DISSERTATION

THREE ESSAYS ON THE ROLE OF CREDIT, LABOR, AND INFORMATION FOR SMALL BUSINESS ESTABLISHMENTS

Submitted by

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ABSTRACT

THREE ESSAYS ON THE ROLE OF CREDIT, LABOR SUPPLY, AND INFORMATION FOR SMALL BUSINESS ESTABLISHMENTS

Small business establishments create jobs, promote innovation, and boost productivity in local and national economies. However, despite this pronounced and enduring impact, they face numerous existential challenges, especially in rural areas, which have smaller markets, population bases, and limited amenities compared to urban areas. Therefore, the United States government has introduced numerous policy measures to support and promote small establishments. This study informs such policy conversations by investigating three key factors that influence small business sustainability and growth: credit supply, labor supply, and information asymmetries. The first chapter reviews the study motivations and elaborates on these key factors.

Existing literature outlines how lending from financial institutions plays an important role in the birth of new businesses. In Chapter 2, I add that bank lending fluctuations also impact the survival of *existing* (newborn) businesses, particularly in non-metropolitan areas. Next, Chapter 3 considers how local labor market dynamics affect the survival of new businesses by applying portfolio theory to evaluate employment-based and income-based measures of risk-and-reward trade-offs in local labor markets. I find that volatility in local labor markets observed during the study period, 2005-2009, has a positive impact on new business survival, especially in Metropolitan Statistical Areas. Thirdly, current and consistent

information about a geographical entity's local economic, demographic, and social characteristics is a valuable commodity; however, such information is often scarce in rural and remote counties. The American Community Survey (ACS) was introduced to address this problem. However, its staggered data release—based on county population thresholds—created information gaps between otherwise similar rural counties. Therefore, Chapter 4 uses a synthetic control method to investigate any differences in economic impact between counties that received ACS information earlier and those that received it later (i.e., as measured through establishment births). There were encouraging results in some cases, indicating a potential economic effect from geographical information asymmetries. The last chapter reflects on the study's findings in the context of current economic events.

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Chapter 1. Introduction

Policy measures in developed countries increasingly promote entrepreneurship and small businesses to drive economic growth, job creation, innovation, and productivity. In 2023, small businesses in the U.S. accounted for 99.7 percent of all employers and 46.4 percent of the private sector workforce. From 1995 to 2021, small businesses provided 62.7 percent of net new private sector jobs (USSBA, 2023). Furthermore, small businesses often operate in nonmetro and remote counties where they contribute significantly to the local economy and economic well-being (cf. big businesses, which are concentrated in urban counties and large Metropolitan Statistical Areas (MSAs)). The definition of "small business" varies by industry but frequently considers metrics like the number of employees and annual revenue receipts. I adopt the U.S. Small Business Administration's definition of any establishment employing 500 or fewer employees[1].

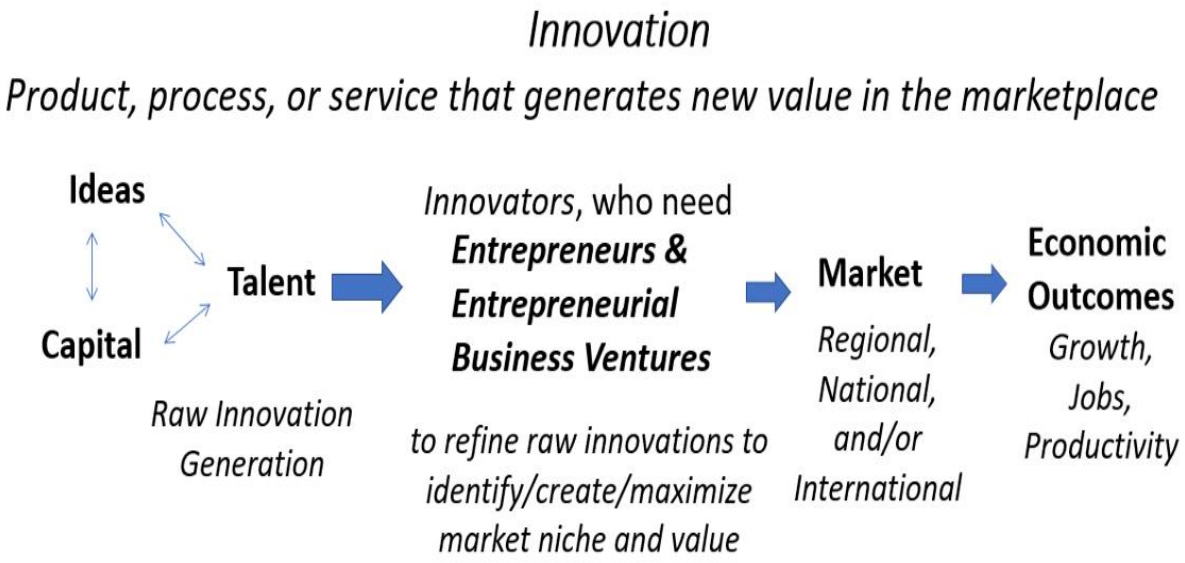

Figure 1: Innovation, Small Business, and Economic Development

Source: Weiler S. (2013), The Colorado Innovation Report, *https://innovation.colostate.edu/*

[1] Hait A., US Census Bureau Webinar, 2020

The flowchart in Figure 1 briefly illustrates the process through which Innovation acts a growth engine driving economic development. Research ideas originate from universities and research institutions, while capital is generated through government grants, private investments, or often through partnerships between the two. Highly skilled scientists and researchers provide the necessary talent. When these three elements – capital, ideas, and talent - converge together new discoveries and inventions are made. However, not all inventors successfully commercialize their inventions. This is where entrepreneurs add value by assuming the risk of developing these inventions into a marketable product or service. Entrepreneurship therefore emerges as an endogenous response to investments made in new knowledge.

To commercialize the innovative product or service, entrepreneurs typically establish small business establishment(s) which serves as a conduit for scaling the venture once it becomes successful. The small business establishment creates new jobs, introduces innovative product(s) and services to the consumer, and enhances productivity. With limited resources, these businesses are motivated to use them efficiently across all aspects of their operations, from production to customer delivery, thereby contributing to overall productivity growth (Akcigit and Kerr, 2018). Additionally, other business establishments are born which supply resources and services to support the venture, further contributing to employment and local economic activity. These new firms, in turn , invest capital, hire employees, and procure supplies from other firms for their operations which lead to formation of additional businesses and the creation of more jobs. The cumulative impact of these direct, indirect, and induced effects results in increased tax revenues, job creation, and economic growth in the region. In summary, the commercialization of the innovation has an amplified impact on the local, regional and national economy through spillover benefits and multiplier effects.

According to estimates, nearly 50% of new business ventures fail within five years of their birth (U.S. Bureau of Labor Statistics, Table 7). Given the critical role of small businesses in fostering economic development, especially in context of advanced economies like the United States, it is imperative that policies and efforts are directed towards sustaining these small businesses to maximize their contribution towards long-term growth. An essential

area of research in this context would involve identifying the systemic challenges that small businesses face during their early years. How critical they are, and how do they impact the survival and sustainability of newly established small businesses?

This study investigates three key factors impacting the sustainability and growth of small business establishments in the United States: credit supply, labor supply, and information asymmetries. Much like the role of capital, talent, and ideas in driving innovation, these factors are expected to play an equally significant role in supporting the survival and growth of small businesses during their formative years, especially by addressing informational gaps and resource constraints.

Since small business establishments play an essential economic role in rural and remote counties, I hypothesize that these determinants also influence county-wide economic development. All the study counties were designated either metro[2] or nonmetro[3] based on economic, social, and demographic data procured from publicly available sources like the United States Census Bureau, Bureau of Labor Statistics, and the Bureau of Economic Affairs. The data on small business establishment survival were retrieved from the National Employment Time-Series (NETS) database. Chapters 2 and 3 examine the period between 2005 to 2009, which was dominated by the Great Recession in the US. This allowed for a comparison of these determinants' influence on small businesses during an economic downturn and normal times (while controlling for rural and urban locations).

Small businesses face several challenges over their lifecycle (i.e., launch, growth, expansion, maturity, and decline). In the post-birth phase, small establishments need financial assistance for working capital, payroll, business expansion, and, at times, to recover from external economic shocks and natural disasters. Most establishments in rural areas are involved in low-risk-low growth operations, making them unattractive for equity funding, thereby leaving debt finance from banks as the only option. This was confirmed by Hancock

[2] Metro counties have at least one urban core of at least 50,000 people; adjacent counties have a high degree of social and economic integration with this core (OMB Standards, 2010)

[3] Nonmetro counties are geographical entities that include an urban area with a population between 2,500 and 49,999 that is not part of a larger labor market, and/or rural towns (population under 2,500) (ERS, USDA 2022).

& Wilcox's (1993) finding that "capital reductions at small banks during a credit crunch led to significant reductions in state employment, total payroll, and number of small businesses". Financially constrained businesses grow slower, hire fewer employees, and pay fewer taxes—all of which constrain regional economic growth. Thus, banks clearly play a critical role in supporting local business enterprises, especially those operating in nonmetro areas.

Small businesses also struggle to navigate local labor market dynamics. The difficulties of attracting and retaining a talented workforce are felt by almost every enterprise, regardless of size. However, new business establishments face a steeper challenge as they lack the scale and deep pockets needed to attract qualified workers. Furthermore, county labor supply is deeply influenced by factors like population, education, dominant industry, geography, and amenities (with major differences between metro and nonmetro local labor markets). Chapter 3 investigates the impact of local labor supply on small business survival in context of the dynamics of local wage and salary job market.

Information (e.g., local economic, social, and demographic data) is another critical resource for enterprise success. Potential business owners need timely information about the local market (e.g., regional business success and failure rates) to generate realistic growth plans. However, some regions of the US are 'Internet Deserts'. Despite the remarkable growth and widespread application of information technology, broadband accessibility and reliability are often inadequate in rural and remote counties. According to the Census Bureau, 78 percent of U.S. households subscribe to the Internet; however, only 65 percent do so in rural and lower-income counties (Martin, 2018). Therefore, accessing reliable information is a challenge for businesses operating in these counties. In the early 2000s, the American Community Survey (ACS) was introduced to remedy this issue. However, the ACS's vital data was released according to county population thresholds, resulting in a temporal information gap between counties. The fourth chapter investigates whether this ACS information gap substantially affected economic development in otherwise similar counties that did not receive this information simultaneously.

Considering the vital role small business establishments play in regional and national economy, this study attempts to highlight some of the challenges they have encountered in

the recent past. Ignoring these challenges would likely result, in the short term, in declining employment opportunities, reduced tax revenue, population loss, and stagnant or declining economic growth, particularly in rural and remote counties. In the long term, this would result in persistent and severe economic disparity between rural and urban regions, ensuring an unprecedented set of social and political challenges in the country. The following table summarizes the research questions in each chapter and the respective findings.

Table 1. A Synopsis of the Research conducted in specific chapters

Chapter	Research Investigates	Time Period	Results
Chapter 2	The impact of changes in Bank Credit Supply during Recession on the Survival of Newly Established Businesses.	Establishments born in 2005 are tracked for survival rates over a five-year period. Bank Lending data and control variables from same years, as well as prior years, are used in the empirical analysis.	Decline in Credit supply by Banks is found to have an adverse impact on the survival of newborn business establishments in non-metro counties.
Chapter 3	The impact of changes in Labor Supply during Recession on the Survival of Newly Established Businesses.	Similarly, survival data of new establishments (born in 2005) is tracked over five years. Wage and Salary Income, as well as Employment data spanning longer periods (around ten years) from 1991 onwards, are used to	Employees' decision to continue with their existing employment during the recession provides a consistent labor supply, thereby helping newborn businesses survive during this period.

		estimate the long-term impact of labor market Risk on newborn establishments. Concurrent and lagged values of control variables are also included in the analysis.	
Chapter 4	Whether the release of ACS information helped eliminate information asymmetry faced by business establishments operating in rural areas?	Data from 1999-2004 for predictors is used to identify the control group of counties corresponding to the selected treatment group counties. The Establishment birthrate in treatment counties is analyzed from 2006 to 2011, and in control counties from 2008 to 2011.	The lack of "better information" is found to be significant, indicating the need for such data. However, evidence establishing an adverse impact on the local economy, as measured through establishment births, is not found.

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Chapter 2. Bank Lending and New Business Survival

2.1 Introduction

It is well established that bank lending plays a crucial role in small business births and subsequent regional economic growth, particularly in nonmetro counties (Conroy et al., 2017). This chapter builds on this foundational insight to ask whether firms still need financial help from banks in the post-birth phase. Specifically, it investigates whether business loan availability is critical for the survival of newly established businesses in an economic downturn.

Between 1991 and 2007, the five-year survival rate for newly born firms (hereafter, *de novo businesses*) in a typical county was only 69% (Deller and Conroy, 2016). Many high-sales firms (28%) needed additional business loans for expansion and improvement[4]. These statistics confirm that many firms struggle to survive in the post-birth phase. They often lack the funds needed for regular business operations, let alone to survive economic downturns and natural disasters. Furthermore, recent research has identified trends like fewer start-ups and declining growth rates for small businesses in the US (Decker et al. 2014, 2016). If left unaddressed, this could have severe consequences for the national economy (e.g., fewer job opportunities and less productivity, innovation, and overall economic growth). It is imperative to nurture and support small businesses, given their contribution to economic growth. Ayyagari et al.'s (2005) survey of 80 countries found that "finance, crime, and political instability [were] critical obstacles for firm growth, [with] finance being the most robust among these factors." Small establishments struggle to access funds for growth (in both developing and developed countries).

Historically, de novo businesses have depended on local banks to meet their financial needs (Robb and Robinson, 2012). Many small businesses seek relatively small loans (under $100,000); however, weak credit profiles and unprofitable operations create significant

[4] U.S. Department of Commerce 2010

barriers when applying for loans[5]. Beck et al. (2006) found that the ability to access external finance was determined by firm size, age, and ownership. They also find that on average, small firms finance 13 percent fewer investments with bank finance than large firms. Furthermore, "impediments in access to external finance have almost twice the detrimental effect on annual growth of small firms than that on the annual growth of large firms."

The dataset includes information about de novo businesses' lifespans across U.S. counties and accommodates the economic, demographic, and geographical differences between metro and nonmetro counties. I find that fluctuations in bank lending significantly impact the survival rates of de novo businesses in nonmetro counties. This impact creates a snowballing feedback loop that builds on the preceding year's survival rate. In other words, credit rationing by banks is found to impact the existence of new establishments, particularly in rural and remote counties. This occurs when local banks ration credit supply to local businesses, which then causes some establishments to close operations.

This chapter is organized as follows. The next section reviews the literature on banking and business survival to situate this study's contribution to small business economics. Section 3 describes the methodology and dataset, while section 4 presents the results of the various regressions. This analysis began with a cross-sectional specification to identify the impact of bank lending on de novo business survival rates in 2009. I then used an instrumental variable to address the endogeneity found with the preceding year's survival rate. I selected the Linear Dynamic Panel Data estimator to validate the results and explore how the prior year's survival rate affected bank credit supply. Lastly, I replicate the regressions using data from 2000-2005 to confirm the role of bank lending in financial downturns. Section 5 discusses how the tested hypothesis manifested differently in metro and nonmetro counties and plausible reasons for this divergence. Section 6 concludes with implications in the context of recent developments in small business finance and policy.

[5] Small Business Credit Survey | 2019" Report on Employer Firms", Federal Reserve Bank System

2.2 Literature Review

While external finance plays an important role in the birth of small businesses and start-ups (Beck et al., 2006; Ayyagari et al., 2005; Conroy and Weiler, 2017), little research has examined how external debt finance impacts the *survival* of existing de novo establishments. Small firms in the post-birth phase are often underprepared for unforeseen challenges like natural disasters and economic downturns. When such events transpire, bank lending plays an essential role in their survival. In the absence of formal finance sources, business owners must rely on informal sources like moneylenders, credit card debt, friends, and family. At best, prohibitively expensive funds procured from payday loans and credit cards can help meet short-term funding requirements, and financial help from family and friends may not be reliable or stable. Thus, financial institutions impact regional economic growth by channeling funds to local enterprises.

Some establishments may also use trade credit, especially when business owners have established long-term relationships with the suppliers (Robb et al., 2012). Trade credit can be a viable funding source if trade creditors possess information about opaque businesses that is not accessible to banks (*a la* Peterson and Rajan, 1997). However, trade credit is best at fulfilling short-term funding needs. Moreover, newly established businesses likely do not have the requisite long-term relationships with suppliers to access trade credit.

Venture capital (VC) is another alternative to formal bank funding, especially in the technology sector. Unlike debt financed from banks, VC is provided in return for equity in the enterprise. Most venture capitalists play an active role in management, with an eye to potential gains (e.g., taking the business public or acquisition by a larger established business enterprise). VC can add value for a transformational entrepreneur in the technology sector. However, in traditional sectors, limited growth and a reluctance to share equity makes venture capital an unviable funding source. Furthermore, venture capitalists often invest in the early stages of business, so this form of funding is unlikely to assist a firm in need of financial assistance for day-to-day operations or to recover from an economic downturn (see Audretsch et al., 2006).

Therefore, a reliable supply of bank credit plays a decisive role for small firms operating in traditional sectors. Financing needs change as firms graduate from the tumultuous growth phase to subsequent phases of expansion and consolidation. Unlike large establishments and corporations, small businesses are not mandated to maintain extensive financial statements, creating an information asymmetry between the business and the bank. In the later lifecycle stages, this relationship becomes less opaque (Berger and Udell,1998), likely reducing the obstacles to securing funding assistance from banks. Importantly, firms continue to rely on formal debt for survival in the later stages of the lifecycle (Robb et al., 2012)—debt's contribution to the capital structure increases as the firm matures (Berger and Udell 1998). In the US, bank lending is a relatively viable source of external finance for small business owners in the post-birth phase. However, in low-income areas, where credit histories provide incomplete information (or none at all), credit may be prohibitively expensive or even outwardly rationed (Stiglitz and Weiss 1981). Local rural banks can reduce this informational friction between a lender and potential borrowers through relationship-based funding for entrepreneurs and business owners in the community. Ergungor (2010) finds that mortgage originations increase when a bank branch is located in a low-to-medium income neighborhood, and interest rate spread declines.

Figure 2 displays the number of loans disbursed to small businesses across different dollar amount categories from 2000 to 2010. Most disbursed loans are placed in the first category (i.e., under $100,000). There was a noticeable increase in the number of loans disbursed in the first category until 2007; this was followed by an equally noticeable decline during and after the Great Recession.

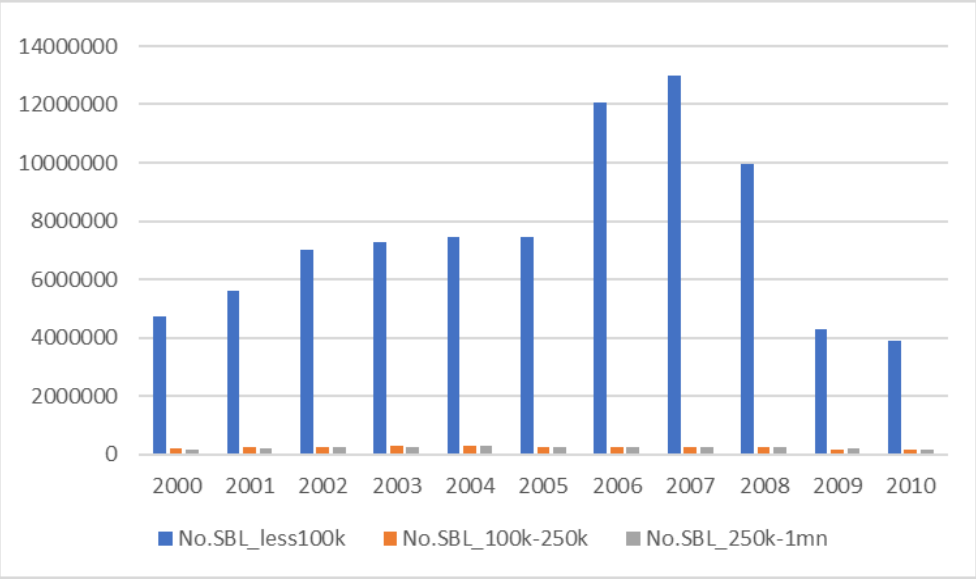


Figure 2. Total Number of Small Business Loans Disbursed by Category, 2000-2010

Source: Aggregate and Disclosure Flat Files, FFIEC, *https://www.ffiec.gov/cra/craflatfiles.htm*

A number of significant changes in traditional small business lending were set in motion in the 1990s. They manifested themselves during the financial crisis and continue to influence the Small Business Loan (SBL) marketplace today. The most important shift was the decline of community banks[6] (Wiersch and Shane, 2013; Brown, 2019) and increased competition from large banks (Jagtiani and Lemieux, 2016). This shift in the SBL marketplace created particular challenges for de novo businesses. Community banks conduct relationship banking (Berger et al., 2005; Chakraborty and Hu, 2006); their knowledge of the local economy and interactions in the community plays a significant role in the disbursement of SBLs and the extension of credit lines to local business owners and entrepreneurs. In contrast, large banks rely on technology and credit ratings when evaluating applications for SBLs, to the disadvantage of de novo businesses in rural areas (Puri et al. 2011, Brie and Schclarek 2013, Cole 2018). Consequently, from the 1990s on, a growing number of small business owners began using mortgage credit to supplement their funding needs (Jagtiani and Lemieux, 2016; Mills and McCarthy, 2015). The use of home equity as collateral for

[6] Federal Reserve defines community banks as those with less than $ 10 bn in assets (2021).

mortgage loans to support their businesses increased business owners' home-equity-loan to net-worth ratio (Kennickell et al. 2015).

