INFORMATION EXTERNALITIES AND SMALL BUSINESS LENDING BY BANKS: A COMPARISON OF URBAN AND RURAL COUNTIES IN THE U.S.

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Abstract: It is widely recognized that small business is not only an important source of employment but is the genesis of virtually all successful large enterprises. Given their size and characteristic opaqueness, Small and Medium Enterprises (SMEs) tend to be more financially constrained than large firms because of the lack of access to external financing from both banks and capital markets. Though building a relationship provides the loan officer more information about the individual entrepreneur, there are other factors that can influence the success or failure of an enterprise. We divide the *entrepreneurial information* available to bank loan officers into three segments: information about competition in the local banking market, information about success and failures of other SMEs in the local market, and information about how well other banks are performing in the local market. The primary purpose of our paper is to find proxies for this entrepreneurial information and to gauge its impact on bank lending in a geographical area. We then test to see how our proxies for this information impact the dollar volume of small business lending. Our analysis uses county level data as the geographical area and controls for general economic conditions such as the level of income and the endowments of human capital. The paper confirms the importance of entrepreneurial information in influencing the level of SME lending by banks.

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Introduction

It is widely recognized that small business is not only an important source of employment but is the genesis of virtually all successful large enterprises[16]. A prime example in the economy today would be Apple, which started with two individuals in a garage, and is now one of the two largest U.S. firms. Small businesses account for around 50% of GDP in the U.S. and are the bedrock of a strong and innovative economy. Many economists have focused their research on the role of small business in the economy and the growth and survival of small business is a top priority of policymakers. Strengthening the culture of entrepreneurship will undoubtedly be important as the 21st century continues. However, promoting entrepreneurship is not enough to ensure the survival of small business. One of the most important factors in the survival of small business is the availability of financing. Though start-ups often use an individual's savings, a credit card advance, or other personal loans, small businesses with the potential for rapid and sustained growth must rely on financing from established financial institutions. The lack of hard information about Small and Medium-sized Enterprises (SMEs) creates asymmetry of information between banks and small enterprises. For example, 'a lack of audited financial statements prevents banks from engaging in what is known as financial-statement lending, by which the loan contract terms are set on the basis of the companys expected future cash flow and current financial condition as reflected in audited statements' [3]. Other lending technologies, such as business credit scoring, asset-based lending, and factoring, also need hard information on the SMEs [7], [18], and [8].

In the U.S., banks, and especially small banks, have long played a crucial role in providing funding for start-ups and ongoing small businesses. Indeed, one of the reasons that banks are viewed as 'special' is because of the role they play in providing financing for informationally opaque companies. While information is widely available for publicly traded companies, this is not the case with small firms. Given their size and characteristic opaqueness, SMEs tend to be more financially constrained than large firms because of the lack of access to external financing from both banks and capital markets. Banks who finance SMEs face a lack of accurate and reliable information on the financial condition and performance of small firms. Information about the probability of success comes from the bank's loan officer establishing a relationship with the small business entrepreneur. [23]

Though building a relationship provides the loan officer more information about the individual entrepreneur, there are other factors that can influence the success or failure of an enterprise. For example, loan officers will want to know the history of successes and failures of small businesses in their geographical area and in particular industries. This gives them more insight about the

level of lending risk in the area and helps answer the question of whether a new firm in a particular sector or industry can be successful. External factors would be how well the economy is doing in the geographical area—whether unemployment is high or low, for example. Other factors to be considered would be the amount of competition for bank loans in the area and the health of local banks. Are other banks that have been making loans performing better or worse than other banks? Also knowing the past success and failure rates for other small businesses in the area would be important both in general and in a particular industry. All of this external information used by loan officers we characterize as *entrepreneurial information*. The primary purpose of our paper is to find proxies for this entrepreneurial information and to gauge its impact on bank lending in a geographical area. Our analysis uses county level data as the geographical area. We control for general economic conditions such as the level of income and the endowments of human capital.

We divide the entrepreneurial information into three segments: information about competition in the local banking market (number of banks relative to SMEs), information about success and failures of other SMEs in the local market (births and deaths of SMEs), and information about how well other banks are performing in the local market (performance and charge-offs). We then test to see how our proxies for this information impact the dollar volume of small business lending. Though we use county level data, we divide these counties into metro areas, micro areas, and rural areas. This allows us to find out whether the factors that influence SME lending in metro counties will have the same impact on the lending practices in the rural counties and vice versa.

Section 1 reviews the literature on information and bank lending, section 2 discusses the data that were used in our research, section 3 states our hypotheses, section 4 contains our empirical analysis and the final section summarizes our findings and comments on future research.

1 Adverse Selection and Entrepreneurial Information in Bank Lending

Our research seeks to explain why SMEs in some counties receive more loans than SMEs in other counties and whether entrepreneurial information can be used by bank loan officers to overcome the problem of informational asymmetry when lending to local small businesses or start-up companies.

To begin with, decisions by loan officer's about making loans to small businesses suffer from a problem that economists call 'adverse selection.' Consider the market where two qualities of a good are offered. Buyers and sellers in the same manner arrange their preferences in terms of products of varying quality, but only sellers know the quality of each individual good; buyers in the best case know only the distribution of the quality of previously sold goods. If buyers cannot in any way distinguish good goods from bad goods, then, along with high-quality products, they

will always find bad-quality products as well. Such a market is an illustration of the problem of adverse selection that was introduced by Akerlof [1]. He analyzed a market where buyers are unable to distinguish between high-quality and low-quality used cars—lemons.

In his used car scenario, Akerlof considered the role uneven information plays between two agents involved in a market transaction. Clearly, the two agents differ in their knowledge of the quality of the car in question, an informational imbalance which Akerlof showed could drive good cars out of the market. Similarly, lenders rely on different kinds and levels of information about localities and regions to make key economic decisions. Taking into account the problem of adverse selection, the initial reaction of a loan officer is to not lend to the firm that s/he considers a risk to be low-quality; that is firms in which the loan officer lacks a sufficient amount of information about its credibility. To overcome the adverse selection problem requires that loan officers acquire more information about the small business. In doing so, the loan officer looks at not only the internal characteristics of the small business, but also external factors which could impact the probability of loan repayment.

