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Sensitivity of Commercial & Industrial Loans to Regional Economic & Banking Conditions: An Analysis Across the Midwest

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Abstract

Commercial banking is a substantial industry with over 5,000 commercial banks in the United States. An important feature of a bank's activity is lending for different purposes. Different types of loans distributed by banks are crucial to propel an economy forward. My research focuses on the commercial banking industry in the Midwest region of the United States. Specifically, I will examine Illinois (IL), Indiana (IN), Iowa (IA), Kansas (KS), Kentucky (KY), Michigan (MI), Minnesota (MN), Missouri (MS), Ohio (OH), and Wisconsin (WI). In 2013, these 10 states together housed 2,446 of the 5,865 banks in the nation, which is 42% of the nation's total banks. Specifically, this paper will analyze how regional economic indicators and bank-specific indicators impact commercial and industrial (C&I) loans. Analyzing C&I loans is relevant because understanding the underlying factors that affect C&I lending is important from a bank's risk management perspective.

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I. Introduction

Commercial banking is a substantial industry with over 5,000 commercial banks in the United States. An important feature of a bank's activity is lending for different purposes. Different types of loans distributed by banks are crucial to propel an economy forward. My research focuses on the commercial banking industry in the Midwest region of the United States. Specifically, I will examine Illinois (IL), Indiana (IN), Iowa (IA), Kansas (KS), Kentucky (KY), Michigan (MI), Minnesota (MN), Missouri (MS), Ohio (OH), and Wisconsin (WI). In 2013, these 10 states together housed 2,446 of the 5,865 banks in the nation, which is 42% of the nation's total banks. Specifically, this paper will analyze how regional economic indicators and bank-specific indicators impact commercial and industrial (C&I) loans. Analyzing C&I loans is relevant because understanding the underlying factors that affect C&I lending is important from a bank's risk management perspective.

Generally, banks' assets include relatively safe, liquid assets such as government securities. However, banks also have illiquid assets, such as loans. Banks make various types of loans: C&I, real estate, agricultural, and individual. These less liquid assets earn more income but are inherently more risky. Within the different categories of loans, C&I loans are among the riskier types of loans.

Examining C&I loans and their relationship with local economic indicators is important because business cycles impact the banking sector, and hence, bank lending. An example of this is the most recent financial crisis in the United States. Koepke (2011) notes that the shocks the banking sector saw in the financial crisis were "historically unprecedented" (p. 168). Given that the banking sector had not been exposed to this magnitude of a recession before, it is critical to examine the causes of this recession and potential ways the banking sector can recover.

Currently, the banking sector is in the process of recovering from the recent financial crisis. The recovery is evidenced by a report noting competition for C&I loans is "fierce" (Stewart, 2014). This is positive news for the overall economy. Increased competition can have two implications. The first is that there is an increase in the number of loans being made. The second is competition may be fierce because banks are lending less in an attempt to recover funds lost during a financial crisis.

Previewing the results of my research, I find that real state GDP growth, real personal income growth, bank return on assets (ROA), credit quality of a bank's assets, and the capital-to-assets ratio have an impact on real C&I loans. All significant variables have a positive relationship with real C&I loans except for the capital-to-assets ratio, which negatively affected C&I loans.

This paper continues with a literature review in section II. Then, the theory is discussed in section III, followed by the data in section IV, and the hypothesis in section V. Next, section VI introduces the empirical model, and section VII discusses the results. Lastly, the paper is concluded in section VIII with consideration of policy implications from this research and avenues for future research.

II. Literature Review

There are currently multiple arenas of the

banking sector that are heavily studied. I focus on reviewing ideas central to commercial bank lending. Much of the literature discusses the cyclical component of bank lending. There are views and literature that support both sides of cyclicality—that lending can be procyclical as well as counter-cyclical. Dages (2000) explains the reasoning for both sides of the argument. He claims that transaction based lending, a lending practice in which banks focus on the hard facts of a loan and not the borrower, drive lending patterns to be procyclical. This is because better economic conditions provide opportunities for expanding one's business, and more loans are both demanded and supplied (p. 20). Along with an expansion driving businesses to demand loans, when the economy is expanding, the numbers always look better and loans seem less risky to banks. This is why transaction lending encourages procyclical behavior. The second type of lending Dages (2000) notes is relationship lending. Dages (2000) states that lending levels are counter-cyclical when banks focus on relationship lending. Relationship lending is when banks focus on the individual relationships they have and make lending decisions based more heavily on the previous lending encounters they have had with said borrower. In this case, Dages (2000) points out that banks use lending to help established customers, "smooth over the effects of cyclical fluctuations or consumption" (p. 20). Therefore, when the business cycle is contracting, lending increases to offset the negative economic condition being experienced by businesses. On the other hand, during expansions, borrowers pay back the loans taken during the downturn rather than taking on more loans. Because the number of loans made during expansions shrinks, lending is counter-cyclical. While the author provides explanations for both, the majority of the literature does not support Dages' counter-cyclical relationship lending theory. Rather, it focuses on lending as a procyclical variable.