The evolving SBL landscape grew even more challenging for de novo businesses during the Great Recession when banks significantly reduced lending (Ivashina and Scharfstein, 2010). During this period, "banks did not expand total loans and credit lines," thereby increasing the financial system's vulnerability (Acharya et al. 2015). Large banks also systematically decreased lending to de novo businesses in response to the sharp collapse in real estate prices (Bord et al., 2018).

This chapter investigates whether a lack of bank lending, in the form of small business loans (SBLs), significantly affects the survival of de novo businesses. I hypothesize that formal bank lending will significantly impact de novo businesses' survival, given the Community Reinvestment Act of 1977's mandate that banks meet the credit needs of low-income and marginal communities where they operate. I first determine whether banks reduce lending to de novo businesses during economic crises to have an effect on latter's survival. I then investigate heterogeneity in de novo business survival between metro and nonmetro counties during such events. This study establishes the critical role of banks and SBLs in business survival and the wider local economy. Additionally, the results contribute to existing knowledge about how exogenous shocks are transmitted to the lending sector (Bernanke, 1983; Bernanke and Blinder, 1988) and the effects of credit rationing (Stiglitz and Weiss,1981; Rajan et al. 1997, 2005). This study also, indirectly, contributes to debates over public sector involvement in the banking sector (Gerschenkron,1962; Krueger, 1974; Brie and Schclarek, 2013).

2.3 Methodology and Data Sources

2.*3.1* *Conceptual Model*

The following methods were deployed to test whether de novo businesses have a higher survival rate with greater access to institutional financial support. This analysis was conceptually based on endogenous growth theory (Romer, 1986,1990) and augmented by

human capital (Lucas, 1998) and entrepreneurship (Audretsch and Keilbach, 2004, 2007). My general model builds upon the endogenous growth model and spatial equilibrium analysis (Stephens, Partridge, and Faggian, 2011,2013; Bunten et al., 2015) to illustrate how local economies are impacted by fluctuations in credit supply (which de novo businesses need to survive). In this model, labor supply in the local economy is determined by households' choice of a location that maximizes their relative utility. Similarly, labor demand in the local economy is determined by firms' decisions to select a location where their profits are relatively higher.

$$(1). \quad \Delta Labor\ Supply_i = \beta_s(U_i - U_N - M_i)$$

where:

$U_i = Utility\ level\ in\ region\ i$

$U_N = Average\ Utility\ level\ in\ the\ nation$

$M_i = Moving\ costs\ to\ region\ i$

$\beta_s = adjustment\ speed\ factor\ affected\ by\ information\ costs$

$$(2). \quad \Delta Labor\ Demand_i = \beta_D(\pi_i - \pi^N)$$

where:

$\pi_i = Profits\ earned\ by\ representative\ firm\ in\ region\ i$

$\pi^N = Profits\ earned\ by\ representative\ firm\ in\ the\ nation$

$\beta_D = adjustment\ speed\ factor$

Local economic growth is influenced by the relative profits of businesses operating there. De novo small businesses depend on a reliable supply of credit to meet their unique financial needs and run a profitable enterprise. The local banks can fulfill a significant portion of this credit demand. Therefore, I incorporate the county survival rate of de novo businesses to evaluate banks' role (i.e., as credit suppliers) in promoting and sustaining economic growth

in the county. When existing businesses remain profitable and continue to operate, they are likely to positively influence the local labor demand, which would manifest through employment growth in the local economy. The following production function represents this:

$$(3). \quad Q_i = \alpha ES^{\beta} HC^{\gamma} CC^{\delta} K^{\varepsilon} I^{\zeta} A^{\eta} P^{\theta} D^{\vartheta} B^{\iota} M^{\kappa}$$

ES = Establishment survival rate in county i

HC = Human capital in county i

K = Credit Supply in county i

I = Median per capita income in county i

A = Amenity score of county i

D = Demand Shock in county i

CC = Creative class in county i

P = Population in county i

M = Distance to the nearest metro from county i

The exponents represent the relative productivity contribution of each factor.

The structural model suggests that regional (i.e., county) economic growth (G_i) is a function of credit supply from banks and other control variables that impact the survival of existing de novo businesses and the utility of households. This is represented by the following reduced form model:

$$(4). \quad Growth_i = f(ES_i K_i A_i HC_i MA_i I_i D_i)$$

I explore the relationship between bank credit supplied to local businesses and regional growth using the following empirical model:

$$(5). \quad Business\ Survival\ Rate_{it} = \beta_0 + \beta_1 Lendings_{it} + \beta_2\ Lagged\ Survival\ Rate_{i\,t} + \beta_3 High\ Human\ Capital_{it} + \beta_4\ Median\ Income_{it} + \beta_5\ Amenities_{it} + \beta_6 Distance\ to\ Metro_{it} + \beta_7\ Employment_{it} + \beta_8\ Density_{it} + \beta_9 County\ Specialization_{it} + \beta_{10} Demand\ Shock_{it} + \varepsilon_{it}$$

2.3.2 *Data Sources*

Data were collected for 3,021 counties from the contiguous 48 states of the US. These counties were categorized into metro (800) and nonmetro (2,221) to evaluate bank lending's impact across economic, demographic, and geographic factors.

Dependent Variable: Small Business Survival Rate in 2009 (SR2009). These data were procured from the National Establishment Time Series (NETS) database of US establishments. The NETS database is maintained and updated by Dun & Bradstreet in partnership with Walls & Associates. It collects data from every firm in the United States (from 1990) and is updated annually. It is a time-series that includes annual records of an establishment's job creation and destruction, sales growth performance, business survivability, mobility patterns, proprietary credit, and payment ratings[7]. Five-year survival rates were determined by tracking de novo businesses in the study counties over a five-year period (2005 to 2009). The dependent variable—small business survival rate—represents the aggregate survival rate of newly established small businesses during each year of the study period (i.e., whether de novo businesses born in 2005 survived from 2006 to 2009). This is not equivalent to hazard rates, which are commonly used in the literature.[8]

Lending Data: Small business lending data were obtained from the Federal Financial Institutions Examination Council (FFIEC). The 1977 Community Reinvestment Act (CRA)

[7] Data Sources, Kauffman Foundation. https://www.kauffman.org/microsites/state-of-the-field/user-resources/data-resources
[8] Hait A., US Census Bureau Webinar, 2020

mandated that large depository institutions provide credit facilities to local businesses and establishments in the communities where they operate. The CRA increased do novo businesses', operating in low-and-moderate income (LMI) neighborhoods, ability to procure loans from banks (Ding et al 2018, Kim 2023). The Act also stipulated that all institutions regulated by the Office of the Controller of the Currency, the Federal Reserve System, and the Federal Deposit Insurance Corporation (and that meet an asset-size requirement) are mandated to report the number of loans made to business establishments in underserved areas. Financial institutions with $1.252 billion or more in assets must report these data to all regulatory agencies (2018 Reporting Criteria, CRA). Small financial institutions may report but are not required to do so. This means that lending data from some small community banks—accounting for approximately 25 percent of aggregate banking system assets (Cole 2018)—may not be reported. However, the reports do include data on the majority of small business loans. CRA data includes valuable information about borrower locations. Other agencies supply the location of lenders; however, headquarters locations are often reported, "skewing the spatial information regarding originations of lending" (Conroy and Weiler, 2017).

There are many definitions of SBLs (small business loans), each with its own limitations (Jagtiani and Lemieux,2016). For example, Call Reports define SBLs as commercial and industrial (C&I) loans with origination amounts under $1 million, regardless of business size. Survey of Small Business Finances (SSBF, Federal Reserve Board) identifies SBLs as loans to businesses with fewer than 500 employees. The Flow of Funds dataset includes all C&I loans made to nonfinancial and noncorporate borrowers, regardless of the size of the loan or borrower. These definitional differences in commonly used datasets mean that results are not always comparable across studies. Following the conventional definition used in the literature, I use the CRA's definition of SBLs as loans made to businesses making less than $1 million in annual revenues.

This study aggregated all small business loans (SBLs) by county for each year from 1999 to 2015. Dividing the aggregate SBLs by annual county population yields the small business loan-per-capita figure; this determines the per annum per capita level of small business loans

disbursed in each county, thereby eliminating any bias due to population differences. This metric is also used to calculate annual changes in small business lending-per-capita.

If access to formal credit affects business stability and growth, then we would expect that previous access to credit (in past years) would be associated with current business survival. Banks frequently adjust their lending in response to macroeconomic conditions (Berger & Udell 1998, Bassett et al. 2014, Bord and Ivashina 2015). Therefore, the model also evaluates how bank lending in previous years impacts firm survival. The new business survival rate in 2009 is now the dependent variable; lending-per-capita levels from prior years (i.e., 2008, 2007, 2006, and 2005) are included as separate explanatory variables. Since changes in lending levels are expected to affect the survival rate of de novo businesses, annual changes in lending levels in the years before a specific survival year are also included in the model.

2.3.3 *Control Variables*

Common control variables from the entrepreneurship literature are used to test this hypothesis. These variables account for county demographic, regional, and economic characteristics (Bunten,2015; Mach & Wolken, 2012; Goetz & Rupasingha,2009). Lagged values of many control variables are used to address any likely bi-causal influence on the dependent variable (i.e., the de novo business survival rate). More information about the control variables and their sources is provided in the Appendix.

Table 2. Summary Statistics for All, Metro, and Nonmetro Counties

	All				Metro				Nonmetro			
	3021				800				2221			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Survival Rate 2009	0.786	0.089	0.286	1	0.726	0.075	0.333	1	0.808	0.084	0	1
Survival Rate 2008	0.91	0.05	0.46	1	0.89	0.04	0.53	1	0.91	0.05	0	1
Loans per capita, 2009	0.45	0.34	0.00	3.92	0.58	0.28	0.04	2.41	0.40	0.34	0.00	3.92
Loans per capita, 2008	0.67	0.47	0.00	5.39	0.87	0.38	0.06	2.85	0.60	0.48	0.00	5.39
Loans per capita, 2007	0.74	0.49	0.01	5.97	0.98	0.41	0.11	2.74	0.65	0.49	0.01	5.97
Loans per capita, 2006	0.68	0.47	0.01	6.11	0.92	0.39	0.16	2.38	0.59	0.47	0.01	6.11
Annual Change loan per capita, 2009-08	-0.33	0.64	-0.94	31.83	-0.33	0.12	-0.80	0.25	-0.32	0.74	-0.94	31.83
Annual Change loan per capita, 2008-07	-0.09	0.27	-0.96	2.33	-0.11	0.14	-0.62	0.70	-0.08	0.31	-0.96	2.33
Annual Change loan per capita, 2007-06	0.16	0.41	-0.82	7.04	0.08	0.16	-0.60	1.82	0.18	0.47	-0.82	7.04
Birth Rate, 1998	4.43	1.60	0.00	14.07	4.69	1.45	0.54	11.15	4.34	1.64	0.00	14.07
Death Rate, 1998	4.29	1.37	0.00	16.87	4.19	1.07	0.47	9.32	4.32	1.46	0.00	16.87
Births*Deaths	1.15	3.17	-30.08	72.04	0.96	1.96	-3.82	26.43	1.22	3.50	-30.08	72.04
Demand Shock, 2000-2005	2.19	4.37	-21.94	84.53	2.99	3.37	-10.47	23.04	1.90	4.64	-21.94	84.53
Demand Shock, 2000-2007	4.32	5.48	-20.71	87.23	5.59	4.24	-10.74	25.91	3.87	5.80	-20.71	87.23
Employment growth, 1990-2000	20.58	26.58	-39.37	767.20	28.43	23.92	-11.86	251.42	17.76	26.93	-39.37	767.20
Log Employment, 2000	9.55	1.45	5.68	15.50	11.14	1.30	7.65	15.50	8.97	1.00	5.68	11.46
Log Income, 2000	10.21	0.24	8.13	11.38	10.40	0.22	9.75	11.38	10.14	0.21	8.13	11.33
Density, 2000	0.22	1.68	0.00	66.94	0.72	3.20	0.00	66.94	0.04	0.04	0.00	0.82
BA Share, 2000	16.36	7.57	4.92	60.48	22.03	9.06	5.43	60.48	14.31	5.72	4.92	57.11
Population growth, 1950-1960	0.06	0.28	-0.42	3.71	0.27	0.35	-0.16	3.71	-0.02	0.20	-0.42	3.48
Median Age, 2000	37.42	3.90	20.70	54.30	35.65	3.27	23.20	54.30	38.06	3.91	20.70	53.00
County Specialization, 2006	0.55	0.19	0.12	1.67	0.40	0.15	0.12	1.31	0.60	0.17	0.22	1.67
Amenity Score	0.04	2.29	-6.40	11.17	0.27	2.41	-5.40	11.17	-0.04	2.24	-6.40	11.15
Distance to MSA	0.81	0.65	0.00	4.34	0.26	0.23	0.00	1.74	1.00	0.64	0.24	4.34
Marg dist MSA> 250k	1.03	1.51	0.00	8.92	0.37	0.85	0.00	7.42	1.27	1.62	0.00	8.92
Marg dist MSA> 500k	0.97	1.53	0.00	9.34	0.47	0.94	0.00	7.50	1.16	1.66	0.00	9.34
Marg dist MSA> 1000k	0.881	1.486	0.000	8.362	0.572	1.074	0.000	7.993	0.993	1.594	0.000	8.362

Source: US Census Bureau (1960 & 2000 decennial), County Business Survey, BEA & County Business Patterns, USDA Economic Research Service

Analysis of the data in the summary table, as displayed in Table 2, highlights important information regarding key variables in the model. The survival rate of de novo businesses is relatively higher in nonmetro counties compared to metro counties and all counties, both in 2008 and 2009. More loans per capita were disbursed in metro counties than in nonmetro counties and all counties. Furthermore, the number of loans disbursed declined from 2006 to 2009 across all three categories, with this decline being more pronounced in nonmetro counties compared to metro and all counties. A similar pattern is observed when examining the annual change in lending per capita during this period. Business dynamism, measured through the births and deaths of businesses in a county, indicates that nonmetro counties experienced higher business dynamism on average, followed by all counties and metro counties. This suggests that the births and deaths of business establishments had a relatively more pronounced impact on the local economy in nonmetro counties compared to the other two categories.

2.4 Empirical Analysis

2.4.1 Lending's *Impact on Business Survival in 2009*

Table 3. OLS Results: Lending & Changes-in-lending on SR2009

	SR 2009		
	All	Metro	Nonmetro
Lag 1 Survival Rate	1.365***	1.486***	1.283***
	(0.0401)	(0.104)	(0.0424)
Lending per capita	0.00345	**0.0715****	0.00154
(lpc)	(0.00804)	(0.0362)	(0.00813)
Lag 1 Lending per capita	**-0.0129****	**-0.0668*****	-0.00838
	(0.00622)	(0.0258)	(0.00641)
Annual Change in lpc	**0.00561*****	**-0.0439***	**0.00540*****
	(0.000609)	(0.0262)	(0.000561)
Lag 1 Annual Change in lpc	**0.0102*****	**0.0383*****	0.00513
	(0.00366)	(0.00962)	(0.00379)
Lag 2 Annual Change in lpc	**0.0120*****	**0.0145***	**0.00902*****
	(0.00311)	(0.00796)	(0.00322)
R-sq	0.758	0.794	0.718
N	3021	800	2221

Robust Standard errors in parentheses

** p<0.10, ** p<0.05, *** p<0.01*

Table 3 outlines how key lending variables affected survival rates in 2009 based on estimating equation number 5. The results are based on ordinary least squares (OLS) regressions on a cross-section of All counties, Metro counties, and Nonmetro counties. Annual changes in lending-per-capita, and its lagged values from preceding years, had a significant positive impact on the de novo business survival rate in 2009 in All counties and Nonmetro counties. As lending declined, establishment survival rates also declined. The contemporaneous impact of lending was significantly positive in Metro counties, though its lag and annual changes in lending-per-capita were found to be significantly negative. The annual change-in-lendings impact is modest but consistent in Nonmetro counties, which

supports the hypothesis that businesses there have limited borrowing avenues and depend on loans provided by existing banks (cf. metro areas, where more alternatives are available).

The economic significance of these findings becomes clearer when analyzed in terms of their impact. In All counties, with an average employment of 56,300, a one standard deviation decrease in the previous year's survival rate (2008) corresponds to a decline from 0.786 to 0.722 in 2009, resulting in the closure of 3.6 de novo establishments.

When evaluating the economic impact of lending variables, combining the significant annual changes in lending from prior years (2006-07, 2007-08, and 2008-09), a one standard deviation decline corresponds to a survival rate dropping from 0.786 to 0.774, resulting in the closure of 0.68 de novo establishments or nearly two out of three newborn business establishments.

In the case of an average metro county, with employment of approximately 175,000, the impulse response of the previous year's survival rate results in the closure of 9.6 de novo businesses. The contemporaneous decline in lending in 2009 resulted in the closure of 3.5 de novo establishments, while the annual changes in lending from 2006-07, 2007-08, and 2008-09 led to the closure of 0.35 de novo businesses, equating to approximately one out of every three newborn businesses.

A similar analysis of the impulse response in nonmetro counties, with an average employment of 13,000, reveals that the previous year's survival rate caused the closure of 0.78 de novo businesses. Evaluating the impact of bank lending, the combined effect of annual changes in lending from 2006-07 and 2008-09 resulted in the closure of 0.10 de novo business establishments in an average nonmetro county. In other words, one out of ten de novo business establishments failed due to credit rationing pursued by banks in response to prevalent economic conditions. Despite intervention by the Federal Government through various programs, banks continued to ration credit during the Great Recession and in subsequent years (Acharya et al., 2015). The cumulative decline in bank lending over the years likely contributed to the failure of additional establishments, particularly in nonmetro counties, which are more reliant on local banks than their metro counterparts.

Focusing on the impact observed in nonmetro counties, it appears that rather than the contemporaneous level of lending, it is the change in lending and its continuous decline, particularly over a two-year period, that negatively impacted the survivability of de novo businesses operating there. Initially, de novo establishments in Nonmetro counties are able to withstand the shock, but as the decline in lending continues in subsequent years, its effect eventually leads to the failure of some business establishments. Deller and Conroy (2016) also find that survival rates of businesses in rural counties are relatively higher than those in urban counties. They suggest that the lower number of business start-ups, the higher opportunity costs of running an unprofitable venture in urban counties, and the likely greater risk-aversion of business owners in rural counties are some of the reasons for the relatively higher survival rate of de novo businesses.

One key (non-lending) variable with a consistently significant positive impact across all three regional categories was the prior year's business survival rate (*Lag 1 Survival Rate* in the tables). This suggests that county business survival rates from the past year influenced the likelihood of business survival in the current year. Additional lags in this variable were not found to have any significant impact, indicating that the lagged value's influence is short-lived but non-trivial.

2.4.2 Exploring the Impact of Exogenous Policy Changes

This research investigates the critical role of credit supply on the survival of de novo business establishments. A potential criticism might note the suspected endogeneity between business survival rates and bank lending. This counterargument claims that the lower likelihood of business survival in nonmetro counties will discourage banks from lending to de novo businesses operating there. However, if this is true, then the estimates obtained in Tables 3 will pick up both the backward and forward effects, leading to inconsistent coefficients. I use an instrumental variable to address the suspected impact of simultaneous causality to address this concern. This instrumental variable not only addresses the suspected endogeneity but also tests the robustness of these results.

The instrumental variables approach (Card and Krueger, 1994) is commonly used in cases of suspected simultaneous causality. A valid instrumental variable should fulfill the conditions of relevance and exogeneity. An instrumental variable is relevant if variation in the instrument is related to variation in the regressor. It is considered exogenous if it is uncorrelated with the error term (i.e., it does not lead to any changes in the dependent variable) (Stock and Watson, p426).

The instrumental variable used is taken from the data on changes in bank lending channels in the counties from 2000 to 2009. I use the interaction between the concentration of deposits in the banks and the Federal Funds Rate during this period as the instrument. An increase in the Federal Funds Rate by the Federal Reserve affects the bank lending channel (Drechsler et al., 2017). This transmission flows through the deposits in banks, causing a decline in lending, with a stronger impact in concentrated markets. The higher federal funds rate results in increased borrowing costs for banks, which are subsequently passed on to consumers and businesses in the form of higher interest rates. Consequently, this leads to a decreased credit supply, reduced borrowing and investment, and potential changes in banks' portfolios.

The instrumental variable thus consists of two components: the county deposits Herfindahl Index and the Federal Funds Rate. The Herfindahl Index captures the concentration of deposits with banks in each county (i.e., variations in the quantity of deposits available in All, Metro, and Nonmetro counties). When combined with the Federal Funds rate, it captures the impact of (exogenous) monetary policy change on the supply of deposits in the county. The interaction between these two components is used to create an instrumental variable that captures the bank lending trajectory in each county but has no direct impact on the survival of de novo businesses. If changes in bank lending are caused by monetary policy, then the change in survival of businesses cannot be regarded as the cause for changes in bank lending. Therefore, this instrument helps establish the transmission of causality: from bank lending to business survival, not the other way around.