In that sense, uncertainty about a particular loan in a particular place is partially a function of the amount of information that the lender has about that location[27]. The concept of geographical informational asymmetries distills the notion that such information tends to vary directly with geography. Rural and inner city markets often have disproportionately ‘thin’ information about their own prospects because there has not been as much experience in as wide a range of economic contexts as in the typical urban/suburban market [38]. Promising entrepreneurial opportunities may indeed exist in marginalized areas, but the uncertainty caused by thin information will tend to make the hurdles for loans higher than under conditions of full information for otherwise identical projects. Even given identical underlying probability distributions of success, projects from areas which simply have fewer data points will have higher variance, heightening risk perceptions, and raising the noted loan hurdles [39]. This disadvantage makes it likely that entrepreneurial projects will be suboptimally pursued in these areas, thereby entrenching the regions’ marginalization due to the low level of information that loan officers and other key economic agents have about them. In a growth model of US counties, [authors omitted] [12] show that information provided by entrepreneurial activity does in fact significantly affect regional growth prospects.

Lang and Nakamura [25] show how information externalities can lead to inefficient credit rationing in low-volume markets. They develop a model of mortgage redlining, which captures the dynamic information gathering. This is implied by the use of appraisals in mortgage lending. In their model, the precision of appraisals depends on the quantity of previous home sales. In a neighborhood with a large number of recent home sales, bank appraisals are more precise than in the neighborhood with few recent home sales. Lenders require larger down payments in the neighborhood with inaccurate appraisals. There is thus a dynamic information externality in

which past purchases influence current purchases. What this shows is that in markets with a greater amount of previous information available regarding economic activity, there is also a greater volume of loan origination in that geographic area. Banks and lending institutions see this previous information regarding economic success or failure as a signal for loan determination.

This notion of information externality was extended further by Michael Barr [5]. In his paper, he demonstrated how information externalities can produce credit constraints that affect creditworthy borrowers in *thin markets*. He defines thin markets as markets with a relatively lower level of economic activity. He showed that borrowers in low-income neighborhoods find it more difficult to obtain mortgage loans in part because lenders lack sufficient information on home sales in these thin markets. He has also explained how these informational problems can lead to a situation where creditors delay entry into low-income markets. Moreover, neighborhood externalities exacerbate these barriers, as do agency problems in financial institutions and in the market more broadly. Low-income markets can become stuck, with low volume and liquidity blocking creation of a complete market.

Another important question in the literatureof small business lending is which kind of banks do in fact lend to small firms. Many articles have been written regarding the impact of a bank size on the dollar volume of loans given to small firms. For instance, there are studies about the effects of bank consolidation through studying the role of the size of the bank in providing loans to small businesses. Economists monitored the lending activity of banks before acquisitions and after to find out how the size of the bank is correlated with lending to SMEs. Avery and Samolyk [2], Sapienza [33], Berger [9], Levonian and Soller [26] concluded that larger banks are less likely to provide small business loans than banks with less capital. Their main argument is that small banks are able to lend to small businesses at a lower cost than large banks. If larger banks suffer from higher costs of making relationship loans, then the new bank formed by the merger or acquisition should give fewer small business loans after the consolidation. Consistent with this prediction, Berger et al. [10] found that ‘after a merger, the new bank originates fewer small business loans than the independent banks prior to the merger.’ According to Berger, ‘Small banks have comparative advantages in lending to the smallest, least informationally transparent firms using lending technologies based primarily on *soft* qualitative information, while large banks tend to specialize in lending to larger firms using technologies based more on *hard* quantitative information.’ Carter, McNulty, and Verbrugge [13] in their research also suggests that small banks have an information advantage in evaluating credit. Nakamura argues that ‘small banks appear best able to lend to local small businesses because small banks have the ability to closely monitor these firms, and their tight organizational structures enable them to effectively use the resulting informational advantage.’ [30] All these results are consistent with the research presented by Petersen and Rajan [31] showed that asymmetry of information induces banks to build relationships with the borrowers. These relationships increase credit availability, in particular to the youngest and informationally opaque borrowers .

The amount of market concentration by banks is another issue affecting small business lending. There are two countervailing hypotheses about the influence of banking competition on the dollar volume of SME lending. The first hypothesis suggests that banks with market power should induce industry entry and more SME loans than competitive banks. According to Cetorelli, lending to small opaque firms requires that the bank and the borrower build a long-term relationship. [14] However, banks can sustain the cost of starting a relationship with unknown, risky entrepreneurs only if market power allows them to recoup the cost at later stages if such entrants turn out to be successful. This idea was tested by Petersen and Rajan, who argued that banks with greater market share can get a high enough profit from high-quality borrowers to offset losses from small opaque businesses. [31] Therefore, this suggests that banks with market power should guarantee more industry entry and larger dollar volume of loans to SMEs than competitive banks.

A second hypothesis suggests that in markets with a less competitive banking environment, potential entrants or existing SMEs face greater difficulty gaining access to credit than markets in which banking is more competitive. This hypothesis was tested by Cetorelli and Strahan, [15] who found that market power may reduce the entry of small firms to the market. Banks with market power will be more willing to lend to their established borrowers than to the new borrowers. The value of a banks current lending relationships will depend on the future profitability of its borrowers, which in turn depends on prospective entry and growth of new competitors. A banks incentive to support the profitability of its older clients could thus restrain its willingness to extend credit to potential industry entrants (or emerging small firms). By testing this hypothesis, Cetorelli and Strahan confirmed that the less competitive the conditions in the credit market, the lower the incentive for lenders to finance start-ups or informationally opaque SMEs.