When describing why lending is procyclical, literature offers a few different explanations. The first and most prevalent comes from Athanasoglou (2014), and relates to the efficient market hypothesis. The efficient market hypothesis states that borrowers and lenders are all privy to the same information in markets, and all individuals make rational investment decisions based on that information. Therefore, banks make loans having a full set of information. The same goes for borrowers—when they take out a loan, they have a full set of information. The efficient market hypothesis suggests, then, that both lenders and borrowers have the same information sets and make/borrow loans trusting and knowing the same present and future economic conditions.
The ideas presented thus far allude to the notion that banks play a role in driving the business cycle. Athanasoglou (2014) says the main reason for procyclicality in variables related to the banking sector is deviations from the efficient market hypothesis. Later in his article, Athanasoglou (2014) also gives attention to the efficiency of banks in the market. He built upon the idea of banks driving the business cycle by writing that, "during the upward phase of the cycle, . . . loans are granted to investments with marginally positive or even a negative net present value" (p. 64). By making loans that banks would not have normally made, or certainly would not have made during a contraction, they are encouraging the expansion of the business cycle. On the contrary, when banks conservatize their lending agenda during recessions, it emphasizes the economic slowdown, which accentuates the negative impacts of a contraction.

In credit markets, rather than having equal information sets, borrowers and lenders are subject to asymmetric information. As noted above, Athanasoglou (2014) claims asymmetric information is the strongest cause of procyclicality (p. 61). Further, he noted borrowers have the upper hand in regard to knowledge about a loan (Athanasoglou 2014). This is because borrowers are able to withhold information/ their concerns from a bank when applying for a loan. And, when banks practice transactional lending they support procyclicality. So, banks are mostly focused on the numbers of the loan rather than the personal details. Overall, asymmetric information in favor of the borrower leads to banks making more loans when the numbers appear better in an expansion, and fewer loans in a contraction. These tendencies are what drive the procyclical nature of bank lending.

Along with positive economic conditions influencing banks to lend more, Athanasoglou (2014) suggests that a bank's competition also has an influence on their lending decisions. While I am not accounting for fellow bank competition in my project,

I am noting it here as it is discussed in the literature. Bank competition pairs with positive economic conditions and urges banks to lend more in good economic times. For example, if a bank were considering tapering their lending because they were lending too aggressively, the actions of their competition would most likely make that decision for them. Athanasoglou (2014) writes, "bank managers and large institutional investors tend to follow their competitors, therefore adding to the market volatility" (p. 61). So, the more each bank increases (decreases) lending in an expansion (contraction), the more those decisions dissipate throughout the local banking sector, and the more pronounced the business cycle becomes.

A separate idea presented in the literature is that single-market banks react differently to regional economic changes than multi-market banks do. Prior to the financial crisis, single-market banks were very common. However, since 2007, over 500 banks have failed. This means that over 500 banks have closed or were bought out by a larger bank. The buying of small banks by larger banks has led to the presence of more multi-market banks than there were prior to the financial crisis. The increase in multi-market banks has created new trends for the banking sector and its reactions to regional economic shocks.

Keeton (2009) explains that studying how multi-market banks react to changes in regional economic indicators is relevant, because for local communities, a change in bank performance, "affects the volatility of [the community's output and employment]" (p. 5). But, the effects of bank performance do not stop there. Not only does bank performance have local impacts, but also Keeton (2009) notes that the, "distribution of credit across markets can affect overall productivity and growth" (p. 5). Therefore, a shift to multi-market banking has impacts on a greater number of geographical locations due to banks being integrated in multiple markets.

In regard to the sensitivity of multi-market banks compared to single-market banks, Keeton (2009) finds multi-market banks are not as sensitive to changes in local economic indicators. Being involved in multiple markets does not allow banks to be as in tune with local economic conditions. When a bank is only involved in one market, they are, for the most part, only greatly impacted by changes in supply and demand in that area. However, multi-market banks are impacted by changes in economic conditions in multiple areas. Therefore, they may not be fully aware of each market they are in and how it is doing economically. In general, it is expected that multi-market banks will be less sensitive to changes in the business cycle compared to single-market banks.

Multi-market banking brings new characteristics to the supply of loanable funds. In a single-market bank, if loan performance decreases, lending levels also decrease. However, if loan performance decreases for a multi-market bank, the bank may not have to immediately decrease lending levels to account for poor loan performance. Rather, multi-market banks may be able to pull funds from another market they are in that is faring well and supplement the need in the bank with poor loan performance. Being able to do this allows the supply of loanable funds for multi-market banks to be less responsive, or more inelastic, to local economic shocks compared to single-market banks (Keeton 2009). A similar reaction is seen with demand side shocks.
Prior to multi-market banking, if the demand for loans decreased, single-market banks had to either adjust their interest rate to spur lending or hold tight until demand increased. However, if a multi-market bank experiences a decrease in demand in one of their markets, there is not as comprehensive of an effect on the bank as a whole. Because multi-market banks are diversified in location, one market performing poorly can be outweighed or neutralized by another market performing well (Keeton 2009). Overall, multi-market banking causes banks to be less reactive to localized economic shocks.

Berrospide and Keeton (2013) discuss these new trends and build upon Keeton's previous work. They assign the new trends the substitution effect and the spillover effect. In a culminating statement, Berrospide (2013) notes, "multi-market banks should reduce local lending less than single-market banks in response to adverse local loan supply shocks" (p. 2). While Keeton's earlier work agrees with this statement, Berrospide (2013) concludes with a different idea for demand shocks. Berrospide (2013) claims that in a contraction, "multi-market banks should

reduce local lending more than single-market banks" (p. 2). He grounds these assertions in the spillover and substitution effects. The spillover effect captures supply side changes. These are changes in lending a bank makes in region B due to adverse economic conditions in region A. The spillover effect says that if region A is experiencing negative economic conditions, banks will reduce lending in that region and increase lending in region B, given region B is not experiencing adverse economic conditions. Next, the substitution effect says that if there is a negative demand shock in one region, banks will substitute lending in other sectors and pull out of the poorly performing sector. These ideas are examples of new trends being seen with the increase in multi-market banking. While I am not controlling for multi-market versus single-market in my research, it is an area that future research may want to delve into as multi-market banks are becoming more and more prevalent.