Table 4. Summarized IV Regression Results of Lending & Changes-in-lending on SR2009

	SR 2009		
	All	Metro	Nonmetro
Lag 1 Survival Rate	**1.324*** **	1.146	**1.254*** **
	(0.0558)	(1.033)	(0.0522)
Lending per capita (lpc)	**-0.0756***	-0.587	-0.0771
	(0.0457)	(1.679)	(0.0497)
Annual Change in lpc	**0.0103** **	0.523	**0.00966** **
	(0.00480)	(1.504)	(0.00465)
Lag 1 Annual Change in lpc	**0.0208** **	0.328	**0.0166***
	(0.00975)	(0.869)	(0.00994)
Lag 2 Annual Change in lpc	**0.0118*** **	0.0756	**0.00950*** **
	(0.00301)	(0.179)	(0.00313)
R-sq	0.718	-	0.663
N	3017	800	2217
Existence of Endogeneity^	Yes	No	Yes
Strong IV	Yes	No	Yes

^Based on Durbin and Wu-Hausman test

Robust Standard errors in parentheses

** p<0.10, ** p<0.05, *** p<0.01*

Table 4 displays the results of the regressions, where the interaction variable between the Herfindahl Index of county deposits and the Federal Funds Rate was used as an instrument in the model. First, the Durbin-Wu-Hausman test was used to test for the existence of endogeneity. Endogeneity was identified in All and Nonmetro counties (p-values .0508 and .054, respectively) but not in Metro counties (p-value .197). The instrumental variable was strong in All and Nonmetro counties, but not in Metro counties. The F-statistic used to test the instrument's strength was 17.55 for All counties and 14.51 for Nonmetro counties. The test statistics and p-values for both tests are displayed in Table 21 in the Appendix. Notably, in Metro counties, no endogeneity was found, and the instrumental variable was weak. Unlike in the last analysis, neither the lagged survival rate value nor any lending variable was found to be significant in Metro counties.

The results echo those from the previous analysis and confirm the hypothesis that bank lending impacted de novo businesses' survival in 2009. Specifically, changes in lending levels in 2009 and from the previous two years strongly influenced whether new business establishments would survive. This impact was evident in All counties and Nonmetro counties.

However, in metro counties the results suggests the existence of a different dynamic regarding the financing and survival of de novo businesses in 2009. The analysis indicates that credit supplied by banks did not play as vital a role in the survival of de novo businesses in metro counties as it did in nonmetro counties. Business owners in metro counties comparatively have access to additional nontraditional funding sources, such as friends and family, credit cards, and home equity loans (Jagtiani & Lemieux, 2016; Cole, 2018), which likely substitute for credit rationing by banks during economic downturns. The absence of endogeneity between business survival rates and bank lending in metro counties suggests that the failure of business establishments in the previous year did not significantly impact banks' decisions to extend credit to de novo businesses. Also, the opportunity cost of running a loss-making business is much higher in metro counties than in nonmetro counties, contributing to the substantial rate of business dynamism observed in metro counties. This high rate of business dynamism is likely factored into the risk management practices of banks' asset portfolios operating in metro counties. It is possible that the majority of business establishments that failed were self-financed and/or had limited access to bank credit, thereby having a negligible impact on banks' lending decisions in subsequent periods. In this context, the weakness of the instrumental variable in metro counties reinforces the relatively diminished role of bank credit, at least in the short-term. These results established the transmission of causality from bank lending changes to business survival rates in All and Nonmetro counties. Puri et al. (2011) arrived at similar results with a unique dataset from German banks spanning from 2006 to 2008, where they segregated the supply effect and demand effect. They found that when banks reduced lending to preserve liquidity, retail customers were disproportionately affected over corporate customers. Similarly, Robb and Robinson (2012) determined that new firms rely extensively on bank debt and are especially sensitive to fluctuations in bank lending conditions.

2.4.3 Using the LDPDM to Address Endogeneity with Lagged Survival Rate

I also use the mechanics of a longitudinal structure to address the suspected endogeneity. This allows for an opportunity to use the lagged value of the dependent variable as an explanatory variable. One can estimate the precise impact of the lagged value of the dependent variable by using an appropriate estimator in the dynamic panel data model.

The dataset in this longitudinal setup is indexed by spatial unit (county) and time (year); it consists of many spatial units and a corresponding time series for each unit (i.e., a dataset with large N and small T). Therefore, a regular fixed effects model is not appropriate since the "de-meaning" process creates a correlation between the regressor and the error term and generates bias in the coefficient of the lagged dependent variable estimates (Nickell 1981). I run diagnostic tests to identify any serial autocorrelation, contemporaneous correlation, and heteroskedasticity[9]. This exercise also helps in selecting an appropriate estimator for the analysis. Commonly used estimators with dynamic panel datasets include Arellano-Bond (1995), Arellano-Bover/Blundell-Bond (1998), Roodman (2009), and Linear Dynamic Panel Data Estimator. It is critical to select an appropriate estimator based on the nuances of the dataset to get consistent and efficient estimates[10].

I select the Linear Dynamic Panel Data estimator (*LDPDM*, hereafter) due to its flexibility in accommodating large autoregressive variables in the error term; it is also better at accommodating complicated model structures than the Arellano-Bond and Arellano-Bover/Blundell-Bond estimators[11]. The LDPDM accommodates the existence of

[9] Detailed results from these diagnostic tests are provided in Table 22 in the Appendix.
[10] The Wooldridge test assesses for serial autocorrelation (Drukker 2003, Wooldridge 2002). The test results indicated the presence of significant first-order correlation in both de novo business survival rate and lending-per-capita. Pesaran's test for cross-sectional dependence (CD test) was conducted to test for contemporaneous correlation. The test indicated the presence of cross-sectional dependence in Metro counties. Finally, the Glejser test assesses the presence of heteroskedasticity. The test regresses absolute values of the residuals from an OLS regression with selected predictors. The test statistic (Glejser-LM test of 138.12) indicates the existence of heteroskedasticity. The well-known Stata user command 'lmhgl' runs this test (Elmessih, 2012). The presence of serial autocorrelation and contemporaneous correlation rules out the application of Pooled OLS and Random Effects models.
[11] The estimator also allows for the choice between instrumental variable and GMM style estimators, and to test for overidentification restrictions in the model. Using the robust option yields heteroskedastic-consistent estimates of the variance-covariance matrix of the estimator if the error term is not serially correlated.

autocorrelation in the error term, which directly addresses heteroskedasticity (by using the robust option in the analysis). Sarafidis et al. (2008) suggest that a system GMM (Generalized Method of Moments) with partial regressors can be a reliable estimator for cross-sectional dependence. The LDPDM offers the flexibility to choose the GMM, which is unavailable or has limited application in other estimators. Additionally, a time variable to control for time effects, and an interaction term of lending variables (both levels, and change-in-lending) with the time variables are introduced in this specification to capture the impact of lending in specific years.

(Cameron and Trivedi, 2009 p289). It was more challenging to establish the absence of autoregression in the error term when using AB and AB/BB, given the short time series of the dependent variable (i.e., business survival rate).

Table 5: Summarized Results from the Linear Dynamic Panel Data Model

	All	Metro	Nonmetro
Lag 1 Survival Rate	**0.920*** **	**0.940*** **	**0.934*** **
	(0.0502)	(0.0535)	(0.0362)
Lending per capita (lpc)	**-0.465*** **	**-0.498*** **	**-0.359*** **
	(0.122)	(0.138)	(0.0997)
Lag 1 Lending per capita	**0.198*** **	**0.262*** **	**0.151*** **
	(0.0625)	(0.0886)	(0.0477)
Annual Change in lpc	**0.213*** **	0.139	**0.168*** **
	(0.0683)	(0.108)	(0.0511)
Lag 1 Annual Change in lpc	**0.0235*** **	**0.0605*** **	**0.0155*** **
	(0.00714)	(0.0111)	(0.00457)
Lag 2 Annual Change in lpc	**0.0117*** **	**0.0240*** **	**0.00746*** **
	(0.00373)	(0.00591)	(0.00252)
N	9051	2400	6651
No. of Instruments	27	27	27
chi2^	20.647	63.748	23.096
Prob > chi2	0.1485	0	0.0821

Standard errors in parentheses

** p<0.10, ** p<0.05, *** p<0.01*

^ Ho: Overidentifying restrictions are valid

Table 5 displays the results from the Linear Dynamic Panel Data Model. As in earlier analyses, annual change-in-lending and its lagged values from the preceding two years have a significant positive impact on the de novo business survival rate. The contemporaneous impact of changes in bank lending (annual change in lending-per-capita) is consistently evident in All counties and Nonmetro counties. Unlike previous regressions, this time the impact of lagged values of this variable is evident in Metro counties as well. A panel setup facilitates the study of a factor or variable over multiple periods, thereby assisting to investigate both contemporaneous and inter-temporal impacts. Although the cross-sectional

setup did not reveal a consistent effect of bank lending levels and its changes on the survival rate of de novo businesses in metro counties, the current model in the longitudinal setup identifies the impact of both the level of credit and changes in credit from prior years on their survival rate. Thus, the impact of local banks' credit rationing is persistent—its cumulative effect becomes stronger with additional credit rationing in subsequent years. Additional lags from this variable were included in the analysis; however, they did not have a significant impact on the de novo business survival rate.

The prior year's business survival rate has a significant positive impact across all geographical categories (again), though the magnitude is relatively smaller than in the previous analysis (as in Table 3 and Table 4). The contemporaneous level of bank lending-per-capita had a significant negative impact on de novo business survival across all categories (see also Table 3). The level of lending in the prior year was also found to have a significant positive impact on de novo business survival (like the annual change in lending). This variable's significance lends support to the claim that both the level of and changes in SBL lending (and their lagged versions) have a lasting impact on the survival of a newly established enterprise. This impact is observed consistently in Nonmetro and All counties, though not in Metro counties. The absence of a contemporaneous impact of decreased bank credit in metro counties supports the argument that business owners in metro counties have access to alternative funding sources. These alternative sources help them manage the immediate financial challenges but are insufficient to withstand the cumulative impact over multiple years.

Table 6. Impact of Bank Lending on Business Survival, 2001-2003

	SR2001			SR2002			SR2003		
	All	Metro	Nonmetro	All	Metro	Nonmetro	All	Metro	Nonmetro
Lag 1 Survival Rate	0.980***	1.074***	0.974***	0.937***	0.999***	0.932***	0.962***	0.952***	0.962***
(L1.SR)	(0.0202)	(0.0414)	(0.0218)	(0.0180)	(0.0188)	(0.0197)	(0.0118)	(0.0197)	(0.0129)
Lending per capita	**0.00573*** **	0.00360	**0.00561*** **	**0.00409** **	0.00192	**0.00340***	**0.00226***	**0.00372** **	0.00201
(lpc)	(0.00167)	(0.00238)	(0.00212)	(0.00161)	(0.00199)	(0.00199)	(0.00118)	(0.00151)	(0.00155)
Annual Change in lpc	**0.000134** **	-0.00464	**0.000152*** **	0.000332	-0.00320	0.000709	-0.000793	-0.00318	-0.000733
(chng)	(0.0000582)	(0.00449)	(0.0000553)	(0.00138)	(0.00297)	(0.00140)	(0.00138)	(0.00474)	(0.00141)
Lag 1 Annual Change in lpc	0.000671	-0.00444	0.000821	**0.000246*** **	**0.00729*** **	**0.000254*** **	0.00113	0.000548	0.00108
(L1.chng)	(0.000585)	(0.00382)	(0.000578)	(0.0000335)	(0.00278)	(0.0000392)	(0.000973)	(0.00277)	(0.00102)
Lag 2 Annual Change in lpc	-	-	-	0.000504	**0.00977*** **	0.000459	**0.000120*** **	0.000341	**0.000116*** **
(L2.chng)				(0.000574)	(0.00297)	(0.000589)	(0.0000339)	(0.00237)	(0.0000361)
R-sq	0.685	0.691	0.685	0.752	0.847	0.743	0.870	0.878	0.870
N	3019	799	2220	3019	799	2220	3021	800	2221

Robust Standard errors in parentheses

** p<0.10, ** p<0.05, *** p<0.01*

2.4.4 The 2001 Recession

I replicate this study's critical findings with historical data from 2001-2003 for increased validity. The primary investigation period (2005-2009) was dominated by the Great Recession and its aftershocks. My limited replication offers another opportunity to establish the role of credit supply on de novo businesses in the context of a previous recession. The 2001 recession was relatively brief, lasting only from March to November.

I run regressions to identify the role of bank lending on de novo business survival in 2001, 2002, and 2003. The dataset is cross-sectional, with business survival rates (2001, 2002, and 2003) from previous year also included as a dependent variable, in respective regressions. The de novo business establishments were born in 1999. Regional control variables are included to account for the counties' economic, demographic, and geographical attributes. The control variables' lagged values are also included to address any potential endogeneity with the dependent variable(s). Levels and annual changes in bank lending are included, along with the appropriate number of lagged variables. Lastly, counties are again categorized as All, Metro, and Nonmetro.

The results from this replication reveal that both the contemporaneous level of lending and changes in lending impacted business survival (Table 6). The concurrent level of lending predominantly affects All and Nonmetro counties in 2001 and 2002, and All and Metro counties in 2003. Interestingly, the annual change in lending's impact on de novo business survival is only visible in All and Nonmetro counties in 2001. Closer scrutiny reveals that this specific effect shows up as the first lag of change in lending in 2002 and the second lag of change in lending in 2003. In short, the impact of changes in lending from 2001 manifests in the lagged values for 2002 and 2003. This is consistent with the findings from the OLS, Instrumental Variable, and Linear Panel Data Model specifications.

Bank SBL fluctuations are seen to have both a contemporaneous and an enduring impact. This impact manifests strongly during recessions and persists for several years, as seen in All and Nonmetro counties. Similar to the previous analysis, in metro counties, the decline in bank credit is found to persist into the future, as evidenced by the significance of the lagged

values of annual changes in lending. Credit rationing in these counties significantly impacts business survival (profoundly so for de novo businesses). Banks provide liquidity for business establishments in these counties; therefore, a liquidity crunch from credit rationing—as observed in declining numbers of new loans issued—increases business establishments' financial fragility and results in the death of struggling de novo businesses.

Even before the Great Recession, banks were struggling to provide liquidity to the market, and an increase in deposit rates by (vulnerable) banks failed to increase the inflow of deposits to adequate levels (Acharya et al., 2015). Federal government interventions (e.g., increased limits on FDIC insurance) eventually led to an inflow of deposits. However, some banks did not immediately expand total loans and credit lines even after receiving federal support (Acharya et al., 2015).

2.5 Discussion of Key Results

Credit supply shocks have a modest contemporaneous impact on de novo business survival rates. However, the effect of credit rationing (changes in bank lending) is steadily visible over the subsequent (at least two) years. This was true for All and Nonmetro counties, but not Metro counties. This highlights the critical role local banks play in the survival of small businesses, particularly those operating in nonmetro counties. In metro counties, businesses have access to alternative funding sources like fintech, venture capital, and larger community networks of friends and family. These additional resources provide a critical lifeline, especially in economic downturns. In nonmetro counties, small, young business enterprises must depend on the sole provider of SBLs—local banks.

The Great Recession (2007-09) was a systemic shock that began in the housing market but quickly engulfed the financial system and, eventually, the entire US economy. The economic damage is evident in fundamental economic indicators: a steep rise in the unemployment rate, a decline in output, and an increased number of businesses filing for bankruptcy protection. The Federal Reserve eased monetary policy by explicitly committing to keep interest rates low for the foreseeable future (the Forward Guidance program) and offered increased credit supply to financial intermediaries through quantitative easing. The decline

in lending during this period is attributed to credit rationing by financial institutions, as manifested in changes to their lending standards and risk tolerance (Acharya et al. 2015, DeYoung 2015, Robb and Robinson 2012). Changes in bank lending reduced the number of SBLs offered in rural areas (that rely heavily on banks). Shocks in credit supply led to a substantial decline in the borrowing capacity of businesses and households (Bassett et al., 2014).

There are noticeable differences between banks operating in nonmetro and metro counties. The former are dominated by small community banks, while the latter contain, on average, larger banks. These two kinds of banks are structurally different (DeYoung et al., 2012,2015). Small community banks follow a portfolio approach, while large banks follow an originate-and-securitize approach. Large banks capitalize on scale economies and securitize a diversified composition of loans (assets) to sell to other institutional investors. In contrast, local community banks mostly make business-and-commercial loans to small businesses, real estate loans, and consumer loans to local clients. They keep loans on their balance sheet and lack the scale and specialized hedging products (e.g., credit default swaps) to securitize them. This approach increases credit risk and liquidity pressure, so community banks are relatively more sensitive to risk when issuing new loans, especially during economic downturns.

Both large and local banks faced immense, unprecedented liquidity pressures directly before and during the Great Recession (Acharya et al. 2015, Ivashina 2010). Local community banks responded by maintaining relatively higher stock for liquidity, resulting in less credit supply for clients in the local market (DeYoung,2015). The impact of community and small banks' credit rationing was most evident in nonmetro counties. Reduced bank lending could also be attributed to state bankruptcy exemption laws since greater bankruptcy protection impairs an asset's value as collateral held by banks. Robb et al. (2012) find that borrowers in states with higher bankruptcy exemptions obtain a lower ratio of external debt to total capital.

Overall, this analysis demonstrates the statistically significant impact of annual changes in bank lending, and the preceding period's business survival rate on the survival rate of de novo business establishments. Both factors likely work in tandem to strongly influence the

new establishment survivability. However, the protracted decline in bank lending during the Great Recession significantly increased the likelihood of business deaths in nonmetro counties. I find the impact of the continuous decline in bank lending persisted for two years. This prolonged credit rationing amplified the risk for de novo businesses already struggling in their challenging initial years. The death of de novo businesses caused a decline in supporting and ancillary business establishments, which caused a further decline in overall economic activity. Banks continued to ration credit even after receiving aid from the government during the Great Recession (Acharya et al. 2015, Ivashina 2010, Cole 2018). This prolonged decline in credit supply contributed to the death of de novo businesses. The results from All and Nonmetro counties indicate that the de novo business survival rate and credit supply did not exist in isolation, but rather within a reinforcing (positive) feedback system. As discussed in the results from Table 2, the combined effect of the previous year's survival rate and reduced lendings by banks during the Great Recession resulted in the closure of more than four de novo establishments in All counties, and more than one establishment in Nonmetro counties in 2009.

In reinforcing feedback systems (Myrdal 1957, Kaldor 1966), "contributory stimuli are transmitted around the feedback loop, [so] each iteration generates a further increment of change" (Joffe, 2021). Feedback is the back-and-forth transmission of information about the state of the system (in this case, between banks, and de novo business owners). Stocks represent the accumulated level of funds within the banking system, while flows represent the number of loans made to de novo businesses. Agents use the information transmitted through feedback loops to adjust the flows, which leads to behavioral changes in the system (Radzicki, 2021). Macroeconomic events act as the (contributory) stimuli that influence local banks' risk tolerance (DeYoung et al., 2015). Credit rationing during the recession impacted the survivability of de novo businesses. Business owners, already struggling with declining sales, opted to close operations in the face of decreasing credit supply from local banks. As credit rationing persisted during the downturn, it manifested in the increased stock of failed businesses, further reinforcing banks' decision to decelerate the credit supply. The inherent nature of this feedback loop apparently created a *credit supply-business survival spiral* that appears to persist even after the end of the Great Recession.

In both recent US recessions (2001 and the Great Recession), banks and other traditional credit suppliers were unable to support enterprises when they most needed credit. Even before the onset of the Great Recession, banks struggled as liquidity providers (Bord et al. 2018, Acharya and Mora 2015, Bassett et al. 2014). De novo businesses in nonmetro counties, with an immediate need for funding and little access to other funding sources, were most likely to suffer adverse effects from credit rationing. De novo businesses do not have a long history, lack sufficient collateral, cannot access the equity or debt market, and have nonexistent or low credit scores and fluctuating sales. Furthermore, most of their loan requests were under $100,000 (Figure 2)—too small for large banks loans. Things have not changed much for de novo businesses in the years since the Great Recession. A survey conducted by Square Capital (now Block) in 2019 found that "about 47 percent of small businesses found obtaining financing to be a difficult or frustrating process, and 37 percent believe that obtaining financing does not feel accessible."[12]

In the years since the Great Recession, major fintech firms[13] have begun operating in online lending. For instance, OnDeck Capital and Kabbage lead in the balance sheet lending segment, while LendingClub and Prosper Marketplace lead in marketplace lending. Additionally, payment processors like Square Capital and PayPal facilitate credit and debit card sales for merchants through online Point-of-Sale (PoS) systems. They have access to vital data about a merchant's credit and debit card transactions and cash sales. These companies use their data to offer merchants short-term loans to meet working capital needs at customized interest rates and fees based on an algorithm-based assessment of each business establishment's financial strength. Small businesses, especially de novo businesses, find this beneficial; it avoids the relatively long and arduous process of applying for bank loans and does not require a long business history or sufficient credit score. A Small Business

[12] https://squareup.com/us/en/capital/capital-report-2020

[13] The term 'Fintech' is a combination of words, 'Financial' and 'Technology'. Although not formally defined, it refers to companies that create technology-based applications in the financial industry. Fintech companies use tools like artificial intelligence, blockchain, cloud computing, and big data to create products and services that enhance and streamline various aspects of the financial industry.

Credit Survey conducted by the Federal Reserve in 2019 found that 32% of applicants accessed loans from online lenders in 2018 (up from 24% in 2017 and 19% in 2016).

The fintech firms seemed to have filled a critical financial need for small and de novo businesses. However, their service proposition changed when the COVID-19 pandemic struck, and lockdowns were imposed. Many online lenders stopped issuing new loans, and this sudden decline in SBLs from online lenders had an adverse impact on the financial well-being of small and de novo businesses. The pandemic alone created numerous challenges like declines in revenue, disruptions of supply chains, and an unprecedented labor shortage. In 2020, firms were more likely to seek financial assistance to meet operating expenses than in 2019[14].