Information about the performance of banks in a local area would be important information that could affect a particular bank loan officer’s decision to lend to an SME. In recent years banks have increasingly adopted innovative performance metrics, which assist managers in making these difficult and complex decisions. Among the large set of measures for banks performances, a distinction can be made between traditional, economic, and market-based measures of performance. Traditional performance measures are return on assets (RoA), return on equity (RoE), cost-to-income, and net interest margin. For example, Revell uses the net interest margin as a performance index for U.S. commercial banks defined as the difference between interest income and expense divided by total assets.[32]

Economic measures of performance reflect the economic profit generated by a firm, in contrast to the firms accounting earnings. The most commonly cited indicators here are economic value added (EVA), developed by Stern, Stewart and Chew[34] and risk-adjusted return on capital

(RAROC). EVA 'takes into account the opportunity cost for stockholders to hold equity in a bank, measuring whether a company generates an economic rate of return higher than the cost of invested capital in order to increase the market value of the company.' RAROC, was first implemented by Bankers Trust and it can be described as the excess return on the market per unit of market risk. Similar to EVA, this measure takes into account the banks cost of capital. However, RAROC goes further because it adjusts the value-added in relation to the capital needed. Unfortunately, it is difficult to calculate RAROC without having access to internal data. Market-based measures of performance characterize the way the capital markets value the activity of any given company, compared with its estimated accounting or economic value. The most commonly used measures include 'price-to-earnings ratio', 'price-to-book value', 'total share return', and 'credit default swap'.

Though it is common to use financial ratios for analysis of banks performance, federal regulators developed the CAMELs rating system, which summarizes the over-all performance of a bank. In 1979, the Uniform Financial Institutions Rating System was adopted to provide federal bank regulatory agencies with a framework for rating financial condition and performance of individual banks. The CAMELS acronym stands for Capital Adequacy, Asset Quality, Management, Earnings, Liquidity, and Sensitivity to Risk. Several academic studies have examined whether CAMELS model is useful for determining the performance of a bank. Most of these studies conclude that CAMELS ratings are highly useful in the supervisory monitoring of bank conditions. This paper will use a proxy to measure bank performance in different counties.[1]

In summary, given the theoretical importance of *entrepreneurial information* on the dollar volume of lending to small business by banks, in the next section we discuss the data utilized as proxies in our model estimation.

2 Data

Data on small business finance are scarce. One of the few available sources is the National Survey of Small Business Finance (NSSBF), a nationally representative sample of non-financial, non-farm small businesses sponsored by the Board of Governors of the Federal Reserve System and the U.S. Small Business Administration. This paper uses data for U.S. commercial banks over the period of 1999 through 2006 from the FDIC's Report of Condition and Income (Call Reports), made available from the Federal Financial Institution Examination Council (FFIEC). Bank Call Reports are used as the source for commercial loans to small businesses. We estimate the model using the total dollar volume of loans between $250,000 and $1,000,000 as our dependent variable.

1 Unfortunately, since CAMELS data is confidential and can only be released if a particular bank wishes it to be known, access to CAMELS data is restricted to researchers at the federal bank regulatory agencies.

Following Nakamura [30] this paper categorizes banks with assets greater than $1 billion as large banks and those with assets less than $1 billion to be small banks. Since previous studies on the role of small and large banks in lending to SMEs show that most small business lending is by small banks, we will focus on small banks. Specifically, because big banks are run from afar, it is expensive for them to obtain the qualitative information about risk that local bankers pick up naturally by being part of the community and interacting with borrowers.

The data for the paper was stratified by region: metro, micro, and rural counties. In addition, those banks with missing or unusable data were eliminated from the sample. The data includes 35,442 small banks, of which 3,686 banks were located in metro counties, 12,739 in micro counties, and 19,017 in rural counties. Variables were selected to control for macroeconomics conditions and entrepreneurial information.

2.1 Economic Conditions

This paper includes a number of variables to control for the macroeconomic factors that could affect the dollar volume of small business loans. We use income per capita, human capital per capita and the unemployment rate to capture economic conditions. Income and population data were collected from the Bureau of Economic Analysis. We use years of schooling as a proxy for human capital. This technique was introduced by George W. Hammond and Eric C. Tompson [20]. Years of schooling in a county are calculated based on high school and college attainment rates from the Census of Population. In particular, years of schooling are computed by multiplying the share of the population (age 25 and older) with a given level of educational attainment by the assigned years of schooling. College graduates or higher are assigned 17 years of schooling, while high school graduates who did not complete college were assigned 13 years of schooling, and persons who did not complete high school were 10 years of schooling. These weighted years of schooling are then summed for the county. The data was collected for the year 2000 from the U.S. Bureau of the Census website. The unemployment data comes from the U.S. Bureau of Labor Statistics.

2.2 Economic Activity: Market Thickness

The main purpose of this study is to explore the determinants of entrepreneurial information at the county level, and how these externalities affect small business lending. We use firm births (new firm openings) and deaths (firms that went out of business) of SMEs as proxies for variables that reduce information asymmetry in the county and help bank loan officers make decisions in their lending practices. These measurements were taken from the Census and normalized by the number of SMEs in the county—BIRTHNORM=Births/Firms and DEATHNORM=Deaths/Firms. Another variable that was used in the analysis is the number of

SMEs normalized by the population. This variable describes the density of SMEs by the population in the county, which may be used to determine the degree of market 'thickness.'

2.3 Bank Market Concentration

As proxies for conditions in local banking market we use the total number of banks operating in the county normalized by the number of SMEs per county. We also use the sum total of all bank assets in the county divided by the total number of SMEs in the county and total bank assets per capita. This data are from the FDIC's Report of Condition and Income (Call Reports). We use deposits per capita as a substitute for the assets in the second run of the regressions to see whether short term liability affect bank propensity to lend.

2.4 Bank Loan Performance Factors

We used the charge-off ratio as a measure of banks portfolio performances that might affect management incentives in making and pricing loans to the informationally opaque small businesses. The charge-off ratio is the ratio of the total dollar volume of loans written off during a period to the total outstanding dollar volume of loans at the end of the period. It shows how successful the bank is in its risk management practice. More precisely, it measures what part of given loans is unlikely to be collected.

