results provide support for a diversification effect related to the use of noninterest revenue sources. Given that these results are at variance with prior research for U.S. banks, the diversification effect may point to unique factors associated with the COVID-19 pandemic.
In this study, we make use of the economic crisis brought on by the COVID-19 pandemic to investigate the relation between bank profit and risk and the use of noninterest income sources. The economic effect of the pandemic resulted in tightened credit standards and reduced demand for many types of loans. Our results suggest noninterest income is positively related to performance but inversely related to risk. These results are consistent with a diversification effect from the use of noninterest revenue sources during the period when COVID-19 was spreading rapidly and affecting the economy. Finally, given the growth in financial innovation over the past two to three decades, further investigation into how the adoption of fintech affects banks’ financial performance.

**5. Conclusion**

In this study, we make use of the economic crisis brought on by the COVID-19 pandemic to investigate the relation between bank profit and risk and the use of noninterest income sources. The economic effect of the pandemic resulted in tightened credit standards and reduced demand for many types of loans. Our results suggest noninterest income is positively related to performance but inversely related to risk. These results are consistent with a diversification effect from the use of noninterest revenue sources during the period when COVID-19 was spreading rapidly and affecting the economy. Finally, given the growth in financial innovation over the past two to three decades, further investigation into how the adoption of fintech affects banks’ financial performance.

**CRediT authorship contribution statement**

Xingjian Li: Formal analysis. Hongrui Feng: Conceptualization, Methodology, Visualization. Sebastian Zhao: . David A. Carter: Writing - original draft, Writing - review & editing, Visualization.

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### Table 4

Regressions of the change in performance and risk on change in non-interest income during the Covid-19 period for sample U.S. commercial banks.

|                          | Profitability Measures | Risk Measures |
|--------------------------|------------------------|--------------|
|                          | \( \Delta \text{ROA} \) | \( \Delta \text{ROE} \) | \( \Delta \text{SDROA} \) | \( \Delta \text{SDROE} \) |
| \( \text{ROA} ( -1 ) \)  | 0.202***               | 0.254***     | 0.631***                 | 0.680***                |
|                          | (3.88)                 | (4.56)       | (12.44)                  | (14.88)                 |
| \( \text{ROE} ( -1 ) \)  |                        |              |                          |                          |
| \( \text{SDROA} ( -1 ) \)|                        |              |                          |                          |
| \( \text{SDROE} ( -1 ) \)|                        |              |                          |                          |
| \( \text{NNI} \)         | 0.008***               | 0.087***     | -0.004***                | -0.043***               |
|                          | (15.06)                | (13.38)      | (-10.69)                 | (-7.11)                 |
| \( \text{LnTA} \)        | 0.035                  | 0.009        | -0.052                   | -0.015                  |
|                          | (0.84)                 | (0.17)       | (-1.07)                  | (-0.32)                 |
| \( \Delta \text{TA} \)   | 0.140***               | 2.040***     | -0.058***                | -1.220***               |
|                          | (5.65)                 | (6.67)       | (-2.74)                  | (-4.28)                 |
| \( \text{Loans} \)       | 0.047***               | 0.619***     | -0.042***                | -0.317***               |
|                          | (5.13)                 | (5.47)       | (-5.29)                  | (-3.02)                 |
| \( \text{Deposits} \)    | 0.016                  | -0.558**     | -0.036**                 | 1.030***                |
|                          | (0.87)                 | (-2.51)      | (-2.34)                  | (4.97)                  |
| \( \text{Equity} \)      | 0.769                  | -2.48**      | 0.033                    | -3.69***                |
|                          | (1.18)                 | (-4.24)      | (0.82)                   | (-6.78)                 |
| \( \text{LLP} \)        | -0.799***              | -9.456***    | 0.333***                 | 4.556                   |
|                          | (-4.49)                | (-69.59)     | (35.87)                  | (0.55)                  |
| \( \text{Intercept} \)  | -0.003***              | 0.014***     | 0.004***                 | 0.022***                |
|                          | (-7.73)                | (-2.94)      | (11.57)                  | (5.00)                  |
| \( \text{Fixed firm} \) | YES                    | YES          | YES                      | YES                     |
| \( \text{Adjusted } R^2 \)| 65.94                  | 66.31        | 76.81                    | 78.48                   |
| \( N \)                  | 216                    | 216          | 216                     | 216                     |

This table reports the estimation results of change in change regressions where the performance measures, \( \Delta \text{ROA} \) and \( \Delta \text{ROE} \), and performance risk measures, \( \Delta \text{SDROA} \) and \( \Delta \text{SDROE} \) are regressed on noninterest income (\( \text{NNI} \)) and the 1-quarter lagged control variables, which include \( \text{LnTA}, \Delta \text{TA} \), \( \text{Loans}, \text{Deposits}, \text{Equity} \), and \( \text{LLP} \) during the COVID-19 period for commercial banks. t-statistics are in parentheses below parameter estimates. The t-statistics are computed using robust standard errors. Statistical significance is at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively. The data are obtained from the Compustat Bank Fundamentals Quarterly database.

pandemic. Further, these results may reflect how fintech has affected the banking industry.

With respect to the control variables, the positive and statistically significant results for lagged ROA and ROE suggest the best performing banks continued to perform well when the pandemic struck. Interestingly, the estimated coefficients for both risk measures are positive and significant at the one-percent level indicating that the riskiest banks became riskier during the pandemic. Finally, the results for asset growth (\( \Delta \text{TA} \)) provide evidence that those banks experiencing high levels of growth experienced increases in profitability associated with reductions in risk.

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