In both the Great Recession and the COVID-19 pandemic, the federal government intervened with economic programs to support vulnerable organizations. Notably, during the Great Recession, government agencies provided explicit financial support to ailing banks to increase liquidity in the system (Acharya 2015, Jagtiani and Lemieux 2016, Ivashina et al. 2010). Similarly, during the pandemic, the federal government introduced the Payment Protection Plan (PPP) to provide direct loans to business establishments, provided they kept existing employees on the payroll. At least one leading online lender (Square Capital) ceased lending to its clients (small and de novo businesses) and instead facilitated PPP applications through its portal.

2.6 Conclusion

This chapter examines how fluctuations in bank credit impact local economies via de novo business survival rates. I use an instrumental variable and a linear dynamic panel data estimator with cross-sectional and panel datasets, respectively, while controlling for regional factors and using different periods to test the robustness of the results. The limited available data on business survival rates demands the application of a comprehensive array of specifications to create a mechanism to investigate the hypothesis and validate the results

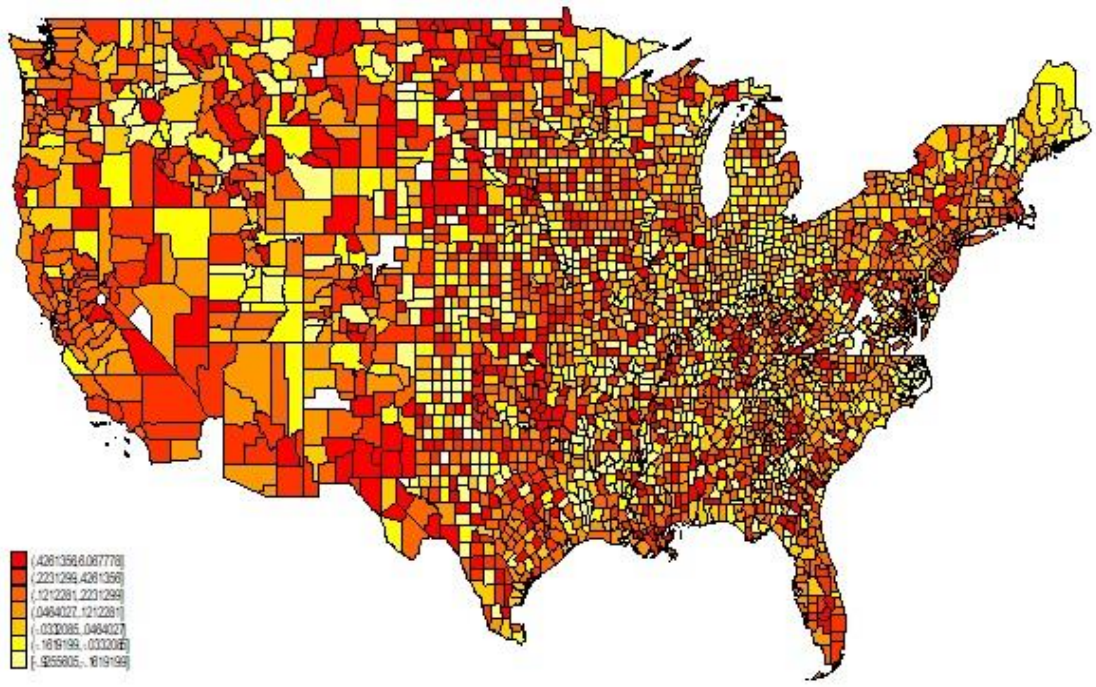
[14] 2021 Report on Employer Firms, Small Business Credit Survey

(*a la* Kennickell et al., 2015). The use of both cross-section and panel setups elicits valuable information. Each specification augments the results from the prior specification, ultimately revealing the existence of a feedback loop between credit supply and de novo business survival. In this credit supply-business survival spiral, rationing of credit by local banks' (in response to economic downturns) aggravated the deaths of de novo businesses. This development reinforces banks' decisions to stop issuing new loans and extending credit lines, thus pushing another set of de novo businesses toward closure. This spiral mainly manifests in nonmetro counties. These findings confirmed the financial hardships de novo business owners in nonmetro counties face relative to their counterparts in metro counties. The evidence, though modest in magnitude, is robust and consistent enough to establish the impact of fluctuations in bank lending on the survival of de novo businesses, notably during recessions.

De novo business deaths exacerbate the impacts of downturns on local economies as they decelerate (and potentially stagnate) job creation, innovation, and productivity growth. The behavior of private banks encourages business owners to search for alternative resources to meet their young establishments' immediate and pressing financial needs. Many used personal assets like home equity and home equity line of credit (HELOC) during the Great Recession (Jagtiani and Lemieux 2016, Cole 2018). The effectiveness of such alternative credit sources for funding businesses should be investigated further. Future research should also consider the inconsistent impact of credit supply fluctuations on de novo business survival in metro counties (i.e., the dominance of large banks, additional credit suppliers, and potential demographic and economic differences).

In two recent recessions (2001 and the Great Recession), banks and private lenders failed to provide uninterrupted credit supply to small businesses, compelling government agencies to intervene with policy measures to support business establishments and stimulate economic activity, thereby highlighting the debate on the role of government in the banking industry.

2006-07



2008-09

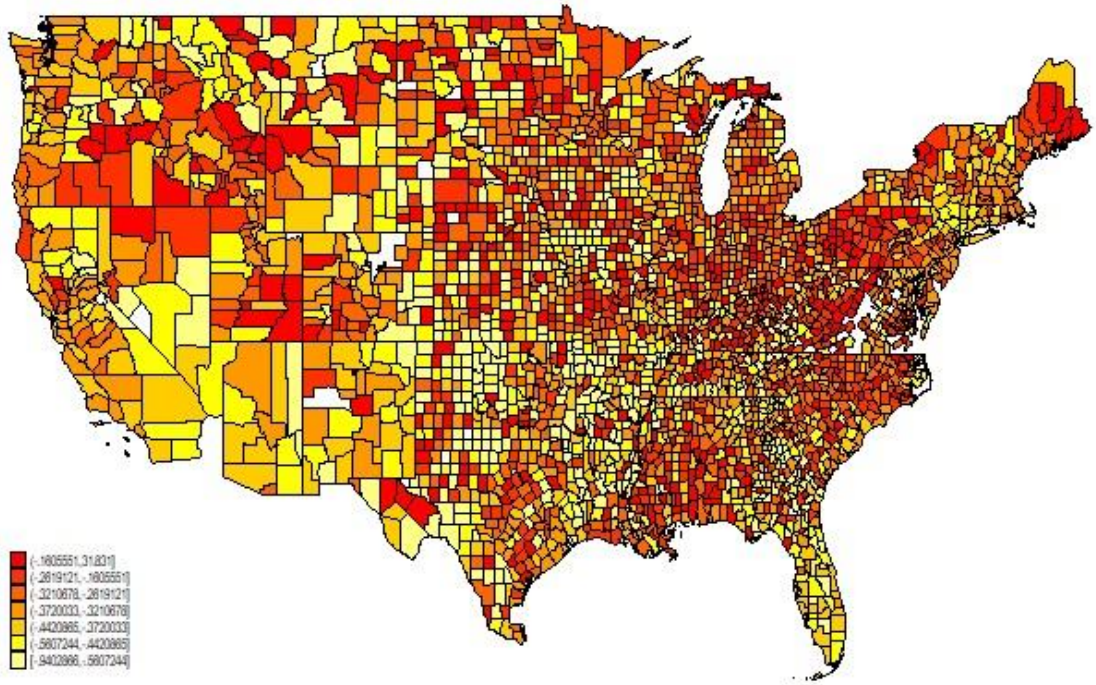
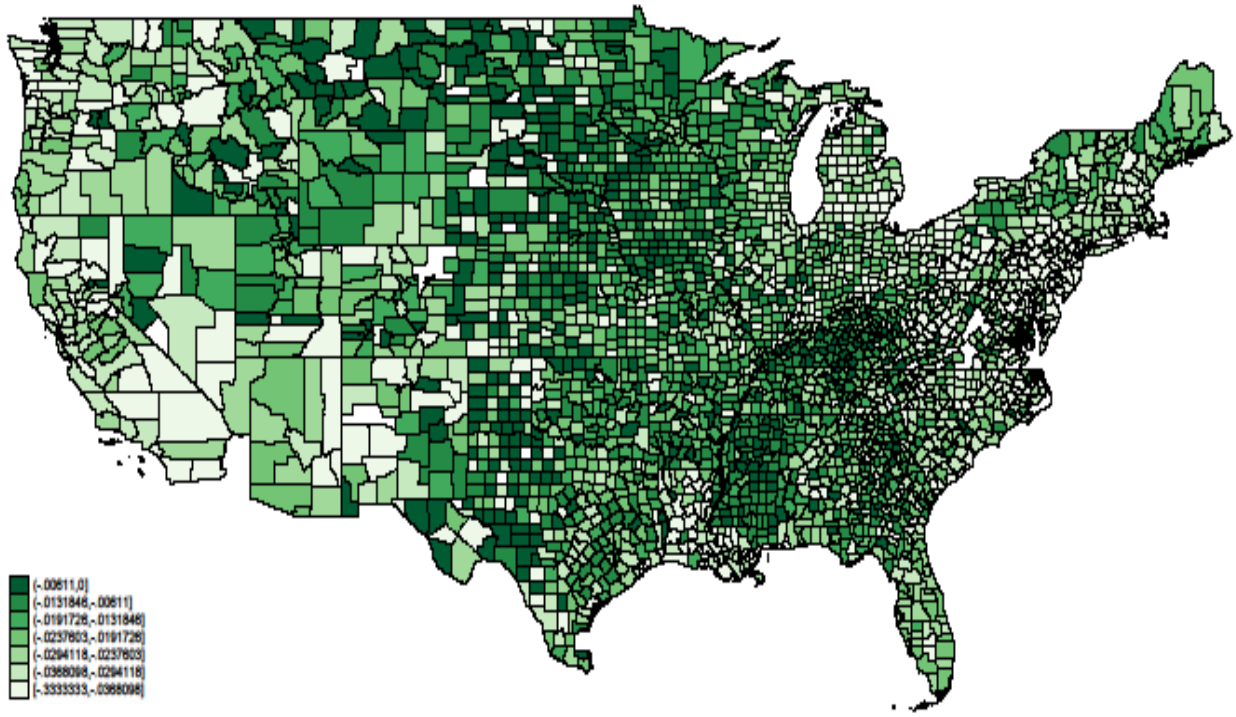


Figure 3. Map Annual Changes-in-Lending: 2006-07 vs 2008-09

2006-07



2008-09

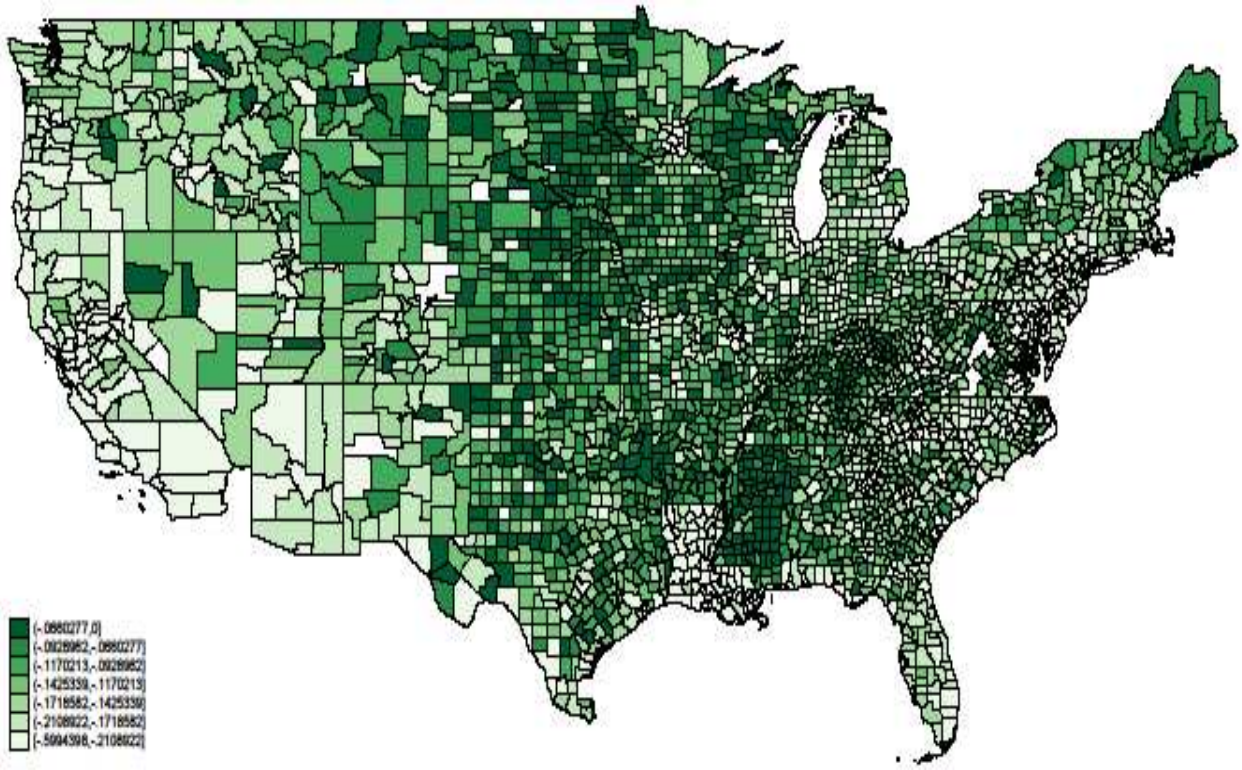


Figure 4. Map Change in Survival Rate: 2006-07 vs 2008-09

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Chapter 3. Risk, Recession, and Resilience

3.1 Introduction

Factors that impact the survival of a firm can be broadly categorized into firm-specific, industry-specific, and region-specific. Among region-specific factors, a significant factor is the local labor market environment. The local labor market's characteristics are likely to significantly impact the level of entrepreneurship, and the success achieved by business enterprises in that region.

Recent empirical research has identified the employment portfolio of a local market as a critical determinant influencing entrepreneurship in the region (Chandra 2002, Lande 1994, Spelman 2006, Low and Weiler 2012). Borrowing from portfolio theory (Markowitz 1952) in financial economics, the employment portfolio of the local labor market is now being used to evaluate the prospects for a business enterprise in that location. Portfolio theory helps identify the frontier where a combination of financial instruments will yield the optimal return, given their risk profile. Similarly, empirical investigation of the employment portfolio in a region has been shown to create a U-shaped frontier in the local labor market, given the risk–return profile in that market. The return in the labor market, on the horizontal axis, represents the growth in jobs, and the risk, on the vertical axis, represents the volatility in the growth in jobs in that local market.

The trade-off between employment-based risk and return measures in the local labor market is crucial for prospective entrepreneurs and business owners to estimate the likelihood of survival of their establishment in the future. Considering the interrelationship between risk and return in a local labor market, I hypothesize that this interrelationship, captured by the employment portfolio, can impact the survival of a new business operating in that region. I am interested in investigating whether the employment portfolio of a region influences the likelihood of survival of a new business establishment. Is there any heterogeneity in the impact of employment portfolio on new business survival in metro and non-metro regions? How significant is this impact on new business survival in different regions?

There is a gap in the existing literature that highlights the impact of local labor market dynamics on new business survival. This chapter attempts to fill that gap. Notable investigations in this domain have focused on the role of human capital in the workforce (Acs et al., 2007), the impact of employment density on labor productivity (Ciccone, 1996), and the education level of the employer (Kangasharju and Pekkala, 2002). In turn, I measure the impact of changes in the local labor market environment on new business survival in three steps. First, I begin by identifying the existence of an optimal frontier, represented by risk and return trade-off in the local labor market (at the county-level), by using the stochastic frontier estimation technique (Chandra 2002, Low and Weiler 2012). Second, I investigate the impact of changes in the employment portfolios in counties on the new business survival rate in 2010. These business establishments were born in 2005–2006. I find that the local employment-based measures significantly impact the survival of new businesses operating in metro counties. I then use income-based measures to validate the results and find that the latter also have a consistent and significant influence on new business survival, again on those operating in metro counties. Third, I narrow our sample to new businesses operating in Metropolitan Statistical Areas (MSAs) only, using both employment-based and income-based measures, testing the hypothesized relationship with new business survival rates in 2010 (post financial crisis). I also replicate the third step to investigate the impact on the new business survival rate in 2005 (pre-financial crisis). This carries dual benefits: one, it tests for the robustness of the initial findings, and second, it tests for any effects of exogenous shocks on the local labor market environment and their consequent impact on new business survival. The 2001 recession and the Great Recession are two major economic shocks that happened during the study period. By replicating the empirical exercise in different periods, I wish to isolate and study each exogenous event's impact on local labor market dynamics and subsequently on new business survival.

I find that volatility in the local labor market consistently impacts the likelihood of survival of new businesses in MSAs. I also find that this impact is stronger during recessions. The results suggest that the continued survival of new businesses despite volatility in local labor markets contributes to local economic growth, and to the resilience of the local economy during economic downturns. I acknowledge the clear limitations of this research given the

probability of reverse causality/endogeneity and suggest trajectories for future work given these likely inter-relationships.

This endeavor also addresses sustainability; in this case in the form of sustainable economic systems, identified through the viability and opportunities created by the local labor market. I find that over the long-term, the local labor markets dynamics likely influence the employee behavior, which enhances the resilience of new businesses by helping them endure the financial and economic challenges, and survive through the economic downturn. This resilience displayed by new businesses, especially during recessions, promotes sustainable local economic development.

The chapter proceeds as follows. Section 2 reviews the new firm survival literature, the literature on the application of modern portfolio theory in regional economics, and how the application of this approach helps in identifying the impacts of changes in local labor markets on new business survival. Section 3 and 4 highlight the methodology and data used for the research; the theoretical framework and the empirical model used in this research. The results are discussed in Section 5. The final section concludes the chapter, highlighting the impact of local labor market dynamics on new business survival, and local economic development.

3.2 Literature Review, Research Niche, and Theoretical Structure

Empirical research into the role of regional factors on firm survival has broadly focused on the impact of agglomeration, scale economies, and institutional legitimacy (Acs et al. 2007, Audretsch and Mahmoon 1995, Audrestch et al. 2006, Christie and Sjoquist 2012).

Investigations into the impact of local labor on firm survival have concentrated primarily on the availability and quality of human capital. In this regard, most of the research focuses on the role of entrepreneur-centric human capital in determining firm survival. The level of human capital possessed by the entrepreneur is typically measured in terms of entrepreneurs' personal characteristics. Acs et al. 2007 cite the role of specific characteristics, namely, the level of education (Bates 1995), entrepreneur's experience in

similar roles (Cooper et al. 1989; Bruderl et al. 1992; Dyke et al. 1992; Peña 2002), psychological factors such as motivation and ambition (Keasy and Watson1991), preparation, and time spent on the operations (Peña 2002). Interestingly, another strand of related literature finds no evidence between such personal characteristics and business survival (Wicker and King 1989; Keeble and Walker 1994).

Acs et al. (2007) find a positive relationship between regional human capital and new firm survival in the growth period (1993–1995), and a not so strong relationship during the recession period (1990–1992) when studying the labor market areas (LMAs) in the U.S. They find that "high school dropout rates are negatively associated with firm survival rate for both periods, and college-degree-share is positively related to firm survival in the growth period." Ciccone and Hall (1996) investigate the variation in labor productivity across states in the U.S. They find that doubling employment density in a county results in a 6% increase in average labor productivity.

Kangasharju and Pekkala (2002) investigated the relationship between education level, self-employment, and firm success in Finland by comparing the performance of highly educated and less educated self-employed individuals and their respective firms during periods of economic downturn (1990-1992) and subsequent economic rebound (1993-1995). They find that the likelihood of survival of firms established by highly educated employers is greater in recessionary periods than in periods of economic growth. They attribute this primarily to self-employment being "a less attractive choice for the highly educated due to lower earnings prospects," and the opportunity cost of foregoing higher wages during periods of economic boom. The study concludes that general labor market conditions significantly influence firms' survival prospects.

3.2.1. Theoretical Structure

Modern portfolio theory, espoused by Markowitz (1952), is used in identifying the unique investment portfolio(s) that yield the highest return for the level of risk tolerance of the investor. The portfolio(s) that meet the risk–return trade-off lie on the border, which is commonly referred to as the efficient frontier. Since it was first applied by Conroy (1974,

1975) to find the efficient trade-off between incentives to offer and the desired industrial mix in the region, regional economists have increasingly used portfolio theory to capture the risk–return trade-off with relevant variables of interest. Spelman (2006) applies portfolio theory and finds that luring businesses by offering economic incentives leads to increased volatility in growth rates in metropolitan areas. Chandra (2002) identifies an efficient frontier while examining the relationship between economic growth and instability among U.S. states. Analyzing the Gross State Product data spanning the periods of 1963-1992 and 1977-1996, Chandra demonstrates that economic growth is non-linearly associated with instability, manifesting in a convex frontier. This finding challenges the traditional one-to-one conceptualization between economic growth and instability in economic literature. Additionally, Chandra suggests "a negative correlation between economic diversity and instability."

Low and Weiler (2012) pioneered the application of portfolio theory to investigate the impacts of local employment portfolios on entrepreneurship levels. Focusing on commuting zones and counties, they find that entrepreneurship may be an attractive avenue in areas having high employment risks and low returns. They suggest that self-employment can be an attractive alternative income mechanism to wage and salary jobs in such regional units.