Here the hypothesis tests the idea that banks with low portfolio performance coefficients are risk adverse in practice and issue fewer loans to risky businesses because of the banks unstable financial situation and inability to cover the charge-offs that might occur from these risky projects. However, there is also the possibility of risky management practice in the same situation. These practices favor a higher amount of risky loans because of their higher expected returns. For the purpose of this paper we will focus primarily on the risk adverse behavior, while still examining both possibilities. All data for the calculation of the Charge-off ratio were taken from FDIC's Report of Condition and Income (Call Reports), 1999-2006.

Another variable we used was a Performance Index utilizing linear multivariate efficiency ratios. In addition to profitability as measured by return on average assets, other important variables include salaries to average assets, the liquidity ratio, the equity capital to asset ratio, and loan charge-offs to loans. The final linear discriminant model contains the following five ratios:

$$Z = \alpha + \beta_1 \text{ E2TA} + \beta_2 \text{ NCO2L} + \beta_3 \text{ SalAA} + \beta_4 \text{ ROAA} + \beta_5 \text{ LiqR}$$

where:

α=Constant

E2TA=Equity Capital to Total Assets

NCO2L = Net Loan Charge offs to Loans

SalAA = Salaries and benefits to Avg. Assets

ROAA = Return on Average Assets
LiqR = Liquidity ratio

To summarize, this paper uses the following variables in our regression model:
Dependent variable

- Total dollar volume of loans between $250,000 - $1,000,000 normalized by the number of small businesses in the county.

Right Hand Side variables

- Economic Conditions
  - Income per capita in the county
  - Human capital in the county per capita
  - Unemployment rate in the county
- Economic Activity or Market 'Thickness'
  - Number of new small firms established in the county normalized by number of SMEs in the county
  - Number of small firms that went out of business normalized by the number of SMEs in the county
  - Number of SMEs in the county per capita
- Bank Market Concentration
  - Number of banks in the county divided by number of SMEs
  - Sum of all bank assets in the county divided by the total number of SMEs in the county
  - Sum of all bank assets in the county per capita
- Bank Loan Performance Factors
  - Charge-off index
  - Performance index index of bank performance. (the higher index the better performance) the largest weight is given to the loans quality part of the index = 1- (Loans Charge-offs-Loans Recoveries)/Total number of loans

2.5 Descriptive Statistics

Because bank performance and lending practice varies over the business cycle, time period effects are captured by including separate dummy variables for each year. The sample includes

3,110 counties, of which 1,062 are metro counties, 676 are micro counties, and 1,372 are rural counties.A metropolitan area contains a core urban area of 50,000 or more population. A micropolitan area contains an urban core of at least 10,000, but less than 50,000, population. And a rural area contains the area of less than 10,000 in population. The metro counties in the sample have on average of $88.5 million in total loans to SMEs from the small banks, micro counties have $11 million, and rural counties have $3.4 million in total loans. However, the median level of loan dollar volume in metro counties is $9.7 million, in micro counties it is $4.7 million, in rural counties it is $0.36 million. This reflects a skewed distribution of small business loans. The average number of small business loans per year is 294 for metro counties, 38 for micro counties, and 11 for rural counties. Also, approximately 55% of the sample banks are located in metropolitan areas, 18% in micro counties, and 27% in rural counties. Tables 8, 9 and 10 in the appendix provide summary statistics for metro, micro, and rural counties. Table 1 presents the descriptive statistics for the variables in the regression aggregated for all counties.

Variable	Mean	Median	St. Dev.	Max	Min
Dependent Variable					
Total dollar volume of loans $250,000 through $1,000,000/Number of SME	10.3	3.84	21.7	801.69	0
Control for Economic Conditions					
Income per capita	25059.67	24018	6554.2	119141	451
Human Capital/Population	0.208	0.21	0.024	0.994	0
Unemployment rate	5.23	5	2.07	30.6	0
Economic Activity or Market 'thickness'					
Birthnorm=B/F	0.1	0.09	0.029	0.5	0
Deathnorm=D/F	0.09	0.09	0.027	0.66	0
SME/Population	0.0235	0.0226	0.078	0.097	0
Bank Market Concentration					
Number of banks/Number of SMEs	0.000114	0.00005	0.00017	0.00214	0
Amount of loans $250,000 through $1,000,000/Number of SME	0.05	0.03	.09	5.30	0.00
Number of loans $250,000 through $1,000,000/Number of SME	15.47	8.87	25.04	801.70	0.01
Bank Loan Performance Factors					
Charge-Off Index	0.16	0.0024	9.211	0.99	0
Performance index	0.24	0.35	2.76	5.93	0
Base Variables					
Population	101450	25191.55	77099.53	4440167	45
Total Assets	2919445	181165.4	788400	256138676	10
Firm Births	241	52	866.94	29971	0

Firm Deaths	218	50	773.14	25160	0
SMEs per county (F)	2294	549	7594.9	238829	0
Amount of loans $250,000 through $1,000,000	34198.3	2708.5	237574.5	9571065	0
Number of loans $250,000 through $1,000,000	113.53	9	793.41	50165	0

Table 1: Descriptive Statistics for Variables Used in Regressions Aggregated for All Counties

3 Hypotheses Tested

Using these data, we tested the following hypotheses. The first test tries to examine the relationship between the degree of bank competition in local geographic banking markets and the volume of SME lending in those markets. In addition, we are going to conduct another three tests. The first test is focusing on metro counties, the second focuses on micro counties, and the third examines the lending practices in rural counties. This will allow us to investigate how lending behavior changes across the size of the county or its geography. Specifically, the significance of market 'thickness' factors or local economic conditions may vary across the counties depending on their size. For example, paper hypothesizes that in rural counties the relationship lending is the most important factor in lending process and the local economic conditions and the degree of business activity does not play the same role as they may play in metro counties where the relationship factor is not so strong.