III. Theory

The theory being used for this research is the loanable funds theory (Abel 2011). The loanable funds theory states that the amount of loans supplied and the funds saved by households to fund those loans find an equilibrium quantity and interest rate in the market for loanable funds. Firms requiring funds for capital expenditure and/or research and development (R&D) are the demanders for loanable funds. In this research, the demand will represent the demand for C&I loans. I expect the demand for C&I loans to move in a procyclical fashion. The healthier the economy, the more businesses invest in expanding, R&D, etc.

The supply of loanable funds comes from households that put their funds into a savings account at a bank. In other words, the supply is the dollar amount of deposits in the bank that banks can loan. Banks then use the funds being saved by households to make loans to firms that want to borrow. In this research, the supply curve represents the aggregate dollar amount supplied in C&I loans. Figure 1 shows the graphical framework for the loanable funds theory.

The supply line is labeled S and the demand curve is labeled D. The value on the x-axis represents the quantity of funds loaned, and the y-axis shows the interest rate that quantity of loans is loaned at. The supply and demand interact in the market to reach an interest rate where the quantity demanded equals the quantity supplied. I expect the supply of C&I loans to move in a procyclical manner. During economic expansions, households have more funds to put aside and save, so the level of deposits in the bank increases. The increase in available funds and the increase in demand for C&I loans causes the amount of dollars supplied in C&I loans to increase as well.

These assumptions are supported by Keeton's (2009) research. In regard to the procyclicality of the demand for C&I loans, he asserts that during contractions, business activity decreases (p. 15). Because of the decrease in revenue and income, businesses will not be in a financial situation to demand C&I loans. In regard to supply, Keeton (2009) concludes economic contractions are associated with lower employment levels and income (p. 16). This supports the assumption that deposit levels will decrease during contractions. Lower employment and income levels mean individuals do not store as much money in a savings account, so deposits decrease. The decrease in deposits decreases the supply of loanable funds.

IV. Hypothesis

My research focuses on the impacts that regional economic indicators and bank-specific variables have on C&I loans. Overall, I hypothesize that C&I loans made by commercial banks are procyclical and sensitive to changes in state GDP and personal income growth rates, state HPI, state unemployment rates, the real loan rate, bank ROA, credit quality, and capital-to-asset ratio. An economic expansion will result in an increase in C&I loans. Further, an increase in the overall health of the bank or economy, or a decrease in a bank's capitalization will also result in an increase in C&I loans.

V. Data Description

5.1. Variables Description and Preliminary Diagnostics

This research analyzes the effects of both regional economic indicators and bank specific indicators on the level of C&I lending in the 10 Midwestern states of Illinois, Iowa, Indiana, Kentucky, Kansas,

Michigan, Minnesota, Missouri, Ohio, and Wisconsin. The dependent variable in this study is Commercial & Industrial (C&I) loans. These loans are a type of loans banks make, and they are the riskiest. As noted in the Literature Review, C&I loans have a cyclical component to them. Further, they are influenced by the business cycle and condition of the banking sector. Because this research is analyzing how both regional economic indicators and overall bank health impact C&I loans, there are multiple economic and banking variables used.

The regional economic indicators included in this study are state GDP growth, personal income growth, state HPI, and state unemployment rate. State GDP growth and personal income growth are used as proxies for local business cycles. State GDP growth measures the yearly increase or decrease in state GDP. Personal income growth measures the yearly growth in household incomes in each state. The HPI is a measure of housing prices in each state, and state unemployment rates capture the unemployed population as a share of the labor force in each state. Along with regional variables, state-level, bank-specific variables are also used in this research and are addressed next.

The bank-specific variables in this study are bank return on assets (ROA), credit quality, and capital-to-asset ratio. A bank's ROA is a measure of bank profitability. It measures the return banks get on their assets, i.e. how efficiently a bank's management generates revenue from the bank's assets. A higher ROA means banks are making more profit, and a lower ROA means banks are making less profit. Credit quality is calculated by dividing the total provision for bad loans and leases by total loans. It captures the quality of banks' credit as well as credit risk. A higher credit quality means banks are making poorer quality, riskier loans. Lastly, the capital-to-assets ratio is calculated by dividing total equity capital by total assets. This ratio shows a bank's capital as a share of total assets. More capitalized banks are considered safer and less risky, and hence are more credit worthy.

I acquired all relevant data from multiple sources. Each variable was collected at the state level for each of the ten states included in the study. First, I collected the data for the variables representing the overall banking industry in each state from the FDIC website . Bank ROA is of annual frequency from 1966-2013. To calculate credit quality I downloaded the provision for loan and lease losses and total loans. They are annual frequency and range from 1967-2013. Calculating the capital-to-asset ratio required downloading banks' total equity capital and total assets. Again, they span from 1966-2013.

For regional economic indicators, I used the US Bureau of Economic Analysis (BEA) for state GDP. This data are also annual frequency ranging from 1966-2013. Next, I downloaded unemployment rates from the US Bureau of Labor Statistics (BLS). Again, the data are annual frequency, but range from 1976-2013. State HPI was found on the US Federal Home Finance Agency (FHFA) website in annual frequency for the years 1975-2013. After downloading these variables, I put them into real terms using the national CPI (sourced from the BLS). I used 2009 as the base year and converted all values into 2009 CPI values. This will allow accurate comparison of changes in the variables over time by accounting for inflation. The bank prime loan rate is the interest rate banks charge on loans to businesses. It was sourced from the U.S. Federal Reserve Board website and was adjusted for inflation to express it in real terms. A summary of these variables, their description, and source are summarized below in Table 1.
Figure 2 shows the total dollar amount loaned in C&I loans for the years 1966-2013 for all ten states combined.