The closure of a business establishment results not only in the loss of jobs or potential losses of tax revenue for the local authorities, but also in a unique externality. Business births and deaths represent business dynamism in the region, which potential entrepreneurs closely watch. Low survival rates of new businesses may have a snowball effect by discouraging potential entrepreneurs from investing in the region. The information spillover from local business birth and death rates is found to have a significant impact on subsequent entrepreneurship and job creation (Bunten et al., 2015).

The number of jobs available, the growth in new jobs, and the risks associated with job growth are some of the factors that define the dynamic character of a local labor market. The interaction of these factors in conjunction with macroeconomic conditions and the unique economic–cultural milieu of the regional unit create opportunities (expected returns) and threats (risks) for the workforce in the region. The impact of exogenous shocks in the local

labor market influences the risk–return trade-off of the worker, which affects their economic behavior.

I attempt to capture these dynamics in the local labor market through the representative labor market portfolio. The portfolio approach helps one to analyze the interplay of numerous idiosyncratic but significant labor market undercurrents, in the context of the prevalent macroeconomic environment, when evaluating their likely impact on the survival of new businesses in the regional unit.

I begin by selecting the county as the regional unit of analysis. The resource base and socio-economic environment unique to the county affect a business's growth; hence, the regional unit or location is vital in new business survival.

3.2.2 How Does Survival of New Businesses Determine the Resilience of the Region?

Recent empirical investigations have highlighted the contribution made by entrepreneurs and local businesses to the recovery of the local economy from exogenous shocks (Williams and Vorley 2013, 2014; Cowling et al., 2015). Entrepreneurship provides local policymakers with an appropriate tool to remove path dependency and the threat of lock-in in the local economy (Martin, 2010). In the aftermath of the Great Recession, local authorities in many states in the U.S. initiated policy measures to promote entrepreneurship and business ventures in sunrise sectors, with the motivation of stimulating economic growth and reducing dependency on historically dominant sectors.

New businesses provide diversity to the local economy (Glaeser, 2005). Given their small size, for all the challenges borne by new businesses, they respond faster to external shocks than their larger counterparts. Not only are they able to adapt to the changes, but they are also able to innovate to respond to the repercussions of the shock (William and Vorley, 2014).

I find that risk in local labor markets helps in the survival of new businesses in metro counties and MSAs. Risk manifested through employment-based and income-based

portfolios increases the likelihood of survival of new businesses. This impact has been observed to be stronger during the recent recessions in these regional units.

Economists are increasingly using the lens of resilience to investigate the contribution of new businesses and young establishments when evaluating the responses of regional economies to recent recessions. This ability to absorb, endure and recover from an exogenous shock is commonly referred to as Resilience.

Resilience is commonly defined from engineering, ecological, and adaptive perspectives. From an engineering perspective, resilience refers to the displacement of an entity from its equilibrium, caused by an exogenous shock, and the subsequent return to the original equilibrium (Holling 1996, Hill et al. 2010). From an ecological perspective, resilience refers to a subsequent shift towards a new equilibrium, in response to displacement caused by the exogenous shock (Holling 1996, Martin 2012). From an adaptive perspective, resilience follows an evolutionary approach, whereby an entity evolves over time to create new sustainable paths by adapting to changes occurring in its environment (Bristow and Healy 2013, Mishel et al. 2015).

In this paper, I employ the definition of resilience from an ecological perspective[15]. I find that the economic downturn highlights the undercurrents operating in the local labor market. The economic agents absorb and endure the economic shock, and eventually the economy recovers to achieve a new steady state after a period of time. This process of absorbing, enduring, and recovering over a period of time to reach a new steady state is significantly determined by the dynamics prevalent in the local labor market besides the existing stock of economic resources, local amenities, and level of aid received.

[15] Regions exhibit economic, demographic, social, and geographical heterogeneity, and this diversity, coupled with an increased frequency of exogenous shocks, presents a new set of challenges. In response to these challenges, policymakers implement measures that lead to the establishment of a new steady state over time. Considering this dynamic process, it is important to note that the return to equilibrium may not necessarily revert to the 'old normal,' but rather to a 'new normal,' which represents the optimal outcome. Unlike 'adaptive resilience,' where "anticipation or reactionary reorganization" (Martin, 2012) of capabilities and resources is a key component, it is apparent that, considering the unpredictability regarding the cause, and magnitude of exogenous shocks, accurate and commensurate anticipation of such shocks is extremely challenging. Hence, the employment of the 'ecological' perspective of resilience in the current research.

The ability to survive in the face of adverse economic downturns also concerns the human element, as the competencies and skills of both employees and the entrepreneur are entwined with the business. The success and failure of a business are determined, to a large extent, by the fortitude, perseverance, patience, and ingenuity displayed by the employees during challenging times. The resilience displayed by new businesses is hence related to the resilience displayed by the employees, which further determines the resilience of the community.

3.2.3 Why Does Risk in Labor Markets Affect Workers?

I identify risk through both employment-based and income-based measures. Employment-based risk (wage and salary employment risk, *WSE-Risk*) represents the volatility in the growth of employment opportunities in a local county. Firms often freeze hiring or lay off workers in response to economic downturns. WSE-Risk is likely to have a profound impact in a recession. Even after the recession, recovery in local employment lags behind recovery observed in other economic indicators. Consequently, the negative impact, economic and social, is more painful and lasts longer for the unemployed.

On the other hand, income-based risk (wage and salary income risk, *WSI-Risk*) represents the volatility in growth in income from wages and salaries. Wage income makes up for a significant proportion of the total income of the bottom 20 percentile of households (Mishel et al. 2015). Volatility in wage income thus has a substantial impact on the living standards of the majority of households. Empirical research highlights the divergence between growth in wages and growth in productivity. From 1973 to 2017, net productivity increased by 77%, while real wages increased by only 12.4% (EPI 2018; Alon et al. 2017). A closer look at the wage growth across different segments of the labor force shows that the hourly wage of the middle-wage worker grew only 6% during 1979–2013. Wages were more or less stagnant during the 1980s, 1990s, and 2000s, except for a short period during late 1990s when wages grew due to a tight labor market (Mishel et al. 2015). The rise in unemployment, observed during recessions, also leads to the suppression of wages.

The overall trend indicates stagnation in wages, which translates into higher income risk for an average worker. The divergence between wage and productivity growth, and near stagnant wage growth, have been identified as major contributors to increases in income inequality in the U.S. With a higher cost of living and divergence in household income, the impact of WSI-Risk is likely to manifest more strongly in urban areas than in rural areas.

A common feature of recession is increased turmoil in the local labor market. This turmoil is apparent through the increased number of mass layoffs, significant and rapid increases in unemployment, a decline in new jobs, increased furloughs, reduced work hours, stagnation, or decline in wage and salary income for the employed.

The Bureau of Labor Statistics (BLS) in the March 2013 survey on Jobs Openings and Labor Turnover highlighted that the number of job openings in the private sector fell sharply, from 3.8 million in December 2007 to a low of 1.9 million in July 2009. During the same period, the number of quits (voluntary separation initiated by the employee) also declined, from 2.7 million in December 2007 to 1.5 million in September 2009. Since the end of the recession, the numbers of both job openings and quits increased by 81% and 34%, respectively, in March 2013.

The increased volatility in the local labor market, demonstrated through a sharp decline in job openings and new hiring, is likely to discourage rational employees from taking the risk of quitting their current employment. Besides the risk of loss of income from quitting, an experienced employee also faces the risk of loss of skills and becoming less competitive in the job market. Fujita (2018) found that such workers face a higher risk of skill loss, and thus accept a lower wage in exchange for job security. This decision results in lower employee turnover and a higher retention rate for existing business establishments. As evident in Figure 5[16], corresponding to an increase in layoffs and discharges, voluntary quits by employees declined significantly during both recessions.

[16] Data is Seasonally Adjusted, 2000s

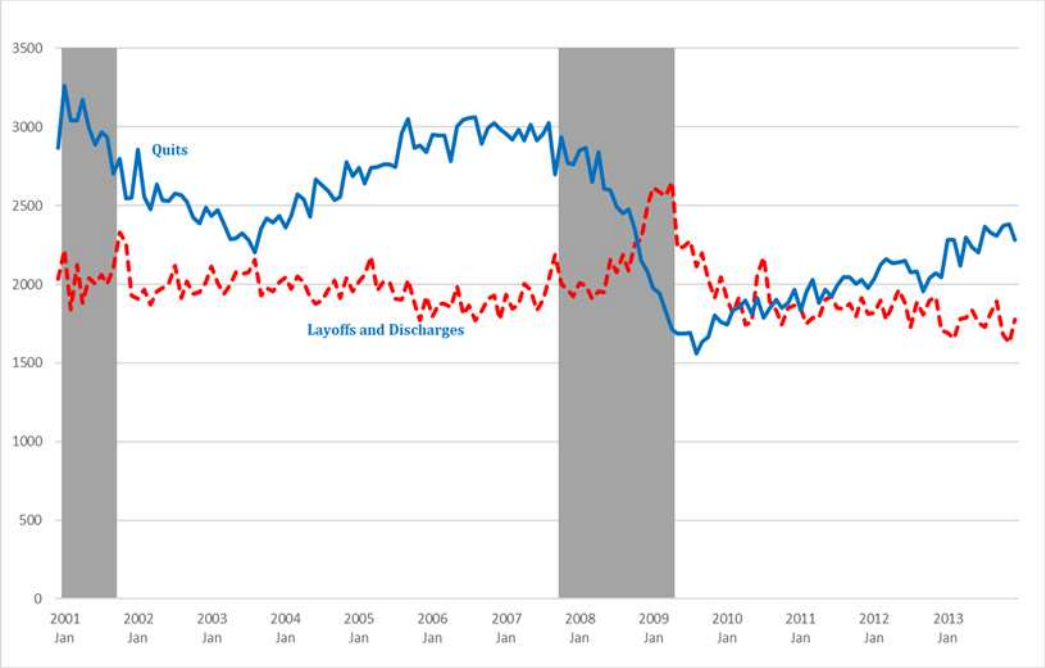

Figure 5. Quits, and Layoffs and Discharges, 2000-2014

Source: U.S. Bureau of Labor Statistics, Job Openings and Labor Turnover Survey Database
https://www.bls.gov/jlt/data.htm

3.3 Methodology

This research begins by investigating the impact of the employment portfolio in a county on the survival rates of new business establishments in that county. Growth in employment in the county is measured through the average annual growth in wage and salary employment. Risk in employment in the county represents the standard deviation in wage and salary employment during the same period.

Before it can be established that risk–return trade-off in a county affects business survival rates, it is imperative to establish the existence of a risk–return relationship. Investigation into risk–return trade-off shows a U-shaped relationship for states, metro areas, and commuting zones (Lande, 1994; Spelman, 2006; Low & Weiler, 2012). Plotting the

(average)[17] risk and growth variables for all counties for the 1996–2005[18] timeframe suggests that a U-shaped relationship does exist (Figure 6).

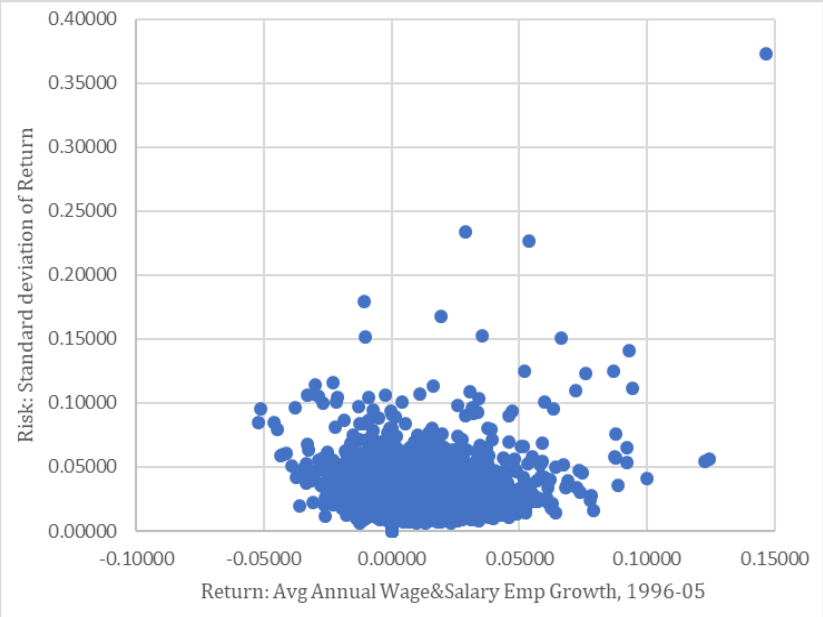

Figure 6. County Wage and Salary Employment Risk and Return, 1996-2005.

Source: Bureau of Economic Affairs, Regional Economic Information System, 1969-2015

The relationship between risk and return appears to be nonlinear. As returns (or job growth) increase, the risk declines. However, beyond a certain level of growth, the risk starts rising again. This indicates that the growth in returns has a dual effect on the risk, hence quadratic variation in the growth variable, growth-squared, is also included as an additional parameter in the model.

To confirm the visual observation of non-linearity between risk and return,, this relationship is tested econometrically. A widely used technique for this purpose is stochastic frontier estimation (Chandra, 2002; Low & Weiler, 2012). This technique can help in identifying the shape of the frontier and the parameters that define this shape. A nonlinear estimator, the

[17] Following the standard practice in financial analysis of plotting average values of variables (Frost and Savarino 1986) in order to highlight only the "long-term effects" on economic position (Spelman 2006).
[18] This period is one of several selected to visually identify the underlying relationship between risk and return over the long term. A similar U-shape pattern is also visible in other periods.

maximum likelihood estimator (MLE), is used to estimate the model. The proposed model to be estimated is as follows:

$$\sigma_i = \alpha_i + \beta_i G_i + \beta_2 G^2{}_i + \varepsilon_i \quad (1)$$

where,

σ_i = *the standard deviation of WSE for county* $_i$

G_i = *the annual rate of growth of WSE for county* $_i$

β_1 = *parameter 1 to be estimated*

β_2 = *parameter 2 to be estimated*

The results displayed in Table 7 confirm that the risk–return trade-off is indeed U-shaped. The risk–return profile can now be used to estimate whether the employment portfolio in a county influences the survival rate of new businesses in that county.

Table 7. Test for U-shaped Risk–Return Trade-off in Counties

	1996-05		**2000-08**	
	Estimate	Std Error	Estimate	Std Error
Constant	0.028***	0.0003	0.025***	0.0003
Growth	-0.355***	0.0226	-0.219***	0.0205
Growth Squared	10.5***	0.412	11.5***	0.397
N	3024		3024	
Log-likelihood	8264.07		8283.7	

p<0.1 , **p<0.05 ,*p<0.01*

I test the hypothesized relationship using the endogenous growth model developed by Stephens, Partridge, and Fagan (2013), and Bunten et al. (2015). Building upon the theoretical model from chapter 2, I use the following reduced form equation to identify the impact of labor market dynamics on new business survival (S_i) in the selected regional unit. Broadly, new business survival depends on the regional labor market portfolio (L_i), amenity score (A_i), demand shock (D_i), local workforce education measures (EE_i), bank deposits (B_i),

regional housing market variables (H_i), regional income variables (I_i), market access (M_i), and regional employment variables (E_i).

$$S_i = f(\, L_i, A_i, D_i, EE_i, B_i, H_i, I_i, M_i, E_i) \qquad (2)$$

The above reduced -form model evolves into the following empirical model:

$$\begin{aligned} Survival\ Rate_i = {} & \beta_0 + \beta_1 Local\ Employment\ Portfolio_i + \beta_2 Median\ Home\ Value, 2000_i \\ & + \beta_3 Owner\ Occupied\ Houses, 2000_i + \beta_4 BartikShock_i \\ & + \beta_5 CountyIncome\ per\ capita, 2000_i + \beta_6 Demand\ Shocks_i + \beta_7 Distance\ to\ Metro_i \\ & + \beta_8 Density_i + \beta_9 Amenities_i + \beta_{10} County\ Employment \\ & + \beta_{11} CountyIncome\ per\ capita\ growth\ rate, 2000-07_i \\ & + \beta_{12}\ Share\ of\ pop\ living\ in\ Rural, 2000_i \\ & + \beta_{13}\ County\ Employment\ growth\ rate, 2000-07_i + \beta_{14}\ Self\ Employment\ rate_i \\ & + \beta_{15}\ Population\ growth_i + \beta_{16}\ Share\ of\ Population\ with\ HighSchool, 2000_i \\ & + \beta_{17}\ Share\ of\ Population\ with\ BA + , 2000_i + \beta_{18}\ Bank\ Deposits\ per\ capita, 2005_i \end{aligned} \qquad (3)$$

Table 8. Summary Statistics for All, Metro, and Nonmetro Counties

	All				Metro				Nonmetro			
	N= 3024				*N= 808*				*N= 2216*			
	Mean	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**
Survival Rate 2010	0.676	0.091	0.000	1.000	0.644	0.060	0.429	0.870	0.688	0.097	0.000	1.000
WSE-Risk, 1996-05	0.029	0.017	0.006	0.373	0.022	0.017	0.006	0.373	0.031	0.017	0.006	0.226
WSE-Growth, 1996-05	0.009	0.017	-0.052	0.147	0.017	0.019	-0.037	0.147	0.005	0.015	-0.052	0.123
WSE-Growth Squared, 1996-05	0.000	0.001	0.000	0.022	0.001	0.001	0.000	0.022	0.000	0.001	0.000	0.015
Bartik Shock, 2005	2.2	4.4	-21.9	84.5	3.0	3.4	-10.5	23.0	1.9	4.6	-21.9	84.5
Business Dynamism	1.1	3.1	-30.1	72	0.9	2	-3.8	26.4	1.2	3.5	-30.1	72
County Income per capita, 2000	27,929	7,075	3,395	87,711	33,717	7,898	17,104	87,711	25,818	5,376	3,395	83,631
County Income per capita growth	27.4	17.0	-42.5	341.2	24.0	10.6	-25.7	107.4	28.6	18.6	-42.5	341.2
County Employment, 2000	53,286	186,743	294	5,404,010	165,187	336,265	2,106	5,404,010	12,485	12,802	294	95,004
County Employment growth	6.46	14.46	-37.51	170.11	13.20	16.28	-37.51	145.26	4.00	12.89	-35.86	170.11
Amenity Score	0.04	2.28	-6.40	11.17	0.27	2.41	-5.40	11.17	-0.05	2.23	-6.40	11.15
Bank Deposits per capita,2005	14,509	11,259	390	241,738	15,026	16,387	2,220	241,738	14,320	8,662	390	219,273
Share of Owner Occupied Houses, 2000	0.86	0.09	0.23	0.98	0.92	0.05	0.46	0.98	0.84	0.10	0.23	0.97
Median House Value, 2000	83,422	44,159	20,100	750,000	114,614	49,067	47,700	514,600	72,063	36,067	20,100	750,000
Share of pop residing in rural, 2000	0.60	0.30	0.00	1.00	0.31	0.24	0.00	1.00	0.71	0.25	0.06	1.00
Self-Employment Rate, 2000	0.73	3.10	0.00	81.51	0.27	0.93	0.00	15.55	0.89	3.56	0.00	81.51
Share of pop with BA +, 2000	0.11	0.05	0.03	0.44	0.14	0.06	0.03	0.44	0.09	0.04	0.03	0.44
Share of pop with HS, 2000	0.40	0.06	0.14	0.57	0.38	0.05	0.20	0.51	0.41	0.06	0.14	0.57
Employment-to-pop Ratio, 2000	0.52	0.15	0.13	2.79	0.54	0.16	0.21	1.79	0.51	0.14	0.13	2.79
Distance to nearest metro	0.81	0.65	0.00	4.34	0.26	0.23	0.00	1.74	1.00	0.64	0.24	4.34
Nonmetro*Amenityscore	-0.04	1.91	-6.40	11.15	0.00	0.00	0.00	0.00	-0.05	2.23	-6.40	11.15

Source: US Census Bureau (1960 & 2000 decennial), County Business Survey, BEA, NETS & County Business Patterns, USDA Economic Research Service

3.4 Data

Data for this research are collected from the Bureau of Economic Affairs' (BEA) Regional Economic Information System (REIS) (1969–2016). This dataset has comprehensive information about local labor markets at the county level for key variables such as wage and salary employment, self-employment (both in farm and non-farm sectors), personal income, and population. Data for variables representing regional characteristics such as education level, homeownership, and median house values are collected from the U.S. Census Bureau, decennial census.

Data for the survival rates of establishments are taken from the National Establishment Time Series database of U.S. establishments. The survival rate of new businesses in the counties is the dependent variable. Metropolitan counties are those with core populations exceeding 50,000 residents. Non-metropolitan counties are geographical entities that include an urban area with a population between 2,500 and 49,999 that is not part of a larger labor market, and/or rural towns (population under 2,500) (ERS, USDA 2022). Descriptive statistics are detailed in Table 8.

Analysis of the Wage and Salary Employment variables within the sample period, as displayed in the summary table, indicates that, on average, growth in Wage and Salary Employment is higher in Metro counties compared to both Nonmetro and All counties. Conversely, the risk associated with such employment is higher in Nonmetro counties, followed by All and Metro counties, respectively. Additionally, the average effect of the Wage and Salary Growth Squared variable appears to be consistent across all three regions.

3.4.1 Local Employment Portfolio—The Core Variables of Interest

Average wage and salary employment is selected as the measure of risk–return trade-off in the county because, as a frequently used employment-based measure, it follows "trends in incomes as well as in population and tax revenue" in the county (Low & Weiler, 2012). This

makes wage and salary employment an appropriate variable for investigating the impact from the risk and return trade-off.