3.1 Economic Conditions

The control variables in the regression are income per capita, the dollar volume of assets per capita, dollar value of deposits per capita, human capital, and unemployment rate. This paper predicts positive impact of assets, income, and human capital on the number of loans to SMEs. As it was written before, the paper tries to prove the correlation between the level of economic activity in the county and the dollar volume of small business loans in this county. The growth in assets, income, and human capital implies the growth of economic activity of the county, thus implying the higher number of loans to small businesses. Table 2 summarizes all hypotheses that are tested in the paper. The predicted outcomes are always represented by the alternative hypothesis H_a .

3.2 Economic Activity and Market 'Thickness'

The first hypothesis deals with the notion of asymmetry of information and market 'thickness.' A large number of articles have shown that asymmetric information may prevent the efficient allocation of lending, leading to credit rationing and living behind the most informationally opaque borrowers—SMEs and start-ups. We argue that in markets with a greater amount of previous information available regarding economic activity there is also a greater volume of loan origination in that geographic area. Banks and lending institutions see this previous information

regarding economic success and failure as a signal for loan determination. It implies that counties with a high level of small business economic activity should be more likely to obtain credit from banks than counties with economic activity being low. This paper uses the number of start-ups and the number of close-outs of SMEs as a proxy to measure the level of economic activity. Specifically, the paper tests whether a larger volume of small business activity in the county leads to a larger volume in SME lending.

3.3 Bank Market Conditions

It is conventional wisdom to believe that greater competition is associated with a greater supply and lower prices; specifically, higher number of banks in the market is associated with higher small business loan volumes and lower interest rates. However, some studies have results that show that it is not always the case. In particular, Petersen and Rajan [31] found that for young small businesses, increases in the concentration of the banking market in which the firm was headquartered reduced the firms loan interest rate. But, if they were older, increases in concentration increased their loan interest rate. This suggests that if a small business is young enough, increases in concentration increase its loan volume, but that if it is older, the loan volume falls. This result does not tell us, however, whether on average, increases in competition in a banking market would be expected to be associated with increases or decreases in small business loan volume in the market as a whole.

To evaluate the relationship between competition and lending more carefully, we conducted a regression analysis to control more for the age of SMEs, specifically for the number of start-ups in a county. These variables were normalized by the number of small businesses. Our hypothesis suggests that small firms in areas with few small banks should be more credit constrained and receive smaller dollar volumes of loans than small businesses in the counties with more small banks. Also, regions with a robust network of small local banks should have significantly more small firms and a larger dollar volume of loans than regions with a few small banks.

3.4 Bank Loan Performance Factors

The third hypothesis states that counties with banks in financial distress receive relatively smaller dollar volumes of loans to SMEs than counties that have banks with better financial performance. There are two countervailing forces when dealing with this issue. On the one hand, small banks in distress may become more risk adverse and will not be willing to lend to potentially risky SMEs. On the other hand, these banks may want to increase their profits by investing in risky projects that require a higher interest rate, thus providing more profit to financially distressed banks. This paper uses two variables that measure the financial condition of the bank. The first variable that is used as a proxy for measuring the financial performance of the bank is a Charge-Off ratio. This index measures the gross credit loss of a loan portfolio over a specified period of

time. Our hypothesis suggests that the banks with this ratio being low will lend more to the SMEs than the banks with a high Charge-Off ratio. More precisely, the banks that have low lending performance will be more risk adverse and will not lend to the informationally opaque small businesses and start-ups that are more risky. The second index is a Performance Index. It utilizes linear multivariate efficiency ratios. The hypothesis stated in this paper implies that banks with a higher performance index will be more willing to lend to small businesses or start-ups because they can afford to offset the losses from these risky projects.

Hypotheses	All counties	
	H_o	H_a
Control for Economic Conditions		
Income per capita	≤0	>0
Human Capital/Population	≤0	>0
Unemployment Rate	>0	≤0
Economic Activity or Market 'thickness'		
Births/Number of SMEs	≤0	>0
Deaths/Number of SMEs	≤0	>0
Number of SME/Population	≤0	>0
Bank Market Concentration		
Number of banks/Number of SMEs	≤0	>0
Assets/Population	≤0	>0
Deposits/Population	≤0	>0
Bank Loan Performance Factors		
Charge-Off Index	>0	≤0
Performance Index	≤0	>0

Table 2: Hypotheses

4 Empirical analysis

4.1 All Counties

To test these implications, we first use data for all counties and conduct an econometric panel data model with it. This paper estimates the model using data from 3110 counties in the United States. We find mixed results regarding whether the regression outcomes support the stated hypotheses. This suggests that aggregation of all counties in the regression may ignore important information and may alter the results. Each county type has its own characteristics that can influence the dependent variable. Data set separation by county type can shed light on these unique parameters that each county type has.

Therefore, it is necessary to test for the structural differences between varying sizes of regional economies: metro, micro, and rural counties and whether it is meaningful to aggregate all sizes of counties in one data set. By conducting disaggregated tests on metro, rural, and micro counties it is possible to investigate how county size impacts lending. Then, we compared the results from the regression that uses aggregated set to the results from three disaggregated subsets. Given this comparison data can be used to analyze the significance county size has. After conducting tests on the micro, metro, and rural counties independently, it is apparent that aggregation neglects the differences amongst the size of the counties and that geography appears to be a significant factor in the analysis. Table 6 reports fixed-effect panel results for the aggregated set, which includes all counties. The results from the tests using metro, micro, and rural counties are presented in Tables 4, 5, and 6 respectively. Table 7 provides the estimates for elasticity for each factor in the model.