The greatest drop in the inflation-adjusted C&I loans occurred during the financial crisis around 2008. As can be seen in the recession in the late 1980's and early 1990's, a recession brings about a decrease of some magnitude in the level of C&I loans. However, the magnitude of the decrease in C&I loans during 2008 is much greater than the decrease in the late1980s-early1990s recession, signaling the most recent crisis had a larger impact on C&I lending in the Midwest. Figure 3 plots the overall ROA for all banks in these 10 states. An ocular view shows the dramatic decline in the overall health of banks in the ten-state region during the financial crisis is easily noted by the dramatic dip around 2008. This graph shows how bank profits declined during the last financial crisis as well as during the banking crisis of the late 1980s-ear-

ly 1990s. And, as with lending levels, the magnitude of decrease in bank ROA in the recent crisis was far greater than any other decrease in the series. Notably, in year 2009 banks in these 10 Midwestern states had negative ROA, which means they suffered losses. Table 2 shows the average values for all variables in each state from 1966-2013.

Overall, each state in the Midwest region has relatively similar values for the variables being analyzed. This shows each state was in a relatively similar economic condition throughout the years 1966-2013. Ohio has the greatest average C&I loans at $70.89 million, and Kansas has the lowest with $5.52 million. In regard to state GDP growth, Minnesota has the highest growth rate (2.62%), and Michigan has the lowest (1.092%). For overall bank heath, Illinois banks have the lowest ROA ratio value (0.007) and there is a three-way tie between Kansas, Kentucky, and Ohio for the highest ROA ratio value (0.010).

5.2 Panel Unit Root Tests

The time-series statistical properties of the variables were tested using panel unit root tests. Table 3 shows the results for the unit root tests. All variables are first expressed in logarithmic form in levels and tested for panel unit roots. The null hypothesis of both tests, Levin, Lin & Chu (2002) and Im, Pesaran and Shin (2003), is that the variable has a unit root and is non-stationary. The rejection of the null implies the variable is stationary in levels form. Based on the two-panel unit root tests, log of real C&I loans, log of housing price index, and log of credit quality were first-differenced to ensure stationarity. Next, the estimation model and corresponding results are presented.

VI. Empirical Model

Regressions were run using two state-level indicators, real state GDP growth and real personal income growth, separately. First, regressions were run using real state GDP growth (Equation 1).

$\Delta\ln(\text{C\&I loans}) = a0 + a1\ (\text{Real state-GDP growth}) + a2\ln(\text{unemployment rates}) + a3\Delta\ln(\text{state HPI}) + a4\ln(\text{ROA}) + a5\Delta\ln(\text{CreditQuality}) + a6\ln(\text{Capital-to-Assets}) + a7\Delta\ln(\text{real loan rate})$

(Equation 1)

Four different model specifications on the aforementioned estimation equation were used. The first two regressions had no fixed effects, with the latter including the lagged C&I loans as an explanatory variable (Equation 2) to examine if the lagged value has any significant impact on the present period's value.

$\Delta\ln(\text{C\&I loans}) = a0 + a1\ (\text{Real state-GDP growth}) + a2\ln(\text{unemployment rates}) + a3\Delta\ln(\text{state HPI}) + a4\ln(\text{ROA}) + a5\Delta\ln(\text{CreditQuality}) + a6\ln(\text{Capital-to-Assets}) + a7\Delta\ln(\text{real loan rate}) + a8\Delta\ln(\text{C\&I loans})_{t-1}$

(Equation 2)

Next, regressions were run with fixed cross-sectional and non-fixed period effects, i.e. no yearly dummies. Fixed effects are used to account for any heterogeneity across states or time that is not accounted for by the independent variables in the regression equation. Lastly, a regression was run with both cross-section and period fixed effects, i.e. with state and time dummies. Real state GDP growth was then replaced with real personal income growth and the same four model specifications were used (Equation 3). Both state GDP growth and personal income growth were used in order to explore the best proxy for the business cycle. The results section discusses which of these was a better proxy as indicated by the regression results.

$\Delta\ln(\text{C\&I loans}) = a0 + a1\ (\text{Real Personal Income growth}) + a2\ln(\text{unemployment rates}) + a3\Delta\ln(\text{state HPI}) + a4\ln(\text{ROA}) + a5\Delta\ln(\text{CreditQuality}) + a6\ln(\text{Capital-to-Assets}) + a7\Delta\ln(\text{real loan rate}) + a8\Delta\ln(\text{C\&I loans})_{t-1}$

(Equation 3)

The regression results are reported in the following section.

VII. Results

The following tables, Tables 4 & 5, display the regression results. The results from the regressions with the real state GDP growth are shown in Table 4. The regression results without both state and time dummies are labeled Model 1. Model 2 represents the regression using neither state nor time dummies, but including lagged C&I loans. Model 3 results represent the regression with fixed state dummies only. Lastly, Model 4 shows results from the regression without the real loan rate and lagged C&I loans, but with both

state and time dummies.