Risk is measured, based on the conventional definition, as the standard deviation of annual wage and salary employment growth (WSE-Risk) during the selected timeframe. The data for annual wage and salary employment growth are obtained from the Regional Economic Information System (REIS) at the Bureau of Economic Analysis (BEA), U.S. Department of Commerce, 1969–2016.

Growth is defined as the average annual wage and salary employment growth (WSE-Growth) in the county during the selected timeframe(s). Growth squared is defined as the average annual wage and salary employment growth squared (WSE-Growth Squared) in the county during the selected timeframe(s).

The composition and character of the local labor market takes several years to evolve, and subsequently influences the local businesses in an average county. The timeframes selected in the study were around ten years on average (longer in a few instances), in order to encapsulate these changes and their subsequent manifestations in the survival of local businesses (Spelman, 2006).

3.4.2. Regional Control Variables

The location of the establishment is likely to have an effect on its survival. To capture the impact of the local economic environment, commonly used measures of regional characteristics from the literature are used. Besides regional controls, financial capital and human capital controls are also used to evaluate their impact on establishment survival rate. To address the issue of the potential endogeneity of some of these measures with the dependent variable, in the spirit of the econometric technique commonly followed in similar studies, lagged values of some of these variables are used in the analysis. The key regional control variables used in the model and their respective data sources are provided in Table 24 in the Appendix. No multicollinearity is found in the model. The variance inflation factor (VIF) for each regional control variable is less than 5.

3.5 Empirical Results

The empirical estimation is conducted by testing the impact of the local labor market portfolio, based on wage and salary employment data, on the new business survival rate in 2010 in county$_i$. Following the convention in the employment portfolio literature, employment-based measures of risk and return trade-off are used (Chandra 2002; Low & Weiler 2012). I begin by looking at the role of employment-based portfolios across the spectrum of the chosen regional unit: counties in the U.S., categorized as all, metro, and nonmetro.

WSE portfolios from 1996 to 2005 and from 1997 to 2006 are found to have a significant impact on the survival rate of new businesses in 2010 in metro counties. These are establishments that were born in 2005–2006. All three measures, WSE-Risk, WSE-Growth, and WSE-Growth Squared, were found to be significant, though to varying degrees (Table 9).

Table 9. Summary results of the WSE portfolio for new business survival rates in 2010

	Survival Rate 2010		
	All	Metro	Nonmetro
WSE-Risk, 1996-05	0.151	0.365*	0.0292
	(0.1070)	(0.1410)	(0.1380)
WSE-Growth, 1996-05	0.279*	0.435*	0.313
	(0.1560)	(0.2370)	(0.1910)
WSE-Growth Squared, 1996-05	-2.466	-5.491*	-5.013
	(2.4300)	(2.6680)	(3.9680)
WSE-Risk, 1997-06	0.103	0.375*	-0.056
	(0.1030)	(0.1200)	(0.1380)
WSE-Growth, 1997-06	0.343*	0.780***	0.306
	(0.1660)	(0.2200)	(0.2090)
WSE-Growth Squared, 1997-06	-3.132	-12.37***	-1.621
	(2.6610)	(2.8730)	(3.9020)

** p<0.1, ** p<0.05, *** p<0.01; Standard errors are in parenthesis.*

As anticipated, an increase in volatility (WSE-Risk) and job growth (WSE-Growth) in metro counties is found to positively influence the survival rate of new establishments. Higher job volatility prompts workers to remain in their current employment to mitigate the risk of unemployment. Conversely, job growth signals economic expansion in the local economy, thereby positively impacting new business establishments. However, the findings suggest that stronger or persistent job growth (WSE-Growth squared) in metro counties may have a detrimental effect on new business establishments. This can be attributed to the additional financial burden imposed on new business establishments because of increased wages demanded by current employees, or workers leaving for higher-paying jobs elsewhere due to higher labor demand.

I replicate the analysis by using an alternative measure to assess the risk and return trade-off in the local labor market, Wage and Salary Income data. A potential criticism of using this measure is the possible influence on the results because of differences in the cost of living across counties. However, the use of this measure is expected to complement and validate the findings derived from using employment-based measures. Wage and Salary Income measures are a good candidate to use in the analysis because of high degree of correlation with Wage and Salary Employment measures (Spelman, 2006). Moreover, this measure offers a nuanced perspective by capturing the influence of high wages on individuals' decisions regarding self-employment (Low & Weiler, 2012). Incorporating Wage and Salary Income data into the analysis, thereby, is expected to contribute to a deeper understanding of the dynamics of local labor markets on new business survival.

Conducting the empirical estimation with the income-based risk and return measures for different timeframes yields interesting results. Similar to the employment-based portfolio, this portfolio comprises wage and salary income growth (*WSI-Growth*; defined as the average annual wage and salary income growth in the county during the selected timeframes), wage and salary income growth squared (*WSI-Growth Squared*; defined as the average annual wage and salary income growth squared in the county during the selected timeframes), and wage and salary income risk (*WSI-Risk*; the standard deviation of annual wage and salary income growth during the selected timeframes). The WSI portfolios from 1996–2005, 1995–2005, 1991–2005, 1991–2004, 1992–2005, 1993–2005, and 1997–2006 are found to be significant for new business survival in 2010. Similar to results found earlier, the observed impact is consistently visible in the metro counties, and all three measures, WSI-Risk, WSI-Growth, and WSI-Growth Squared, are found significant.

The results indicate that risk and return trade-offs in local labor markets, identified through employment-based and income-based measures, are instrumental in the survival of new businesses. This impact was found to be strong, in metro counties, which suggests a further focus on Metropolitan Statistical Areas (MSAs; identified using the crosswalk file from National Bureau of Economic Research (NBER)). The existence of a non-linear relationship between risk and growth variables is also verified in MSAs. Similar to counties, the existence

of a U-shaped relationship is found in MSAs also (see Table 23 in the Appendix, for results of the MLE tests in MSAs).

The validity of these results could potentially be challenged due to the impact of the Great Recession on the local economy. The influence of this macroeconomic shock cannot be ignored, though considerable heterogeneity is observed in its impact on regions across the country. A widely used practice in econometric analysis is to replicate the empirical exercise using a different time period. To validate the results, the estimation is replicated to determine the impact of local labor market dynamics on the new business survival rate in 2005. A similarity that encouraged the selection of the new business survival rate in 2005 was the fact that the new businesses that operated during this period also had to go through the recession in 2001, just like those that operated in 2010.

To test the robustness of the results, the empirical estimation is replicated in MSAs only, using both employment-based and income-based risk and return portfolios separately to gauge their impact on new business survival rates in 2005 (three regional control variables: Bartik shock, county/MSA income growth 2000–2007, county/MSA employment growth 2000–2007 were dropped when running regressions, as historical data are not available for them for this timeframe) and 2010.

Similar to the results found for counties, income-based risk and return (WSI) measures are consistently found to have a significant impact on new business survival in 2010 in the MSAs as well. WSI-Risk and WSI-Growth from 1991–2001, 1991–2005, 1995–2005, 1996–2005, 1996–2006, 1997–2006, 2001–2010, 2000–2009, 1997–2007, 2000–2008, 2002–2007, and 1998–2007 are found to be significant (Table 10). WSI-Growth Squared is found to be significant for all these timeframes, except in 2000–2009 and 2000–2008.

Across the specified time periods, the WSI-Risk and WSI-Growth variables demonstrate a positive and statistically significant influence on new business survival within Metropolitan Statistical Areas (MSAs). As anticipated, the WSI-Growth Squared variable exhibits a negative and significant effect, indicating its detrimental impact on new business survival. Among the control variables, MSAs with a population holding bachelor's degrees or higher

—as well as those with a high school diploma but no bachelor's degree—show a positive and significant impact. This indirectly suggests the role of education in supporting new business survival. Further research could explore whether relatively higher wages earned by workers in MSAs contribute to increased demand for services/products from new businesses, or if education-wages tradeoff influences highly educated individuals' decisions to become business owners or entrepreneurs (Kangasharju & Pekkala 2002, Low & Weiler 2012), thereby affecting the likelihood of new-business survival.

Estimating the impulse response of the new business survival rate (SR) to Wage and Salary Income (WSI) measures enables the determination of the magnitude of the effect. For example, in an average MSA with nearly 198,000 workers, a one standard deviation increase in the WSI-portfolio during the period of 1996-2005, leads to a thirteen-basis point increase in the survival rate of new business establishments. Consequently, this impact from WSI portfolio saves, on average, an additional 2.5 establishments in a Metropolitan Statistical Area (MSA) in 2010. These findings underscore the significant impact of WSI measures on the survival and sustainability of new business ventures within local economies.

Next, I replicate this exercise in order to specifically investigate the impacts of employment-based and income-based measures on new business survival rates in MSAs in 2005. These are the business establishments that were born during 2000-2001. The regression results reveal that the WSE-Risk related to employment-based measures in 1991–1999, 1991–2000, 1992–2000, 1993–2000, and 1991–2001 among other periods have a consistent and significant impact on the new business survival rates in 2005 (Table 11). The risk of losing current employment seems to be the key factor influencing the decision of workers in MSAs during the specified periods. WSE-Growth and WSE-Growth Squared are not found to have any impact. Income-based risk and return measures are also not found to have an effect on the new business' survival in 2005, suggesting that growth and volatility in wage and salary income did not influence workers' decisions, nor did they affect the likelihood of new-business survival. The interplay between income dynamics and business survival outcomes visible in the last analysis is not apparent in this case. Notably, in this instance, Population with high school diploma but no bachelors' degree is found to have a negative impact on

new-business survival rate thereby indicating that higher levels of education may be more conducive for the survival of new businesses.

Estimating the specific magnitude of Wage and Salary Employment (WSE) risk indicates that a one standard deviation increase in risk during the period of 1991-2001 leads to an eight-basis point increase in the survival rate of new businesses. Consequently, employment-related risk, on average, helped save an additional 1.5 establishments in a Metropolitan Statistical Area in 2005.

Table 10. Results from WSI Portfolios from different timeframes[19] on SR2010 in MSAs

	Survival Rate, 2010				
	1991-01	**1995-05**	**1996-05**	**1996-06**	**1997-06**
WSI- Risk	**0.426***	**0.438***	**0.482****	**0.494****	**0.484****
	-0.223	-0.224	-0.21	-0.215	-0.202
WSI-Growth	**2.080*****	**1.912*****	**1.722*****	**2.056*****	**2.017*****
	(0.6290)	(0.6740)	(0.6490)	(0.6740)	(0.6800)
WSI-Growth Squared	**-12.90****	**-12.44****	**-11.26****	**-12.33****	**-12.15****
	(4.6010)	(5.4620)	(5.2460)	-5.534	(5.5920)
Bartik Shock, 2005	-0.0000796	-0.000047	-0.00000365	-0.000104	-0.0000941
	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)
Business Dynamism	-0.00213	-0.00191	-0.00187	-0.00193	-0.00188
	(0.0016)	(0.0016)	(0.0016)	(0.0015)	(0.0015)
County Income per capita, 2000	-0.000000924	-0.0000012	-0.0000013	-0.0000012	-0.0000012
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
County Inc per capita growth rate, 2000-07	0.000389	0.000174	0.000154	0.000057	0.00004
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
County Employment, 2000	-0.00000001	-0.00000001	-0.00000001	-0.00000001	-0.00000001
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
County Employment growth rate, 2000-07	-0.000198	-0.000284	-0.000259	-0.000444	-0.000431
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Amenity Score	0.00089	0.00025	0.000294	0.0000129	0.0000737
	(0.0013)	(0.0013)	(0.0013)	(0.0013)	(0.0013)
Deposits per capita, 2005	-0.0000004	-0.0000004	-0.0000004	-0.0000005	-0.0000005
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Share of Homes Owner Occupied	0.0456	0.0551	0.0554	0.0594	0.0617
	(0.0510)	(0.0510)	(0.0510)	(0.0507)	(0.0508)
Median HH Value, 2000	-0.000000314**	-0.000000285**	-0.000000282**	-0.000000285**	-0.000000284**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Share of pop living in Rural, 2000	0.0595***	0.0557**	0.0545**	0.0535**	0.0539**
	(0.0172)	(0.0175)	(0.0176)	(0.0175)	(0.0175)
County Self-Employment Rate, 2000	-0.00158	-0.00232	-0.00237	-0.00231	-0.00221
	(0.0039)	(0.0039)	(0.0039)	(0.0039)	(0.0039)
Population with BA+, 2000	0.375***	0.329***	0.325***	0.322***	0.324***
	(0.0874)	(0.0860)	(0.0858)	(0.0855)	(0.0857)
Population with HS degree but NO BA+, 2000	0.121*	0.125*	0.118*	0.128*	0.126*
	(0.0548)	(0.0549)	(0.0547)	(0.0545)	(0.0545)
Employment-Pop Ratio, 2000	0.0173	0.0267	0.0276	0.0236	0.0241
	(0.0379)	(0.0373)	(0.0372)	(0.0370)	(0.0370)
Distance to the Nearest MSA	-0.0145	-0.0132	-0.0137	-0.0136	-0.0137
	(0.0083)	(0.0083)	(0.0083)	(0.0082)	(0.0083)
Constant	0.452***	0.465***	0.476***	0.460***	0.461***
	(0.0619)	(0.0622)	(0.0620)	(0.0618)	(0.0619)
R-squared	0.258	0.253	0.254	0.263	0.263
Observations	374	374	374	374	374

** p<0.1, ** p<0.05, *** p<0.01. Standard errors are in parenthesis.*

[19] Selected timeframes are displayed due to space constraints.

3.6 Discussion of Key Results

The analysis of the roles of wage and salary employment (WSE) and wage and salary income (WSI) portfolios in new business survival in MSAs reveals some interesting results. WSE-Risk is found to have a significant impact on new business survival in 2005, and the aggregate WSI portfolio on new business survival in 2010. Risk, manifested both in WSE and WSI, is consistently found to influence the likelihood of new business survival when estimated for different timeframes. Reverse causality or endogeneity may well be a factor in these results, and future work would need to incorporate robust identification strategies to untangle these relationships.

3.6.1 New Business Survival Rate 2010 Dynamics

Wage and salary income risk–return (WSI) portfolios are found to play a significant role in the survival of new businesses in 2010 in MSAs. These are the businesses that were born in 2005–2006. Similarly to the wage and salary employment risk and return (WSE) portfolio, the WSI portfolio also shows a U-shaped relationship between WSI Growth and WSI Risk, when plotted for all the counties in different timeframes (see Figure 9 in the Appendix).
The wage and salary income risk and return portfolios of 1996–2005, 1996–2006, 1995–2005, 1991–2005, 1991–2001, 1997–2006, 2001–2010, 2000–2009, 1997–2007, 2000–2008, 2002–2007, and 1998–2007 are used in this analysis. The impact of the WSI risk–return portfolio on the new business survival rate in 2010 is found to be robust across these timeframes in the MSAs.

A severe economic event occurred preceding 2010, namely, the Great Recession. This recession was a distinctive event, comparable only to the Great Depression. It was deep, and compared to recent recessions, lasted for a longer period—from December 2007 to June 2009. The severity of this recession can be gauged from the fact that the national unemployment rate rose to almost 10% in late 2009. The average expenditure per household (in constant 2010 dollars) declined from USD 52,203 in 2007 to USD 48,109 in 2010 (Bureau of Labor Statistics, 2012). Spending declined in all major categories except healthcare during this period. Labor productivity increased marginally, while output and number of hours

worked dropped significantly (Bureau of Labor Statistics, 2012). The wages and salaries of employees in the private sector grew by only 1.3% in December 2009, compared with an increase of 3.6% in March 2007.

Wage and Salary Income growth is found to have a positive effect and is strongly significant in this analysis. This suggests that with increased growth in WSI, the survival of businesses increases. New businesses that rewarded existing employees who stayed with them during this unprecedented event, with small but significant increases in wages and salaries, were likely to have encouraged these employees to prolong their stay with the current employers. Sharing the economic rewards with their employees is likely to help new businesses not only survive in challenging times, but also sustain themselves. WSI-Risk is found to have a positive effect and is significant in new businesses' survival in MSAs during the studied timeframes. MSAs with a higher share of skilled labor force attract high-tech jobs. Bartik and Sotherland (2019) find that the job-multiplier in commuting zones ranges from 1.7 to 2.9, depending upon the existence of high-tech clusters. This means that for every 100 new jobs created in high-tech sectors, 70 to 190 additional local jobs (including semi-skilled and unskilled) are created in the regional unit. The survival of new businesses in the high-tech sectors in MSAs saved not only existing jobs in their units, but also several jobs that they helped create.

3.6.2 New Business Survival Rate 2005 Dynamics

I find that WSE-Risk has a consistent impact on the survival of new businesses in 2005. These businesses were born in 2000–2001. This analysis is also conducted over different timeframes. WSE-Growth and WSE-Growth Squared are not found to have any impact on business survival in 2005. The impact of WSE-Risk is found to be robust across all selected timeframes.

Table 11. Results from WSE Portfolios from different timeframes[20] on SR2005 in MSAs

	Survival Rate 2005				
	1991-99	1991-00	1991-01	1992-00	1993-00
WSE-Risk	**0.494****	**0.515****	**0.500***	**0.436***	**0.489****
	(0.2340)	(0.2300)	(0.2160)	(0.2350)	(0.2360)
WSE-Growth	0.188	0.232	0.147	0.387	0.299
	(0.3100)	(0.3330)	(0.3640)	(0.3390)	(0.3320)
WSE-Growth Squared	-4.762	-5.364	-5.011	-6.324	-4.872
	(4.3560)	(4.7240)	(5.3860)	(4.4020)	(4.2690)
Dynamism Centered	0.0019	0.00176	0.00192	0.00177	0.00175
	(0.0024)	(0.0023)	(0.0023)	(0.0023)	(0.0023)
County Inc per capita, 2000	-0.00000116	-0.00000115	-0.00000114	-0.00000111	-0.00000111
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
County Employment, 2000	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Amenity Score	-0.00311	-0.00311	-0.00298	-0.00305	-0.00286
	(0.0019)	(0.0019)	(0.0019)	(0.0019)	(0.0019)
Deposits per capita, 2000	0.000000469	0.000000453	0.000000453	0.000000426	0.000000447
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Share of Homes Owner Occupied	-0.205**	-0.207**	-0.209**	-0.206**	-0.200**
	(0.0723)	(0.0723)	(0.0722)	(0.0724)	(0.0725)
Median HH Value, 2000	0.000000430**	0.000000432**	0.000000431**	0.000000420**	0.000000415**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Share of pop Residing in Rural, 2000	0.0162	0.0169	0.018	0.0153	0.0169
	(0.0233)	(0.0233)	(0.0232)	(0.0233)	(0.0232)
County Self-Employment Rate, 2000	-0.0058	-0.00568	-0.00537	-0.00568	-0.00591
	(0.0055)	(0.0055)	(0.0055)	(0.0056)	(0.0055)
Population with BA+, 2000	-0.152	-0.153	-0.15	-0.151	-0.145
	(0.1180)	(0.1170)	(0.1170)	(0.1180)	(0.1180)
Population with HS degree but NO BA+, 2000	-0.269***	-0.271***	-0.273***	-0.278***	-0.269***
	(0.0761)	(0.0761)	(0.0762)	(0.0763)	(0.0761)
Employment-Pop Ratio, 2000	-0.0414	-0.0396	-0.0399	-0.0398	-0.0399
	(0.0524)	(0.0523)	(0.0523)	(0.0526)	(0.0526)
Distance to the Nearest MSA	-0.0116	-0.0119	-0.0116	-0.0112	-0.0111
	(0.0118)	(0.0118)	(0.0118)	(0.0118)	(0.0118)
Constant	0.900***	0.900***	0.903***	0.905***	0.895***
	(0.0820)	(0.0820)	(0.0817)	(0.0822)	(0.0824)
R-squared	0.102	0.104	0.105	0.101	0.103
Observations	370	370	370	370	370

** p<0.1, ** p<0.05, *** p<0.01; Standard errors are in parenthesis.*

[20] Selected timeframes are displayed due to space constraints.

A distinctive event in the lives of new businesses was the 2001 recession. This recession was unique compared to the recessions preceding it as it lasted for eight months, which is less than the average age of eleven months of previous recessions (Kliesen, 2003), and largely saw a slowdown in technology, telecommunications, and tourism sectors. Comparatively, it was a milder and shorter recession. The unemployment rate increased by 2.10 percentage points(pp), non-farm employment declined by 1.34 pp, while real output dropped by 1.6% from first quarter to the second quarter of 2001. Despite the decline in output and increase in unemployment, the 2001 recession was also unique because, surprisingly, the U.S. economy observed increased spending on consumer durables, new residential housing, and a significant increase of 2.2 pp. in labor productivity (Kliesen, 2003). The former is broadly attributed to strong growth in real disposable personal income (Kliesen, 2003). The causes of this recession are identified as the dot-com bubble burst, the decline in international trade, and the terrorist attacks of September eleventh, all of which resulted in a decline in business spending and eventually gross output. The 2001 recession severely affected the Technology sector compared to other sectors of the economy.

3.6.3 Role of Risk in New Business Survival in MSAs

Risk is the key factor consistently influencing new business survival in MSAs, through both wage and salary employment and wage and salary income portfolios. The positive impact of volatility in the local labor market on new business survival is found to be consistent and significant during recessions as revealed by this analysis. Quantifying the impact on new business survival, the dynamics captured by WSE-Risk are shown to save additional 1.5 newborn establishments in 2005, while those from the WSI portfolio save 2.5 newborn establishments in 2010, on average. I offer the following speculative scenarios to help explain these results.