$\mathbf{R}^2$ (within)	0.09		
	β	SE	t-stat
Control for Economic Conditions			
Income per capita	4.79e-07	3.39e-07	1.41
Human Capital/Population	.0001357	.0001359	1.00
Unemployment Rate	0.111	0.0962	1.15
Economic Activity or Market 'thickness'			
Births/ number of SME	.007308	.0182932	0.40
Deaths/ number of SME	.0236297	.0179589	1.32
Number of SME/Population	-.0194621**	.0038359	-5.07
Bank Market Concentration			
Number of banks/Population	3.27379**	.7423867	4.41
Assets/Population	-1.72e-08	2.00e-08	-0.86
Deposits/Population	-6.75e-09	2.07e-08	-0.33
Assets/SME			
Bank Loan Performance Factors			
Charge-Off Index	5.17e-07	1.64e-06	0.31
Performance Index	.0347106**	.0086632	4.01

Table 3: Regression results for all counties. **10%significance

$\mathbf{R}^2$ (within)	0.028		
	β	SE	t-stat
Control for Economic Conditions			
Income per capita	-0.00012	0.0001	-1.02
Human Capital/Population	-15.54	14.84	-1.05

Unemployment Rate	0.3	0.21	1.41
Economic Activity or Market 'thickness'			
Births/ number of SME	-24.14	11.98	-1.8
Deaths/ number of SME	14.05	12	1.17
Number of SME/Population	92.83**	25.02	3.71
Assets/SME	2.02e-07***	6.12e-09	32.94
Bank Market Concentration			
Number of banks/population	-1549.53	2333.4	-0.66
Assets/Population	0.00044	0.0017	0.25
Deposits/Population	-6.70e-09	2.07e-08	-0.32
Bank Loan Performance Factors			
Charge-Off Index	-0.067**	0.014	-4.71
Performance Index	0.227**	0.047	4.76

Table 4: Metro counties. **10%significance, ***5%significance

$\mathbf{R}^2$ (within)	0.20		
	β	SE	t-stat
Control for Economic Conditions			
Income per capita	-0.000017	0.0013	-0.13
Human Capital/Population	57.39**	25.05	2.29
Unemployment Rate	0.29	0.19	1.49
Economic Activity or Market 'thickness'			
Births/ number of SME	28.88**	9.55	3.02
Deaths/ number of SME	-2.67	9.52	-0.28
Number of SME/Population	-0.0095	0.05	-0.17
Assets/SME	0.000111***	4.06e-07	27.42
Bank Market Concentration			
Number of banks/population	3400.8**	1588	2.14
Assets/Population	0.0391**	0.01	3.75
Deposits/Population	.0503**	.0135	3.71
Bank Loan Performance Factors			
Charge-Off Index	0.004	0.0164	0.26
Performance Index	0.05	0.016	0.31

Table 5: Micro counties. **10%significance, ***5%significance

$\mathbf{R}^2$(within)	0.27

	β	SE	t-stat
Control for Economic Conditions			
Income per capita	6.79e-07 **	3.01e-07	2.17
Human Capital/Population	0.1025 **	0.0485	2.11
Unemployment Rate 0.1373	0.12	1.14	
Economic Activity or Market 'thickness'			
Births/ number of SME	-.0068003	.0141958	-0.48
Deaths/ number of SME	.0132108	.0139515	0.95
Number of SME/Population	.5263883	.3043614	1.73
Assets/SME	-1.36e-09***	1.35e-08	52.77
Bank Market Concentration			
Number of banks/population	110.757***	10.6970	10.35
Assets/Population	-1.24e-09	1.35e-08	-0.09
Deposits/Population	-9.12e-10	1.39e-08	-0.07
Bank Loan Performance Factors			
Charge-Off Index	- .0040209	.0164003	-1.38
Performance Index	0 .0562206***	.0096226	5.84

Table 6: Rural counties. **10%significance, ***5%significance

Variable	Metro counties	Micro counties	Rural counties
Control for Economic Conditions			
Income per capita	1.259e-07	-1.904e-08	4.567e-09
Human capital/Population	4.071e-08	-1.463e-07	0.0003647
Unemployment Rate			
Economic Activity or Market 'thickness'			
Birthnorm=Births/Firms	0.0154	0.012599	0.00012115
Deathnorm=Deaths/Firms	-0.00667	-0.000221	0.00012115
SME/Population	-0.1239	-0.0141	0.003955
Bank Market Concentration			
Banks/Population	1.1733	0.9976	1.0377
Assets/Population	1.288e-06	0.00020	-1.0443-11
Deposits/Population	-3.377e-07	0.000227	-8.510e-12
Bank Loan Performance Factors			
Charge-Off Index	0.000091	2.415-06	0.000339
Performance Index	-0.000148	-4.272e-06	0.00050659

Table 7: Elasticity

4.2 Metro, Micro and Rural Counties

4.2.1 Economic Conditions

The control variable—human capital per capita—has a positive sign and is significant for rural and micro counties, however, is not significant for metro counties. Therefore, small counties with high human capital are more likely to attract a greater number of loans. This result may also imply that more human capital in areas that have less economic activity increases attractiveness of the area in regard to SME lending.

The unemployment rate does not play the major role in the SME lending activity. The coefficient for the unemployment rate appears to be insignificant for all regression results. Income per capita is significant in rural counties only, implying that rural counties that have higher income will receive more credits than the counties with the low income per capita. The rural counties with high income per capita will provide safer environment for investment. This result goes along with a human capital effect, where rural counties with higher amount of human capital will be viewed as more stable, less risky investment.

4.2.2 Economic Activity or Market 'Thickness'

Another hypothesis that was tested in this paper deals with the notion of asymmetry of information and market 'thickness.' The idea here is that in markets with a greater amount of previous information available regarding economic activity there is also a greater volume of loan origination in that geographic area. Banks and lending institutions see this previous information regarding economic success and failure as a signal for loan determination. Specifically, the counties with a high level of small business economic activity should be more likely to obtain credit from banks than counties with economic activity being low. The factors used in this paper that may reduce information asymmetry and determine the level of market 'thickness' are number of start-ups, the number of closeouts of small businesses, and the total number of the SME per county normalized by population. We find mixed evidence on whether these factors can reduce asymmetry of information. The number of start-ups appears to have a significant positive effect in micro counties. Also, the number of small enterprises has a positive and significant effect on the number of loans in metro counties. Both of these variables have insignificant coefficients for the rural counties. These results could indicate that in rural counties small firms have stronger relationships with their banks, consistent with a prediction of relationship effect, presented by Petersen and Rajan [31]. In the larger counties the information concerning the birth and death of small businesses and the density of SME can be used as a proxy for the market 'thickness' measurement. These factors can reduce information asymmetry between banks and borrowers in metro counties.