The various regression specifications provided robust results in regard to the variables that impact C&I loans. The significant variables were log of the capital-to-assets ratio, log of bank ROA, state real GDP growth, and the growth rate of the log of the real loan rate. Model 2, which represents the regression where the lagged log of C&I loans growth rates were included in the independent variables, shows that this variable is significant. The results show that a 10% increase in a bank's capital-to-assets ratio will result in a decrease in real C&I loans of 1.2%-2.0%. When a bank's ROA increases 10%, real C&I loans increase between 0.6%-0.7%. A 10% increase in state GDP growth will result in an increase in real C&I loans of 6.7%-7.0%. If the real loan rate increases 10%, real C&I loans will increase 7.4%-7.8%. And, a 10% increase in real C&I loans in the previous year causes an increase in real C&I loans in the current period by 0.9%. Interestingly, Model 4, which uses both time and state dummies, reports that the real state GDP growth is not significant. A plausible explanation for this will come later. Thus, it can be concluded that bank-specific variables and state GDP growth have a significant impact on real C&I loan growth.

Analyzing the statistical properties of the four models, the F-statistics are all significant at the 99% confidence level. This means that the regression equations fit the data well. The R-squares are low due to the use of first-differences, especially for the dependent variable, real C&I loans. Between the four models, their explanatory power ranges between 9%-25%. The Durbin-Watson statistic, (D-W stat), ranges from 1.81-1.97 for all models. This is close to the desired value of 2, and means the residuals are not autocorrelated. As mentioned, the same regression specifications were used, but personal income growth was inserted into the equation in the place of real state GDP growth. These results are reported in Table 5.

The results from the regressions with real state personal income growth mirror those for real state GDP growth. Model 1 represents the regression results without both state and time dummies. Next, Model 2 shows results from the regression with neither state nor time dummies, but with the lagged value of real C&I loans. Model 3 results are from the regression with state dummies but not time dummies. And, Model 4 shows the results from the regression without the loan rate and lagged C&I loans, but including both state and time dummies.

As with the real state GDP growth results, the significant variables are log of the capital-to-assets ratio, log of bank ROA, state real personal income growth, and the growth rate of the log of the real loan rate. Model 2, which represents the regression where the lagged log of the C&I growth rates were included in the independent variables, shows that this lagged variable is significant. Model 4 reports that the state real personal income growth is not significant. Though, overall it can be concluded that bank-specific variables and state real personal income growth most impact real C&I loans. According to the results, when real state personal income is used rather than real state GDP growth, a 10% increase in a bank's capital-to-assets ratio will result in a decrease in real C&I loans of 1.1%-2.0%. When a bank's ROA increases 10%, real C&I loans increases between 0.5%-0.7%. A 10% increase in real personal income growth will cause real C&I loans to increase between 11.00%-12.00%. If the real loan rate increases 10%, real C&I loans will increase 8.5%-8.9%. Comparing the coefficients of real state personal income growth with that of real state GDP growth, I found state personal income growth to have a larger coefficient. This signifies that real C&I loans are more sensitive to personal income growth than to state GDP growth.

The statistical properties for the regressions with personal income growth were very similar to the regressions that had state GDP growth that are reported in Table 4. The F-statistics were all significant at the 99% confidence level meaning the regression equations fit the data well. The R-squares are low again because of the use of first-differences. Between the four models, their explanatory power ranges between 10%-25%. The D-W stat ranges from 1.83-1.96 for all models signifying autocorrelation is not a concern.

The similar results between the two state-level economic indicators are not surprising. First, the negative coefficient for the capital-to-asset ratio implies

banks with a higher capital to asset ratio lend less in C&I loans. As mentioned in the introduction, C&I loans are some of a bank's riskiest categories of assets. Therefore, as banks become more capitalized, they will decrease their lending in C&I loans. The negative coefficient also implies banks in the Midwest are risk-averse and invest in other, safer forms of assets rather than C&I loans. The next significant variable is credit quality. A rise in credit quality means a deterioration of banks' asset quality. When the quality of a bank's credit falls, banks increase their engagement in risky lending practices. The other bank-specific variable that is significant is ROA. This follows, because as bank's profits rise, banks fund more C&I loans.

The non-bank specific significant variable is the real interest rate. As the interest rate that banks charge on loans adjusted for inflation rises, banks are incentivized to make more loans due to higher real returns on loans. This is in accord with the loanable funds theory. According to the theory, as the interest rate rises, the supply of loanable funds rises.
The positive and significant effect of both real state GDP growth and real personal income growth implies C&I lending in the Midwest is procyclical in nature. As the Midwest experiences an economic boom, both real state GDP growth and real personal income growth rise, which in turn raises C&I loans.

The other variables, state HPI and unemployment rate, were not significant. The state HPI may not have proven significant in my research, as it is a measure of residential house values. So, while a rise or fall in the HPI may signal an economic expansion or recession, the direct impact of this will most likely not be seen in real C&I loans, but rather in real estate loans. The next insignificant variable is the state unemployment rate. Changes in the unemployment rates will most likely not have an effect on C&I loans. Instead, because unemployment has a more direct impact on individuals, unemployment rates will most likely impact loans to individuals (such as auto loans) made by banks .

Lastly, as noted, both real state GDP growth and real personal income growth were insignificant in the regression with both state and time fixed dummy variables. This is because the number of state dummies, (10), are far less than the number of year dummies. And, the large number of year dummies in the sample of 368 observations affects the state real GDP growth rates and makes them insignificant. Because growth rates themselves are correlated with time, the fixed time dummies make both of these variables insignificant.

VIII. Conclusion

C&I loans are among the riskiest loans that banks make. This is simply because one can never be certain of how successful a business will be, and thus, whether or not it will be able to pay off its loan. This research aimed to examine the impacts of regional economic cycles and the health of commercial banks on real C&I loans in the Midwest. To study these relationships, regressions were run using two state-level indicators: real state GDP growth and real personal income growth. Several other state economic and banking industry variables were used as well. The significant variables identified in my regressions were the same regardless of which state-level indicator was used.