The role of risk in the birth of enterprises is well documented (Low & Weiler, 2012). The results indicate that the risk displayed in the local labor market also significantly increases the likelihood of new business survival. Increased turmoil in the labor market primarily manifests through mass-layoffs, higher unemployment, and stagnation in wage and salary

income. Empirical investigations highlight the stagnation in labor productivity, a secular decline in demand for semi-skilled workers, increases in low-wage and insecure jobs, and decreases in union membership as some of the long-term trends observed in the U.S. labor market (Kallenberg & Wachter, 2017). Fernald et al. (2018), show that the growth rate in productivity picked up in the mid-1990s, slowed in the mid-2000s, and remained flat going into the Great Recession. The response of a rational worker aware of both the impact of exogenous macroeconomic shock and the ongoing dynamics in the local labor market should be to continue with their existing employment. This decision results in lower employee turnover and a higher retention rate for newly established businesses.

A low employee turnover rate is beneficial for establishments. Excessive employee turnover has both monetary and non-monetary costs that can have a significant and far-reaching effect on the economic and operational efficiency of the establishment. In extreme cases, high employee turnover may have detrimental impacts on new business survival. Abbasi and Hollman (2000), citing a nationwide survey, finds that the average internal cost-per-hire for an engineer was USD 4901, a computer programmer USD 2500, a secretary USD 1000, and a retail sales associate USD 350 in the 1990s. The direct monetary costs can be attributed to the costs of advertising, recruitment, candidate travel, selection, hiring, assignment, orientation, training, signing bonus, and relocation expenses for the new employee(s). These costs would be significantly higher in current dollars. The non-monetary costs include the "breakdown of customer relations, the disruption of workflow, declines in morale of the remaining employees", and additional costs incurred till the newly hired employee acquires necessary job skills and can work at the desired level of efficiency (Abbasi and Hollman, 2000).

Highly talented and competent employees generally leave for better opportunities or get poached by competitors. The monetary and non-monetary costs from the loss of such employees are likely to have a substantial impact on the survival of new establishments. New businesses operating in MSAs that witness high employment growth are also likely to experience high employee turnover, which would result in significant monetary and non-monetary costs. The aggregate consequences of these costs for new businesses, operating on

shoe-string budgets, could be attributed to the closure of some of these businesses. However, the shift in employee preference to current employment vis-a-vis the potential gains from a risky switch during a recession helps a new establishment save significant economic resources. Additionally, the prolonged employment of such employees during a recession facilitates a continued focus on innovation, and on maximizing efficiency, which are the comparative advantages of a new business and are the bedrock of their survival.

Another interesting result I find from the empirical analysis is that risk only consistently manifests on the survival rate via wage and salary employment in 2005, and via wage and salary income in 2010. The analysis of new business survival also highlights the role of the salient structural changes observed in the labor market over years, the impact of which becomes strongly visible during both (the 2001 and 2008) recessions. The labor market witnessed a significant export of jobs to low-wage countries, beginning with manufacturing jobs going to China and Vietnam, and subsequently low-end service sector jobs going to India and the Philippines. The former was facilitated through increased global trade, and the latter accelerated through the technological improvements adopted by corporations in the late 1990s and early 2000s. Autor et al. 2013 finds that increased Chinese imports result in reductions in both employment and wage levels in the manufacturing sector. They also find that increased transfer payments made through multiple federal and state programs mask the loss in average earnings of the affected households during this period. Ebenstein et al. 2014 show that globalization affects wages by pushing workers out of the manufacturing sector into low-paying jobs elsewhere. These subtle structural changes that started in early 1990's changed the composition and quantity of jobs available in the key sectors, which first became evident during the 2001 recession. The Great Recession resulted in a sharp increase in unemployment across all sectors of the economy, thereby strongly demonstrating the impact of the structural changes that began earlier in the 1980s and 1990s. Workers across all sectors experienced a significant and prolonged decline in or loss of wage and salary income, which manifest through income-based measures included in this investigation.

Empirical research shows that urban areas performed better than rural areas during the 2001 and 2007–2009 recessions (Capello et al. 2015, Connaughton and Madsen, 2009, 2011). Businesses that survive during recessions contribute valuable tax dollars, and at the same time help reduce additional expenditures by state and local governments in the form

of transfer payments. Hence, new businesses played a vital role in sustaining tax revenues and averting additional job losses, contributing to the economic recovery and growth in subsequent phases. This underscores their significant support to local economies highlighting their role in mitigating economic challenges and facilitating recovery processes. These contributions thereby enhance the resilience of the community, especially during economic downturns.

3.7 Conclusion

The findings in this chapter highlight how risk in local labor markets improves the survival of new businesses providing much needed resilience to the local economy. This dynamic is evident in MSAs when investigating the survival-rate of new businesses during the recent recessions of 2001 and 2007–2009.

The impact of macroeconomic shocks on the local labor market, captured through volatility in employment-based and income-based measures, likely influences employees' decisions when they evaluate the risk–return trade-off involved in quitting existing employment. The turmoil in the local labor market encourages employees to continue with their present employment. This shift in employee behavior, even if temporary, is beneficial for new businesses, as it shields the business from monetary and non-monetary costs associated with high employee turnover. Many new businesses struggle with numerous challenges, which compound exponentially due to the exogenous shocks. The savings on such costs and the continued contribution of valued employees in business operations are nothing short of a lifeline for a new business.

This research contributes to the literature focusing on the role of human capital in regional economic growth. Research in this domain is predominantly anchored in the entrepreneur's personal characteristics. This endeavor contributes to this literature by uniquely applying portfolio theory in the context of employee-centric risk-and-return trade-offs in the regional unit, thereby also highlighting the contribution of employee decisions during economic crises to new business survival.

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Chapter 4. Assessing The Contribution of the American Community Survey on Establishment Births

4.1 Introduction

The fundamental question of regional economics revolves around understanding why certain regions experience higher economic growth while others lag, particularly in the rural-urban context. Rural areas find themselves trapped in a cycle of economic weakness, marked by a lack of investment inflows due to their underdeveloped economic infrastructure. This situation, therefore, results in persistently lower rural growth rates and restrains overall economic development. On the other hand, urban centers experience consistent economic growth and make a disproportionate contribution to national economic growth. Rural areas' sluggish growth indicates untapped potential in the national economy. It also highlights the need to address the core factors causing such regional economic disparities.

Recent regional economic studies identify geographical information asymmetries as a major factor in inter-regional and intra-regional economic disparities (Weiler, 2000, 2006; Stephens and Partridge, 2011; Stephens, Partridge, and Faggian, 2013). The scarcity of reliable and timely information (hereafter, '"better information"') about local economic, social, and housing characteristics in rural and remote areas likely has adverse effects on the efforts of entrepreneurs, business owners, and local government agencies operating in these areas. In the absence of 'better information', rural entrepreneurs and business owners are forced to rely on revealed marketplace information mechanisms, suggesting a potential market failure (Bunten et al., 2015).

Information is clearly a valuable commodity but measuring the lack of '"better information"' and its manifestation in economic choices is challenging. This study endeavors to estimate the impact of geographical information asymmetries using a quasi-natural experiment setting. The results, while not very robust, point to a marginal effect in some cases.

4.2 Literature Review

The subfield of information economics investigates the role of information and information systems in the economy and economic decisions (Stigler,1961; Beth, 1990; Arrow (1984,1996,1999)). Such research has reviewed the implications of asymmetric information on economic decisions.

Contrary to popular belief, information is not a public good but actually a quite scarce, "expensive and valuable" economic commodity (Arrow K., 1999, p 21). When parties cannot freely obtain information, information asymmetries create suboptimal outcomes and reliable information comes at a higher price. Scholars have increasingly emphasized the need to investigate and address these asymmetries when considering information and its role in economic systems. Information's scarcity may seem surprising given advances in information technology. Nevertheless, the primary challenge in accessing information is the cost of obtaining local soft information (Coval and Moskowitz 2001, Malloy 2005, Butler 2008). Soft information is "intangible, expensive to quantify, transmit, and interpret" (El Ghoul et al. 2013), making it scarce and costly to obtain.

Financial economists have examined geographical information asymmetry, largely at the firm level. They examine geographical information asymmetries' impacts on firms by estimating effects on financial metrics like the cost-of-capital (Malloy, 2005; Arena and Dewally, 2012), security prices (Anand et al. ,2011), and risk-adjusted returns (Christoffersen and Sarkissian, 2009). This work evidences a negative relationship between a firm's geographical distance from central locations (centers of capital markets and financial services) and information advantages accruing to the firm (Boubaker et al. 2018). Wang et al. (2018) show that rural firms struggle to obtain initial and seasoned equity financing due to existing information gaps. Urban firms benefit more from their proximity to central locations than rural firms (Loughran ,2008; Cai et al. ,2016).

Regional economists highlight economic and non-economic factors responsible for the economic plight of rural communities in the US (Audrestch, 2006; Acs et al. ,2007; Ayyagari et al. ,2006; Berger and Udell, 1998; Beck, 2006; Petersen and Rajan, 1997; Goetz et al., 2011;

Florida, 2002). Inadequate access to infrastructure and support services in rural areas increases the costs of doing business and deters potential entrepreneurs and business owners (especially when urban centers have ample access to these resources). Timely local government support can help establish a strong foundation for economic growth and fertile ground for entrepreneurs and new businesses to accelerate this growth in rural areas.

Economic geography—the study of economic activity's spatial distribution—has also generated significant interest among researchers. Krugman's core-periphery model (1991) and its many theoretical extensions build on a general equilibrium framework under specific assumptions. This has been used extensively to explain "the interaction between demand and supply linkages in determining the geographical distribution of industry" (Gaspar et al. 2018). However, these studies do not consider the role of 'better information' on the economic development of the geographical unit.

In the absence of "better information", potential entrepreneurs and business owners must rely on 'stale' information or revealed marketplace information. For example, the rejuvenation of older industrial districts often depends on the success of a pioneering firm, which reveals project viability and encourages other firms to "take the plunge" (Weiler 2000). Information spillover from establishment births and deaths significantly affects subsequent establishment births and job creation (Bunten et al., 2015). Information gaps likely also obstruct the local, state, and federal government's efforts, including the allocation of financial resources to promote economic development in rural and remote areas. These information gaps widen economic disparities between rural and urban areas and obstruct the collection and diffusion of local economic, social, and demographic information.

The decennial Census release is a reliable source of economic information, with particular utility for rural regions. However, this information's usefulness—valuable in the initial years after its release—declines with age (Chi, 2023). Therefore, in 2005, the Census Bureau implemented the American Community Survey (ACS) to provide reliable and timely information and address the information gap existing between rural and urban areas. The ACS's introduction and unique implementation approach offer an exciting opportunity to estimate the economic benefits that accrue from "better information", especially in rural and

remote areas. This study examines whether the ACS's "better information" successfully addresses geographical information asymmetries and promotes economic growth.

4.3 Data and Methodology

The Census Bureau implemented the ACS sequentially, using population thresholds to classify counties into clusters. Counties with a population over 65,000 were selected for the first cluster. The ACS was conducted in 2005 in these counties, with estimates released in 2006 and every subsequent year. The second cluster includes counties with populations of less than 65,000 but more than 20,000. The ACS was conducted in these counties for three years (2005-2007), with estimates released in 2008 and every subsequent year. Finally, counties with populations below 20,000 are included in the third cluster, where the ACS was conducted for five years (2005-2009), and estimates were released in 2010 and every subsequent year. The sequencing is summarized in Table 12.

Table 12. ACS Release Schedule

Data Product	**Population Threshold**	**Year of Data Release**							
		2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
		Year(s) of Data Collection							
1-year Estimates	65,000 +	2005	2006	2007	2008	2009	2010	2011	2012
3-year Estimates	20,000 +			2005-2007	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012
5-year Estimates	All areas*					2005-2009	2006-2010	2007-2011	2008-2012

** Five-year estimates available for areas as small as census tracts and block groups*

Classifying counties into three clusters based on population thresholds facilitated the program's relatively smooth implementation. Fortunately, assigning otherwise similar counties into separate clusters also created an unintended, quasi-experimental situation. The gap between the ACS clusters' information release likely put counties in later clusters at a relative disadvantage. For example, suppose counties X and Y share similar economic, social, and climatic characteristics. Suppose however, County X has an (average) population of 66,000, while County Y has an (average) population of 64,000. Now, County X is assigned to the first ACS cluster with estimates released annually beginning in 2006. In contrast, since County Y being below the population threshold had to wait until 2008 for the first release of information. The two-year information lag will then put County Y at a disadvantage, despite the otherwise similar critical economic and social characteristics. In this study, County Xs—the treatment counties—had the advantage of benefitting from "better" local information two years before similar counties just below the population threshold. County Ys—otherwise similar to the treatment group but illuminated later with ACS information—are used as counterfactuals for the selected treatment counties.

The analysis involves two steps. First, I utilize the Synthetic Control technique to create a 'synthetic' group of counties to serve as the control group for each treatment county (identified from a pool of potential treatment counties). Second, I use the Difference-in-Difference (D-i-D) methodology to investigate the ACS information gap's impact on local economic growth, measured through establishment births.

Establishment Birthrate is a proxy to capture benefits accruing to the local county economy from information contained in the ACS. New establishments support the local economy in many ways, including generating new jobs. Forty-eight cents of every dollar spent at a locally-owned retail business goes back to the local economy, three times more than what local economies recover from chain stores[21]. Furthermore, local businesses account for 65% of the country's new jobs over the past 17 years[22]. ACS's role in promoting local economic growth would be confirmed if the treatment counties enjoy a significant difference in

[21] Civic Economics' 2012 survey of local businesses
[22] U.S. Small Business Administration

Establishment Births before and after the intervention, while the counties in the control group do not.

I identify fifty-two counties for the pool of potential treatment counties and seventy-four counties for the pool of likely synthetic controls. The lists of potential treatment counties and likely synthetic group's counties are provided in Tables 25 and 26 of the Appendix, respectively. I draw from treatment counties and respective counterfactuals in different regions of the country to investigate the hypothesized ACS impact across the nation, not only in a specific region or state. I followed the Bureau of Economic Analysis' (BEA) approach to selecting appropriate regions: the 48 contiguous states are divided into eight regions (i.e., New England, the Mideast, the Southeast, the Great Lakes, the Plains, the Southwest, the Rocky Mountains, and the Far West). The highest number of treatment counties (n=23) come from the Southeast, followed by seven counties each from the Far West, the Great Lakes, and the Southwest, four from the Plains, three from the Mideast, and one from the Rocky Mountain Region. No treatment county is found in the New England region. The highest number of potential synthetic control counties (n=27) come from the Southeast region, followed by twelve from the Great Lakes, eleven from the Plains, eight from the Southwest, seven from the Far West, four from the Mideast, and three from the New England region.

I used the Synthetic Control Method (SCM) (Abadie & Gardeazabal, 2003, Abadie et al., (2010,2014,2021)) to compare Establishment Births in the treatment county with the combination of similar counties constituting the synthetic control pool. SCM is a novel tool increasingly used for comparative case analysis in economics and the social sciences. In regional economics, SCM facilitates comparative case studies that evaluate the impact of policy interventions by comparing the economic benefits before and after the intervention. Previously, scholars would use a contiguous geographical unit to the 'treated' unit for comparative evaluation. However, political, economic, and cultural differences between the treated and untreated units diminished the reliability of this approach (Abadie, 2021). Additionally, inferences drawn from contiguous unit comparisons are limited when generalizing beyond the specific case (McClelland and Gault, 2017).

SCM address this problem by creating a synthetic group of untreated units. This synthetic group mimics the outcome variable's trajectory without a policy intervention. Thus, the synthetic group serves as a counterfactual to evaluate the hypothesized impact of the treatment. The SCM creates this counterfactual group by weighting averages from selected units within the pool. The units in the pool are selected based on the predictor variables that affect the outcome variable (in this case, Establishment Births) before the treatment/policy intervention is introduced. The treatment/policy intervention's effectiveness is revealed by differences in the treated county and its synthetic control's outcome variable.

Each potential county is assigned a weight (w_i). These weights ensure that the synthetic control pool resembles the treatment county before the intervention. For example, Table 13 lists the five counties constituting the synthetic control pool for the treatment county, Limestone – AL. Tehama, CA, is the most heavily weighted (58%) of the five counties, followed by Washington, VT (22%).

Table 13. Synthetic Control Counties for Limestone, Alabama

FIPS	County	State	Unit Weight
6103	Tehama	California	0.58
12119	Sumter	Florida	0.08
29145	Newton	Missouri	0.10
45043	Georgetown	South Carolina	0.02
50023	Washington	Vermont	0.22
			1.00

Source: Table 14 for variables used as predictors for identifying Synthetic control counties

The fifty-two treatment counties are pulled from each of the eight regions. I apply the Synthetic Control technique to these treatment counties to select the combinations of counties for each synthetic control. The outcome variable is the county Establishment Birthrate, and I use the following predictor variables (shown in Table 14) to help identify synthetic control counties for each treatment county.

Table 14. Common Predictors used in the Synthetic Control Method

Variable	Description
ba_00	Share of Population with BA+, 2000
dens_00	County Population Density, 2000
BirthRate (1999)	County Establishment Birth Rate, 1999
BirthRate (2003)	County Establishment Birth Rate, 2003
BirthRate (2005)	County Establishment Birth Rate, 2005
pop_growth	County Population Growth Rate (1999-2004)
PCPI_growth	County Per Capita Personal Income Growth Rate (1999-2004)
Emp_growth	County Employment Growth Rate (1999-2004)
MedHHValue00	County Median House Value, 2000
age00_med	County Median Age, 2000

I identify three treatment counties from the Southeast, two from the Southwest and the Great Lakes, and one from the Far West, Mideast, Rocky Mountain, and Plains regions. Table 15 lists these eleven representative treatment counties and their respective synthetic controls. The latter are selected from the pool of counties that qualify for the control group based on the magnitude of the mean squared prediction error (MSPE) and a visual inspection of the trajectory of the Establishment Birthrate of the treatment county and the selected counterfactuals.

Table 15. Treatment Counties and their respective Synthetic Controls

FIPS	Treatment County	State	Region	Synthetic Controls
1083	Limestone	AL	Southeast	Tehama-CA, Sumter-FL, Newton-MO, Georgetown-SC, Washington-VT
1115	St Claire	AL	Southeast	Sumter-FL, Catoosa-GA, Kauai-HI, Wagoner-OK, Georgetown-SC, Hamblen-TN
54033	Harrison	WV	Southeast	Herkimer-NY, Marion-WV, Suak-WI
40125	Pottawatomie	OK	Southwest	San Benito-CA, Sampson-NC, Garfield-OK
40101	Muskogee	OK	Southwest	Liberty-GA, Reno-KS, Lowndes-MS, Rutherford-NC, Putnam-WV
53009	Clallum	WA	Far West	Pope-AR, San Benito-CA, Nassau-FL, Kauai-HI, Butler-KS, Lewis & Clark-MO, Chaves-NM
55097	Portage	WI	Great Lakes	Herkimer-NY, Marion-WV, Carbon-PA
26073	Isabella	MI	Great Lakes	Lonoke-AR, Troup-GA, St. Joseph-MI, Hamblen-TN, Chippewa-WI, Sauk-WI
34033	Salem	NJ	Mideast	Sumter-FL, Catoosa-GA, Lea-NM, Sampson-NC, Hamblen-TN
56025	Natrona	WY	Rocky Mountain	Pope-AR, Liberty-GA, Walker-GA, Butler-KS, Crow Wing-MN, Lewis & Clark- MO, Otero-
20103	Leavenworth	KS	Plains	Nassau-FL, Blue Earth-MN, Otero-NM, Herkimer-NY, Sauk-WI

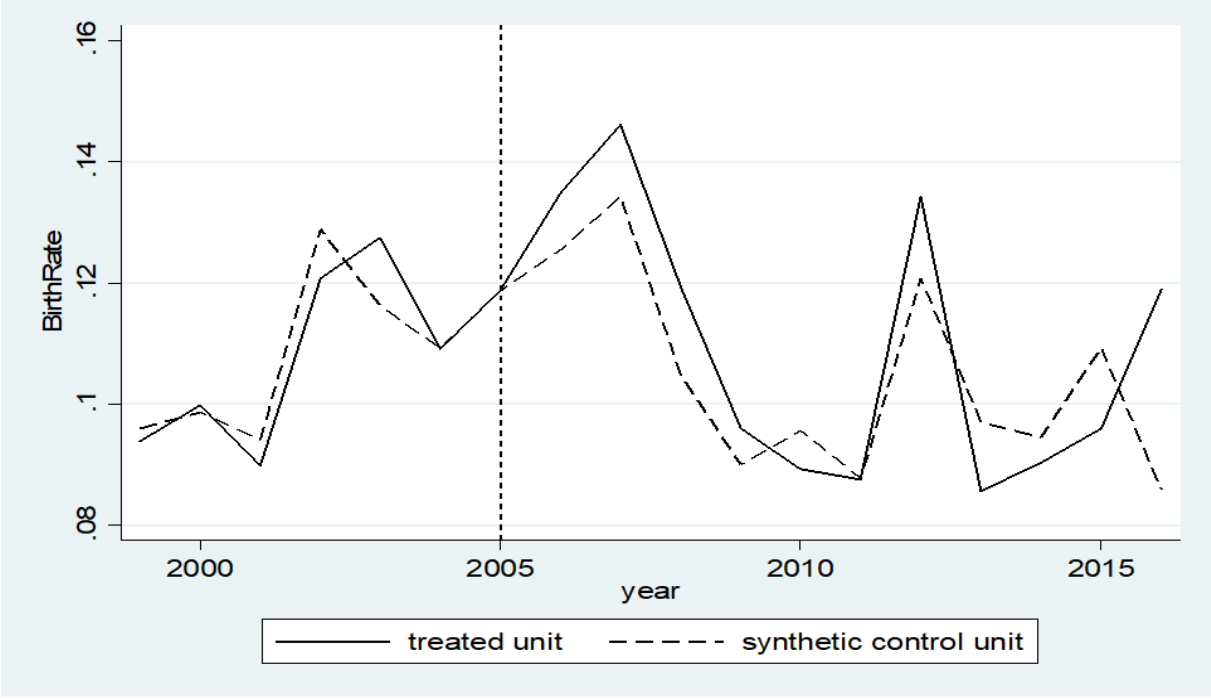

Figure 7. Estab. Birthrates in Limestone County, AL and its Synthetic Control, 1996-2016

Figure 7 illustrates the trajectory of Establishment Births in the treatment county, Limestone AL, and its synthetic control. The vertical line in 2005 divides the period into pre-ACS and post-ACS respectively. A comparison of the trajectories of both entities visually presents the Establishment Births in the two sub-periods. During the pre-ACS period, the two lines closely parallel each other, indicating a similar pattern of Establishment Births in Limestone County and its synthetic control group, thereby validating the selection of the synthetic control as an appropriate comparative entity. In the post-ACS phase, both lines follow similar trajectories, but the gap between them becomes more pronounced. In the initial years of this phase, Establishment Births in the treatment county exceed those in the synthetic group, even surpassing them in the years leading up to the Great Recession. Subsequently, in the recovery period post-Great Recession, Establishment Births spike in the treatment county, again surpassing those in the synthetic control, followed by a comparatively deeper decline. The trajectory of Establishment Births appears to be relatively more volatile for both entities in the post-ACS phase than in the pre-ACS phase. The higher rate of Establishment Births observed in Limestone County in the initial years of the post-ACS phase provides an opportunity to investigate the factors likely contributing to this difference, specifically whether information released by ACS in Limestone County played a role.