4.2.3 Bank Market Concentration

The results of the test show that the coefficients of assets and deposits per capita are positive and significant for micro counties. With regard to the metro counties, the results suggest that banks assets per capita and short-term liabilities do not affect the banks propensity to lend in these counties. The same results appear to be true for rural counties. However, the assets per SME have positive and significant effect on SME lending in all three types of counties. This result is in line with the predictions of the hypothesis. The intuition behind this outcome is that the small community banks with high dollar volumes of assets per SME are more likely to lend more to informationally opaque small businesses and start-ups as they can afford to offset the losses that may occur when financing risky projects. In addition, those banks holding more assets are better able to diversify their portfolios, which in turn, can lead to more aggressive and risky investments in SME or start-ups.

The number of banks variable is positive and statistically significant in micro and rural counties. These results support the hypothesis of this paper that in markets with a less competitive banking environment, potential entrants, or existing SMEs face greater difficulty gaining access to credit than markets in which banking is more competitive. These results also imply that market power may reduce the entry of small firms in the market, where relationship lending takes place, namely in micro and rural areas. Banks with market power prefer to lend to their established borrowers rather than to the new borrowers, as it is more costly for banks to establish new relationship than maintain the old ones.

4.2.4 Bank Loan Performance Factors

The banks performance factors give mixed results across different counties. The charge-off index is significant and negative for metro counties. The negative effect can be explained by risk-adverse behavior of small banks. Small banks cannot afford to take a risk of lending to obscure small businesses or start-ups as a result of their financial situation and inability to recoup the future losses with their assets. In contrast, the charge-off index does not affect the lending practices in rural and micro counties.

When using Banks Performance index as a second measure of banks financial standing the hypothesis stated that the banks, which have better overall financial performance, also have higher propensity to lend to SMEs. The results suggest that in the metro counties banks are more open to the risky investment or they have enough profit to offset the future losses. Specifically, the beta coefficients for metro and rural counties are positive and have significant impact on the number of small business loans, while it is insignificant for micro counties.

The possible explanation for these results can be derived from the financing policies in the specific counties or regions. It is likely that there are different policies concerning financing of SMEs. They may change across sectors, regions, county size, etc. One form of such policy is

subsidiary. States authorities may give subsidiaries to SMEs through the community banks. In this case, even though the investment in informationally-opaque small business may appear risky to the bank, it will give the required dollar volume of the loan to the SME. However, this may disproportionally affect small banks because of the fixed costs of these policies. The existence of such policies can be the reason why the charge-off index in the rural counties does not have a negative influence on the dollar volume of loans given to small enterprises.

5. Conclusions

SMEs lack hard quantitative information about their own performance as well as the regional track record of investment projects, together creating lending barriers. The aim of this paper was to analyze the entrepreneurial information that may be used by banks to overcome these barriers, generating reliable signals that loan officers can use to increase the dollar volume of loans to SMEs at the county level.

After controlling for local economic conditions, three different factors likely to influence a banks willingness to lend to informationally-opaque small enterprises were evaluated econometrically: bank market concentration in a county, small business activity in the county, and the performance of banks in the county. We conducted four sets of tests using metro, micro, rural, and overall county data.

Local economic conditions clearly affect lending behavior. In particular, the number of banks in the county as well as human capital have a positive effect on SME loan volume in micro and rural counties. Therefore, banks in small counties with high human capital are more likely to lend to SMEs. Bank market concentration also influences lending, as our results show that greater bank competition produces larger dollar volumes of small business loans.

Yet small business activity itself may play a more subtle yet informationally more interesting role in lending behavior. In this context, the volume of loans given to small businesses is linked to the notion of market ‘thickness’, the degree of business activity in a county. Even if such activity is not directly related to a firms particular loan project proposal, the existence of a richer set of entrepreneurial experiences in that regional setting should provide greater informational clarity for loan officers considering indirectly related projects. In that spirit, a principal goal of this paper tests to what extent the market ‘thickness’ matters in bank lending practices. Most simply, a region with higher economic growth would be expected to have a higher dollar volume of SME loans, reflecting the logic that regions where business is expanding will attract more small business loans. Yet even after controlling for local economic conditions, such as income and employment, richer information sets about local business activity may induce lending in counties with a relatively higher degree of market ‘thickness.’ The number of births and deaths and the density of small businesses per population are used as a proxy to measure market thickness.

In fact, the pure informational effect of market thickness does appear to influence lending behavior by local banks. The number of births and the density of SMEs significantly positively affect loan volume in large metropolitan counties, suggesting that banks do value this information in such highly competitive urban business environments. In rural counties, by contrast, these variables are not significant, which may be explained by the prevailing importance of relationship lending practices in the sparser-activity regions with a relatively small number of banks and SMEs.

Finally, this paper explores the effect of the financial performance of banks on lending behavior, yielding some intriguingly complementary findings to the core results outlined above. In metro and micro counties, financially distressed banks are less willing to lend to informationally-opaque small businesses, a result which directly complements our core informational hypotheses. In rural counties, however, the charge-off index does not significantly shape lending volume. This result may again be due to the idiosyncratic nature of such sparse regions, where policies may both compel small business lending and provide direct or indirect subsidies for such loans. In these cases, bank financial distress indicators may not be as important. However, overall bank performance has a positive impact on lending volume in both small and large counties, providing further complementary support to our core informational perspective. Less data on broad business activity in a region leads to higher expected variances of loan performance, even if the underlying probability structure is identical to that of a thicker market setting. Successful banks will be more willing to take on this additional variance, reflected in more loans to small informationally-opaque businesses, because it is easier for them to accept potential lemon loans given their less margin-sensitive portfolio.