The results show that the main variables which impact real C&I loans are bank profits, the real loan rate, real state GDP growth, personal income growth, and the capital-to-assets ratio. Real C&I loans in the Midwest are increased by increasing bank profits (ROA). Likewise, an increase in the lending rate, the state GDP growth rate or personal income growth rate, or a decrease in a bank's capital-to-asset ratio will also significantly increase C&I loans. Moreover, I found real personal income growth to have a greater impact on C&I loans than state GDP growth. A 10% increase in real personal income results in an 11%-12% increase in real C&I loans, while a 10% increase in real state GDP growth only causes a 6.70%-7.00% increase in real C&I loans.

A policy that has had an impact on C&I lending is the Dodd-Frank Act, which began in 2010. It has caused a general increase in banks' capital-to-assets ratios since its enactment. The Dodd-Frank Act inserted new requirements, which demanded banks to spend more time and resources ensuring they are following proper documentation and reporting standards. This extra push for proper banking also discourages banks from engaging in

risky lending behaviors, like lending more C&I loans, which occurred prior to the financial crisis. A decrease in risky behavior leads banks to be more risk-averse, and practice safer lending practices. So, the Dodd-Frank Act provides some explanation for the current decrease in C&I loans. My research also provides some explanations as to the banking industry's situation during the recent financial crisis.

During the crisis, banks were flooded with liquidity by the US Federal Reserve Board. This liquidity allowed banks to be more capitalized. As the results show, the coefficient for capital-to-assets ratio is negative and significant. Therefore, the additional liquidity caused a decrease in risky C&I loans. Banks in the Midwest were operating over cautiously and ignoring potential income earning investment opportunities by making fewer C&I loans and investing in more capital. In regard to the overall banking sector, the results show that for commercial banks in the Midwest, it is imperative that banks' profits rise for them to give out more C&I loans to businesses. Moreover, the positive coefficient for real state GDP growth and real personal income growth imply real C&I loans are procyclical to regional economic activity.

Overall, my research proved quite conclusive as to what regional economic indicators and bank-specific variables have an impact on real C&I loans. Some areas of future research are to expand this study to include all 50 states and the District of Columbia. The focus of this research was on 10 states in the Midwest region, but adding in the remaining 40 states would allow one to draw more conclusive results in regard to the United States' entire banking industry. A second avenue for future research is to include other types of loans that commercial banks make aside from C&I loans. The other types of loans banks make are agricultural loans, loans to individuals, and real estate loans. Including all loan types will enable one to provide a comparative prospective by comparing the sensitivity of each category of loans to state GDP growth and personal income growth. Adding loans to individuals would most likely cause the state unemployment rate to be significant, because the amount of loans made to individuals is heavily dependent on one's income and employment. Likewise, state HPI is likely to have a significant impact on real estate loans. A third variable to control for in future research is whether or not a bank is a single-market or multi-market bank. As mentioned in Section II, scholars suggest these banks will react differently to changes in regional economic conditions. Distinguishing between the two and comparing the results is another way to examine the banking sector in another way. These courses of future research will allow one to draw more complete results that more wholly represent commercial bank lending throughout the United States.

References:

Abel, A. B., Bernanke, B., & Croushore D. D. (2011). Macroeconomics. Boston: Addison-Wesley.

Athanasoglou, P. P., Daniilidis, I., & Delis, M. D. (2014). Bank Procyclicality and Output: Issues and Policies. Journal of Economics & Business, 7258-83.

Berrospide, J. M., Black, L. K., & Keeton, W. R. (2013). The cross-market spillover of economic shocks through multi-market banks. Econlit.

Dages, B., Goldberg, L., & Kinney, D. (2000). Foreign and Domestic Bank Participation in Emerging Markets: Lessons from Mexico and Argentina. Federal Reserve Bank of New York Economic Policy Review, 6(3), 17-36.

Federal Deposit Insurance Corporation. (2014). Real C&I Loans, Return on Assets, Credit Quality, and Capital-to-Assets Ratio.

Federal Housing Finance Agency. (2014). Housing Price Index (Data file).

Im, K.S., Pesaran, M.H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. Journal of Econometrics, 115, 53-74.

Keeton, W. R. (2009). Has Multi-Market Banking Changed the Response of Small Business Lending to Local Economic Shocks? Economic Review (01612387), 94(1), 5-36.

Koepke, M., & Thomson, J. B. (2011). Small Business Lending Continues to Struggle. *Economic Trends (07482922)*, 8.

Levine, A., Lin, C., & Chu, C.J. (2002). Unit root tests in panel data: asymptotic and finite sample properties. *Journal of Econometrics*, *108*, 1-24.

Stewart, J., Kline, A., & Peters, A. (2014). Regional Banks Turn Focus to Commercial Lending. *American Banker*, *179*(10), 13.

United States Bureau of Economic Analysis. (2014). *State Gross Domestic Product and Real Personal Income* (Data file). Retrieved from http://www.bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrdn=1#reqid=70&step=1&isuri=1.

United State Bureau of Labor Statistics. (2014). *State Unemployment Levels* (Data file). Retrieved from http://data.bls.gov/cgi-bin/dsrv?la.

Figure 1: Market for Loanable Funds

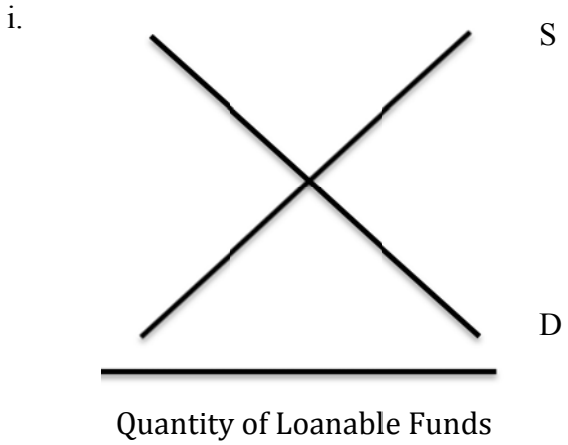

Figure 2: Real C&I Loans for All States

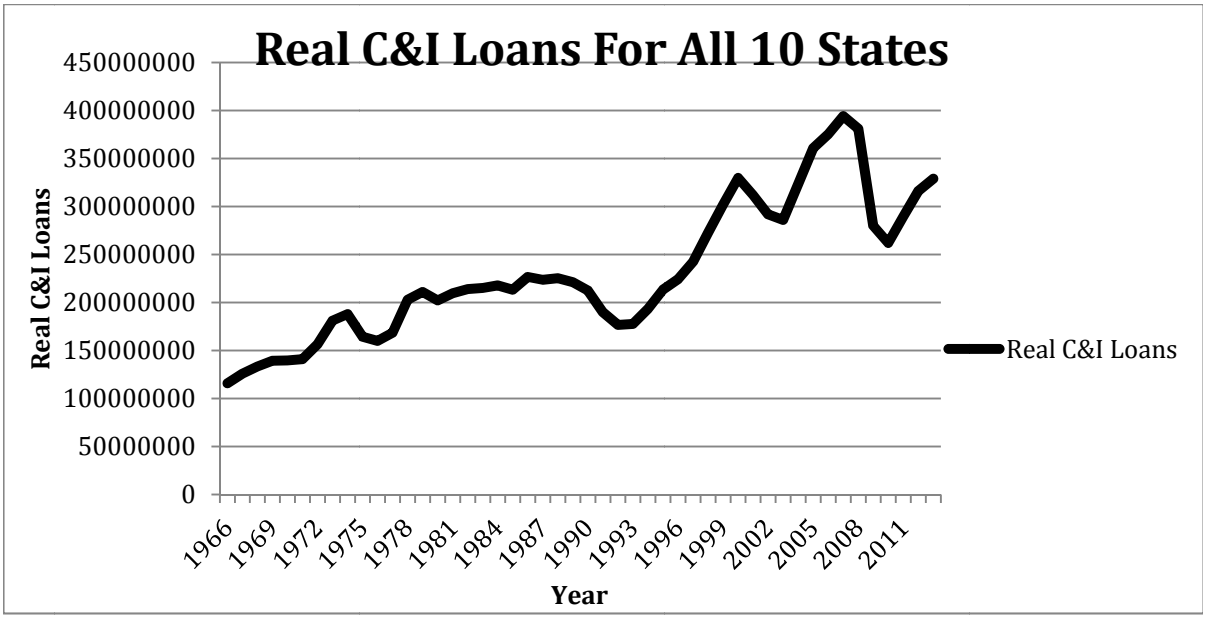

Figure 3: Bank Return on Assets for All States

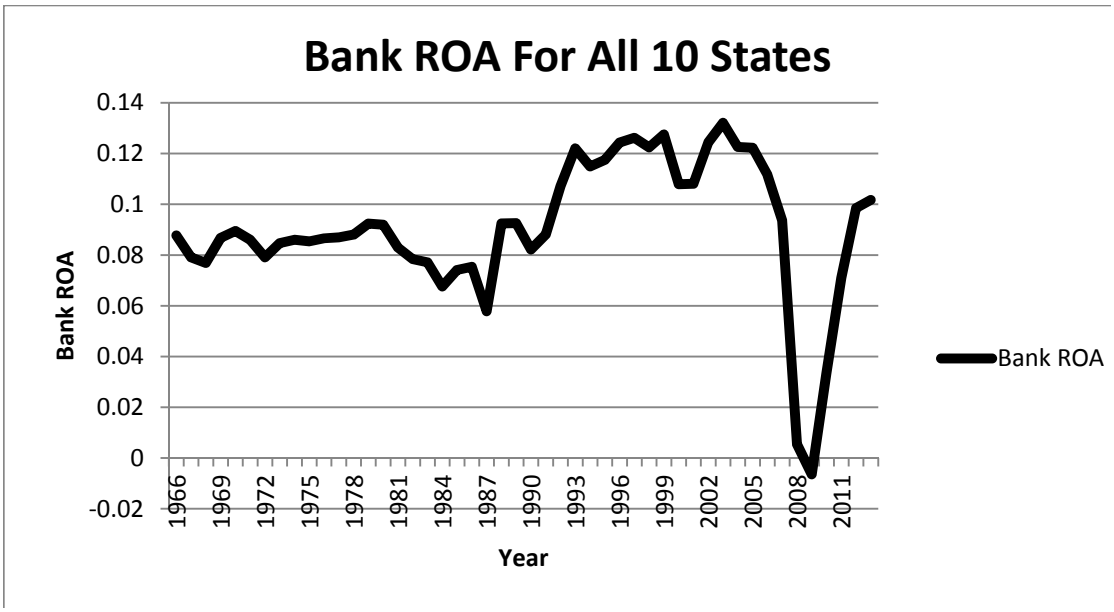

Table 2: Average Values for Variables by State

State	Real C&I Loans	ROA	Credit Quality	Capital-to-Assets	State HPI	Unemployment Rate	State Real GDP Growth	State Real Personal Income
Illinois	65,941,985.39	0.007	0.007	0.076	208.466	7.087	1.620	1.734
Indiana	10,565,238.14	0.009	0.005	0.082	170.818	6.234	1.846	1.905
Iowa	5,794,521.93	0.009	0.005	0.087	159.529	4.808	1.956	1.913
Kansas	5,521,575.34	0.010	0.007	0.089	155.470	4.805	2.242	2.235
Kentucky	6,420,949.59	0.010	0.005	0.084	184.569	6.997	2.065	2.466
Michigan	26,388,993.76	0.008	0.006	0.078	185.825	8.313	1.092	1.491
Minnesota	14,906,118.64	0.009	0.006	0.077	198.069	5.034	2.623	2.673
Missouri	12,762,458.50	0.009	0.006	0.081	182.374	6.016	1.886	2.014
Ohio	70,899,037.52	0.010	0.008	0.078	174.852	6.903	1.464	1.589
Wisconsin	12,781,725.50	0.008	0.005	0.081	189.967	5.603	2.040	2.220

Table 3: Panel Unit Root Tests

	Levels		1st differenced	
Variable	Levin, Lin & Chu t-stat	Im, Pesaran and Shin W-stat	Levin, Lin & Chu t	Im, Pesaran and Shin W-stat
Log of real C& I Loans	-0.222	0.979	-8.003***	-9.852***
Log of Return on Assets (ROA)	-1.284*	-2.336***	-7.137***	-9.918***
Log of Housing Price Index (HPI)	-1.426*	-0.894	-2.534***	-4.356***
Log of Unemployment Rate	-1.533*	-1.301*	-8.144***	-6.401***
Log of Credit Quality	0.360	-2.869***	-6.778***	-5.448***
Log of Capital-to-Assets Ratio	-3.153***	-1.507*	-13.369***	-14.023***
State real GDP Growth	-11.219***	-10.128***	-11.673***	-19.770***
Log of real Loan Rate	2.823	0.277	3.686	11.888***
State real Personal Income Growth	-1.650**	-2.302**	-13.852***	-11.440***

* Denote rejecting the null hypothesis of unit root process. *** = at the 1% level, ** = at the 5% level, and * = at the 10% level.

Table 4: Results for GDP Growth

	Model 1	Model 2	Model 3	Model 4
c	-0.03	-0.01	-0.04	-0.11
	(-0.24)	(-0.10)	(-0.26)	(-0.36)