In general, the paper confirms the importance of entrepreneurial information in influencing SME lending by banks, as lenders use the markets own thickness to help illuminate the regional lending terrain for potential investment projects. By understanding the role of these factors on small business lending, economists can encourage effective practices that support SME growth and foster regional economic development.

6. Future Research

Our future research will further develop this geographical informational asymmetry research agenda on two related trajectories. First, we plan on using commuter data from the Census to better identify cross-county channels of contact and information flows, assuming that commuting is a good proxy for more general connections and networks between places. These links can be quantified and aggregated for each county, creating a network structure for every county across the United States. Using this framework, the information flow hypotheses applied in this paper will be tested again, this time to the counties themselves as well as their ‘network-neighbors’ to evaluate the validity of the network proposition as well as the additional explanatory power of a

model incorporating these cross-county effects. The latter will be tested against more traditional cross-county linkages, such as metropolitan areas, commuting zones, and labor market areas [29].

The second related trajectory will test the spatial spillovers that apparently occur in higher-information contexts, such as those superficially exhibited by metropolitan areas. There is evidence of eventual diminishing returns, thus second-order concavity, of increased information in county contexts, which are hypothesized to signal the point of spatial spillover to adjacent (or networked, as above) counties. These hypotheses can be tested using spatial econometrics to assess both the functional form of own-county information effects, as well as potential spatial spillovers.

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Appendices

Variable	Mean	Median	St. Dev.	Max	Min
Control for Economic Conditions					
Income per capita	28334.88	26978	7605.3	111346	451
Human Capital/Population	0.203	0.206	0.024	0.99	0.0038
Unemployment rate	4.8	4.7	1.7	30.1	0
Economic Activity or Market 'thickness'					
Birthnorm=B/F	0.1	0.1	0.02	0.3	0
Deathnorm=D/F	0.09	0.09	0.01	0.56	0
SME/Population	0.019	0.017	0.005	0.032	0
Bank Market Concentration					
Number of banks/Number of SMEs	0.00005	0.00002	0.000078	0.00078	0
Amount of loans $250,000 through $1,000,000/Number of SME	10.3	3.84	21.7	801.69	0
Number of loans $250,000 through $1,000,000/Number of SME	0.036	0.016	0.1	5.3	0
Bank Loan Performance Factors					
Charge-Off Index	0.26	0.003	12.92	1.1	0
Performance index	0.23	0.35	3.87	5.93	0
Base Variables					
Population	247892.5	92527	969528.4	34440167	1699
Total Assets	8039647.	8399143	8169537	8256138	67610
Firm Births	595.3	212	1407.78	29971	0
Firm Deaths	534	193	561	25160	0
SMEs per county (F)	2294	549	7594.9	238829	0
Amount of loans $250,000 through $1,000,000	88551.82	9684	400389.3	9571065	0
Number of loans $250,000 through $1,000,000	294.05	32	1336.3	50165	0

Table 8: Summary Statistics for Metro Counties

Variable	Mean	Median	St. Dev.	Max	Min
Control for Economic Conditions					
Income per capita	24310	23850	5155	119141	9262
Human Capital/Population	0.205	0.207	0.02	0.28	0.008
Unemployment rate	5.34	5.2	2.05	25	0

Economic Activity or Market 'thickness'					
Birthnorm=B/F	0.09	0.08	0.023	0.5	0
Deathnorm=D/F	0.08	0.086	0.02	0.57	0
SME/Population	0.00025	0.000132	0.00051	0.01	0
Bank Market Concentration					
Number of banks/Number of SMEs	0.00008	0.000051	0.00012	0.001372	0
Amount of loans $250,000 through $1,000,000/Number of SME	10.94	5.59	18.92	343.84	0
Number of loans $250,000 through $1,000,000/Number of SME	0.035	0.018	0.06	2.14	0
Bank Loan Performance Factors					
Charge-Off Index	0.19	0.35	3.39	1.67	0
Performance index	0.32	0.002	11.31	0.57	0
Base Variables					
Population	45649	38237	49107	1158277	405
Total Assets	471349.4	259763	1250568.	42542843	20
Firm Births	103.67	79	165.8	4451	0
Firm Deaths	97	77	135.8	3385	0
SMEs per county (F)	1098	904	1309.8	32043	3
Amount of loans $250,000 through $1,000,000	11261.3	4709.5	25101.9	615088	0
Number of loans $250,000 through $1,000,000	38	15	107.48	4264	0

Table 9: Summary Statistics for Micro Counties

Variable	Mean	Median	St. Dev.	Max	Min
Control for Economic Conditions					
Income per capita	22893.8	22323.5	5122.6	100711	5355
Human Capital/Population	0.214	0.215	0.024	0.39	0.1
Unemployment rate	5.5	5.1	2.27	30.6	0
Economic Activity or Market 'thickness'					
Birthnorm=B/F	0.09	0.09	0.034	0.66	0
Deathnorm=D/F	0.09	0.09	0.035	0.66	0
SME/Population	0.024	0.023	0.009	0.097	0
Bank Market Concentration					
Number of banks/Number of SME	0.00018	0.00013	0.000225	0.002141	0
Amount of loans $250,000 through $1,000,000/Number of SME	9.6	1.38	20.6	636.37	0
Number of loans $250,000 through $1,000,000/Number of SME	0.03	0.005	0.067	2.26	0

Bank Loan Performance Factors					
Charge-Off Index	0.007	0.001	0.028	0.76	0
Performance index	0.27	0.35	0.15	0.61	0
Base Variables					
Population	15589.8	11697.5	26364.04	840785	45
Total Assets	162343.1	100131	250106.7	7058741	0
Firm Births	35.36	23	86.31	3208	0
Firm Deaths	34	24	72.57	2526	0
SMEs per county (F)	365.33	262	693.2	24098	0
Amount of loans $250,000 through $1,000,000	3427.08	368.5	7516.48	233549	0
Number of loans $250,000 through $1,000,000	10.98	2	24.77	830	0

Table 10: Summary Statistics for Rural Counties