Δlog(Credit quality)	0.02	0.02	0.02	**0.07*** **
	(1.27)	(1.11)	(1.27)	(2.80)
log(Capital-to-Assets)	**-0.13***	**-0.12****	**-0.12****	**-0.20***
	(-2.44)	(-2.15)	(-2.14)	(-1.92)
log(Return on Assets)	**0.06*** **	**0.06*** **	**0.06*** **	**0.07****
	(2.96)	(2.91)	(2.40)	(2.37)
State real GDP growth	**0.67*** **	**0.68*** **	**0.70*** **	-0.10
	(2.86)	(2.87)	(2.93)	(-0.20)
log (Unemployment rates)	0.00	0.01	-0.01	-0.03
	(0.04)	(0.24)	(-0.19)	(-0.36)
Δlog(HPI)	0.00	0.01	0.05	-0.11
	(0.01)	(0.04)	(0.21)	(-0.36)
Δlog(real loan rate)	**0.74***	**0.77***	**0.78***	
	(1.66)	(1.73)	(1.74)	
$\Delta\log(\text{real C\&I loans})_{t-1}$		**0.09***		
		(1.62)		
State dummies	No	No	Yes	Yes
Year dummies	No	No	No	Yes
N	368	368	368	368
R^2	0.09	0.10	0.11	0.25
F-Stat	5.13***	4.84***	2.72***	1.99***
D-W stat	1.81	1.97	1.86	1.94

* Denote rejecting the null hypothesis of insignificance. *** = at the 1% level, ** = at the 5% level, and * = at the 10% level. Terms in brackets denote the t-stats.

Table 5: Results for Real Personal Income

	Model 1	Model 2	Model 3	Model 4
c	-0.04	-0.02	-0.05	-0.11
	(-0.32)	(-0.18)	(-0.33)	(-0.37)
Δlog(Credit quality)	0.02	0.01	0.02	**0.07*** **
	(0.96)	(0.80)	(0.98)	(2.83)
log(Capital-to-Assets)	**-0.12****	**-0.11****	**-0.11****	**-0.20***
	(-2.30)	(-2.05)	(-1.98)	(-1.88)
log(Return on Assets)	**0.06*****	**0.06*****	**0.05****	**0.07****
	(2.89)	(2.84)	(2.34)	(2.33)
State real Personal Income growth	**1.13*****	**1.10*****	**1.21*****	0.04
	(3.40)	(3.31)	(3.61)	(0.06)
log (Unemployment rates)	0.01	0.01	0.00	-0.02
	(0.28)	(0.43)	(0.08)	(-0.32)
Δlog(HPI)	0.01	0.02	0.06	-0.12
	(0.06)	(0.10)	(0.27)	(-0.40)
Δlog(real loan rate)	**0.85***	**0.88****	**0.89****	
	(1.91)	(1.97)	(2.00)	
$\Delta\log(\text{real C\&I loans})_{t-1}$		0.07		
		(1.39)		
State dummies	No	No	Yes	Yes
Year dummies	No	No	No	Yes
N	368	368	368	368
R^2	0.10	0.10	0.12	0.25
F-stat	5.66***	5.20***	3.02***	1.99***
D-W stat	1.83	1.96	1.88	1.95

* Denote rejecting the null hypothesis of insignificance. *** = at the 1% level, ** = at the 5% level, and * = at the 10% level. Terms in brackets denote the t-stats.