Figure 8 presents analogous data for other treatment counties and their corresponding synthetic controls, illustrating the trajectory of Establishment Births during pre and post ACS phases.

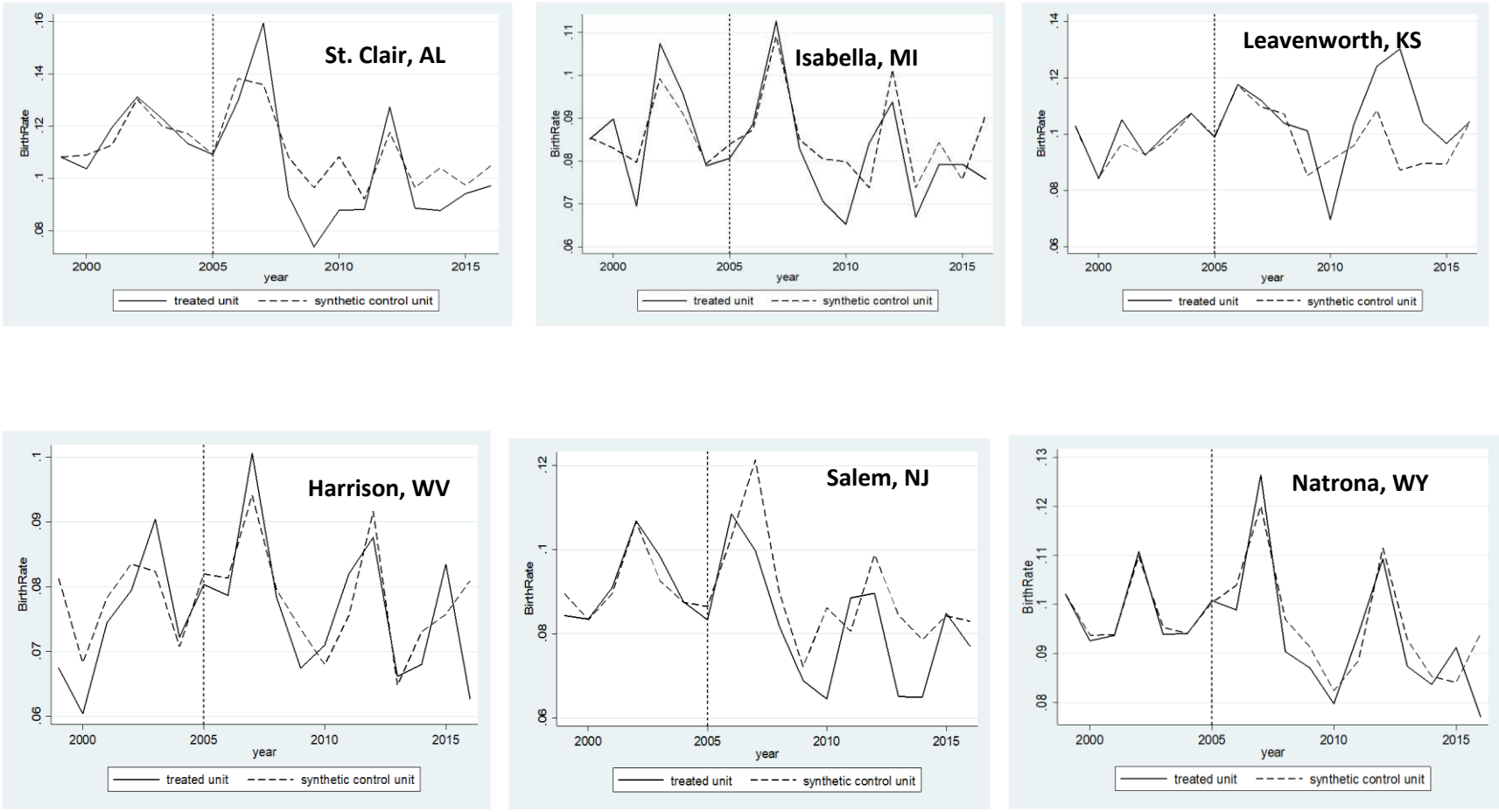

Figure 8. Synthetic Control match for selected Treatment Counties

I build on Stephens, Partridge, and Fagan's (2011, 2013) endogenous growth model, where the Establishment Birthrate in county '*i*' is a function of the information released by the ACS and standard regional variables controlling for human capital, per capita income, population, density, and employment. I use historical values for county median household value and median age to address any potential endogeneity. Utilizing contemporaneous values for selected control variables poses a risk of inducing endogeneity with the variable of interest, potentially leading to biased and inconsistent estimates. By employing historical values of control variables, their effects can be captured in the model while also preventing any potential transmission of effects from the Establishment Births to them. Therefore, the utilization of prior values for these control variables is recommended. The empirical model developed as follows:

$$
\begin{aligned}
&Establishment\ Birthrate_{it} = \beta_0 + \beta_1 ACS\_Release_{it} + \\
&\beta_2 Share\ of\ population\ with\ Bachelors'or\ higher_{i\,t} + \\
&\beta_3 Population\ density_{it} + \beta_4\ Per\ capita\ \ peronal\ income,_{it} + \\
&\beta_5\ Population_{it} + \beta_6\ Employment_{it} + \\
&\beta_7\ Median\ Household\ Value, 2000_i + \beta_8\ Median\ Age\ 2000_i + \varepsilon_{it} \quad (1)
\end{aligned}
$$

As Bertrand et al. (2004) note, standard errors reported in conventional D-i-D regressions severely understate the variance of the estimators. I follow the authors' call to cluster the standard errors at the group level (i.e., clustering at the county (FIPS) level when running the regressions for D-i-D analysis).

4.4 Results

First, I investigate the hypothesized impact of Census Bureau information decay in the sample period (1999-2016). I create the variable 'Information_Age' to capture the number of years elapsed from the release of the last decennial Census and the release of the ACS in each county. For example, in a representative county, the years 1999 and 2000 would have a value of 9 and 10, respectively (representing the number of years since the information from the 1990 decennial was released), and a value of 1 for the years it received information

from the ACS during this period. The larger the value, the older the information available for that county. Counties in the treatment group receive a value of 1 starting in 2006, and those in the synthetic control group receive it from 2008. The results displayed in Table 16 show that time since information release (or information decay) has a negative and significant impact on Establishment Births in Limestone (AL), , Portage (WI), and Natrona (WY) counties. Each additional year of utilizing existing information led to a reduction of 0.34 establishment births in Limestone County, 0.15 in Natrona County, and 0.42 in Portage County. In other words, one fewer establishment was born over three years in Limestone County, over six years in Natrona County, and slightly over two years in Portage County. While the impact is small, the results strengthen the argument that a lack of "better" information adversely affects establishment births in these counties. I supplement this by comparing differences in establishment births in the treatment counties and their respective controls. The results displayed in Table 17 show the differences in establishment births in Limestone (AL), Muskogee (OK), Clallum (WA), and Leavenworth (KS) counties when compared with their respective control groups.

Table 16. Results of Information Decay, 1999-2016

FIPS	Treatment County	State	Region	Information_age Estimator Coeff.
1083	Limestone	AL	SouthEast	-0.0033916*
1115	St Claire	AL	SouthEast	-0.0038178
54033	Harrison	WV	SouthEast	0.0003656
40125	Pottawatie	OK	SouthWest	-0.000498
40101	Muskogee	OK	SouthWest	-0.002336
53009	Clallum	WA	FarWest	0.001098
55097	Portage	WI	Great Lakes	-.0031155**
26073	Isabella	MI	Great Lakes	0.000944
34033	Salem	NJ	MidEast	-0.000744
56025	Natrona	WY	Rocky Mountain	-.0010473**
20103	Leavenworth	KS	Plains	0.0013506

,,*** represent 10%, 5%, and 1% levels of significance*

Table 17. Results from D-i-D analysis, 1999-2016

FIPS	Treatment County	State	Region	Diff-in-Diff Estimator Coeff.
1083	Limestone	AL	SouthEast	.0242754**
1115	St Claire	AL	SouthEast	0.0040852
54033	Harrison	WV	SouthEast	0.0031586
40125	Pottawatie	OK	SouthWest	0.002631
40101	Muskogee	OK	SouthWest	.0163984**
53009	Clallum	WA	FarWest	0.0146438***
55097	Portage	WI	Great Lakes	0.007544
26073	Isabella	MI	Great Lakes	0.003717
34033	Salem	NJ	MidEast	0.010334
56025	Natrona	WY	Rocky Mountain	0.01427
20103	Leavenworth	KS	Plains	.018759**

,,*** represent 10%, 5%, and 1% levels of significance*

While these preliminary results are encouraging, the hypothesized impact from the ACS is likely camouflaged by information released from the decennial census. The hypothesized impact of the American Community Survey (ACS) is evaluated over the period spanning 1999 to 2016. The treatment county received the ACS release in 2006, whereas their synthetic control received it in 2008. Subsequently, information from the 2010 decennial census was released nationwide in 2011. Considering the brief interval between the ACS release in 2008 and the decennial release, it is possible that any observed information effect in the analysis may be obscured by the data released from the decennial census. To estimate the ACS's specific impact, measured through County Establishment Birth rate, I focus on the ACS implementation period and the information first released in treatment counties and control

groups, respectively. To that end, I modify the variable and measure its hypothesized effect using the cumulative value for each county from 1999 onwards. Accumulating the impact over the study period, rather than measuring it on an annual basis, is likely to provide a more meaningful measure of the effect of ACS information release on Establishment Births when examining each set of treatment and control counties.

4.4.1 Results from treatment years, 2006-11

The Difference-in-Difference (D-i-D) analysis includes the eleven treatment counties and their respective synthetic control groups for the period of interest (2006-11 for the former and 2008-11 for the latter).

The 'year-treatment' variable represents the year when local ACS information was released in the county. In treatment counties, the value 0 was assigned to years 1999-2005 (pre-intervention period), while the value 1 was assigned to years from 2006-2011 (post-intervention period). Similarly, in the case of synthetic controls, the value 0 was assigned to years from 1999-2007 (pre-intervention period), and the value 1 was assigned to years from 2008-2011 (post-intervention period). Table 18 summarizes the result of this D-i-D analysis for treatment counties and their counterfactuals, both before and after the treatment periods.

The D-i-D estimator is statistically significant in four treatment counties—Limestone-AL, Harrison-WV, Muskogee-OK, and Natrona-WY. While the D-i-D estimator's significance is encouraging, its sign is negative, indicating that the cumulative Establishment Birthrate value was lower in treatment counties after the introduction of ACS local information when compared to the synthetic controls. In other words, the Establishment Birthrate declined after the ACS intervention in the treatment county but increased in synthetic control counties. These results are counterintuitive to the hypothesized impact on the local economy.

Table 18. Results from treatment period, 2006-2011

FIPS	Treatment County	State	Region	Diff-in-Diff Estimator Coeff.
1083	Limestone	AL	SouthEast	-0.2540871**
1115	St Claire	AL	SouthEast	-0.1409415
54033	Harrison	WV	SouthEast	-0.1655456***
40125	Pottawatie	OK	SouthWest	-0.0849335
40101	Muskogee	OK	SouthWest	-0.0904093*
53009	Clallum	WA	FarWest	-0.1217255
55097	Portage	WI	Great Lakes	-0.0444796
26073	Isabella	MI	Great Lakes	-0.0230005
34033	Salem	NJ	MidEast	-0.1395349
56025	Natrona	WY	Rocky Mountain	-0.0630314**
20103	Leavenworth	KS	Plains	-0.0696851

,,*** represent 10%, 5%, and 1% levels of significance*

4.4.2 Results from truncated treatment years, 2006-08

I attempt to isolate the impact of the exogenous shock by re-implementing the D-i-D technique, this time eliminating years 2009 and beyond from the analysis (since the ACS estimates were first released in the synthetic control counties in 2008). The treatment counties received ACS results in 2006, 2007, and 2008, while the synthetic control pool counties only received ACS results in 2008. The results from the D-i-D analysis for these years are displayed below in Table 19.

The results from this truncated period echo the previous findings. This time, the D-i-D estimator is significant in four counties (i.e., Limestone-AL, St Claire-AL, Portage-WI, and Salem-NJ). And as before, these estimators' signs ae negative, indicating that the Establishment Birthrates in these counties declined after the introduction of the ACS. I conduct additional analyses, including modifying the model by combining other variables. However, I am not able to find robust changes in the significance or the sign of Establishment Births to draw alternative conclusions. Results from this analysis are available in the Appendix.

Table 19. Results from truncated treatment years, 2006-2008

FIPS	Treatment County	State	Region	Diff-in-Diff Estimator Coeff.
1083	Limestone	AL	SouthEast	-0.3996216*
1115	St Claire	AL	SouthEast	-0.2395851***
54033	Harrison	WV	SouthEast	-0.063117
40125	Pottawatie	OK	SouthWest	0.174223
40101	Muskogee	OK	SouthWest	0.184044
53009	Clallum	WA	FarWest	0.015628
55097	Portage	WI	Great Lakes	-0.2228295*
26073	Isabella	MI	Great Lakes	-0.059311
34033	Salem	NJ	MidEast	-0.0945904*
56025	Natrona	WY	Rocky Mountain	0.05793
20103	Leavenworth	KS	Plains	-0.0922817

,,*** represent 10%, 5%, and 1% levels of significance*

4.5 Conclusion

Rural economies have struggled to capitalize on their potential, resulting in lagging contributions to national economic growth and enduring regional economic disparities compared to their urban counterparts. One contributing factor to this situation is the presence of geographical information asymmetries between rural and urban counties. The introduction of the American Community Survey (ACS) was expected to address the lack of "better information" that has hindered rural counties. The staggered release of ACS information across counties with otherwise similar economic, geographic, and social characteristics presented an opportunity to estimate the impact of ACS in addressing these informational asymmetries on local economic growth.

In this study on the effects of informational asymmetry on Establishment Births, I use the synthetic control method to identify a sample of eleven treatment counties and their respective counterfactuals from different regions. The predictors used are lagged values of Establishment Birthrates, county population growth rate, county per-capita income growth rate, county employment growth rate from the pre-intervention period (1999-2004), the share of county population with a bachelor's degree or higher, county median age, and county population density (from 2000).

The predictors used in the synthetic control technique facilitate the selection of control counties that closely mirror the treatment counties. Some of the predictors are also used as control variables in the D-i-D methodology to account for similar economic characteristics. Many of the variables used as controls in the D-i-D analysis models are found to be significant (across different periods), validating their utility in the research.

I then employed the Difference-in-Difference methodology to isolate the ACS's informational effect, as estimated using the outcome variable (i.e., Establishment Birthrates). The initial analysis supports information decay's impact on establishment births. However, I do not find robust evidence that the ACS information stimulated Establishment Births in treatment counties vis-a-vis their respective synthetic control groups during the study period (2006-11 for treatment counties and 2008-11 for the control groups). I truncate the study period

(2006-08 for treatment counties and 2008 for the control groups) but still find no evidence to substantiate the ACS information effect on Establishment Births between the two groups. The results do not support the ACS's information effect on Establishment Births at the county level.

The Great Recession had a profound economic impact in the United States, with an evidently deeper decline and a delayed economic recovery in rural counties. It is possible that, despite the advantage of ACS informational benefits, the Great Recession's impact negated any benefit in the treatment counties. It is likely impossible to eliminate the Great Recession's economic impact in an assessment of ACS information.

The ACS was meant to provide relatively frequent "better information". However, this desired impact may have been hampered by a lack of adequate awareness and accessibility. The targeted users, namely small business owners and entrepreneurs in rural areas were likely unaware of this survey. Furthermore, even among those who were aware of ACS, certain targeted users may have been excluded due to inadequate internet access. According to a Census Bureau report on Computer and Internet use, in 2003, forty-five percent of households in the country did not have access to the internet at home[23] (Day et al 2005). Subsequent data from the 2013-2017 ACS 5-year estimates indicated that seventy-eight percent of households in the country had internet access. However, it is noteworthy that "households in both rural and lower-income counties lagged behind the national average by thirteen points" (Martin, 2018, p. 1). Even though internet access has gained pace during this period, the urban-rural disparity in internet access still persists. This lack of awareness and accessibility plausibly undermined the effectiveness of the initial ACS release in these areas. While the results from this empirical analysis are not highly robust, they provide sufficient evidence to warrant further research on this topic. Rural counties exhibit distinct industrial structures to urban counties; they are less diversified, with specific sectors like food services and retail being more concentrated in the local economy (Chi, 2023). Establishments in these sectors are typically independently owned and smaller in size, rendering them vulnerable to local economic and demographic changes. Unlike those belonging to large

[23] Estimates based on the Current Population Survey

franchise chains, which can strategically capitalize on additional support and research services provided by the franchiser, small and independent establishments rely on public data sources like those from the Census Bureau. Additionally, they offer localized products and services in small geographic areas that can experience relatively large demographic shifts. According to Chi (2023, p. 3), "census data has the largest impact on independent establishments, followed by small chains". Therefore, the availability of reliable and current information is crucial for their survival and for fostering the birth of new establishments in these sectors. Considering the higher concentration of establishments from these sectors and their unique role in the local economy, they are a good (potential) candidate for measuring the hypothesized impact of ACS release in these counties. Future research endeavors should thus focus on investigating the impact of information gaps on establishment births in specific industries such as restaurants and retail.

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Chapter 5. Conclusion

Small businesses play a vital role in regional and national economic growth through contributions to job creation, productivity growth, and innovation (Haltiwanger et al. 2012). Between 1992 and 2013, small businesses employed forty-eight percent of private sector employees and created sixty-three percent of net new jobs (SBA, 2016). They also help minorities, veterans, and immigrants in pursuing the American Dream. As of 2012, twenty-nine percent of firms in the U.S. were owned by minorities, nine percent by veterans, and about fifteen percent by immigrants (SBA, 2016) compared to being forty-one percent, seven percent, and thirteen percent respectively of the total U.S. population[24] [25]. Small businesses' size and flexibility make them resilient in economic downturns; they help the US economy dynamically respond to changes in business cycles (Decker et al. 2014, William and Vorley 2014).

Research has highlighted numerous challenges confronting the US economy, including declining business dynamism, decreased rates of firm entry, and consequently, lower rates of firm growth (Decker et al 2014, 2016). These challenges have tangible effects on the small business sector leading to declining productivity growth, job reallocation, and churn, where the latter is often measured through gross job flows (Akcigit and Ates, 2021). This study examines the causes and implications of some of these critical challenges in the regional economy through appropriate econometric analyses. Motivated by the economic development through innovation mechanism illustrated in Figure 1, I investigate three main challenges encountered by de novo businesses[26] following their inception: credit supply shocks, labor supply, and the impact of local information asymmetries. While these challenges affect small businesses across all stages of development, they are particularly critical for the survival of newborn establishments. Since these establishments are typically

[24] Minorities include those who identify as Black or African American, American Indian or Alaskan Native, Asian, Native Hawaiian, Two or more races, and Hispanic or Latino
[25] 2012 ACS 5-Year estimates
[26] Newly born small business establishments

independently owned and operated, they often subsist by bootstrapping resources during the post-birth phase. Therefore, any disruption or decline in access to these resources is likely to have a detrimental impact on their existence. Establishments born from 1990 to 2007 had an average five-year survival rate of sixty-nine percent in a typical county (Deller and Conroy, 2016). My investigations examine the economic impact of small businesses at the county level to contribute to the literature on regional economic development and small businesses. The time period studied includes the Great Recession period, allowing for an assessment of the economic downturn's impact on small business birth\survival in urban and rural counties.

Credit is the lifeblood of any business venture, particularly de novo businesses. In the post-birth phase, small business establishments need credit for working capital, payroll, and capital expenditure. They disproportionately depend on loans from local banks for these funding requirements. I find that changes in bank lending have a pronounced impact on the likelihood of de novo business survival in nonmetro counties. During the economic recession, the evidence is indicative of the existence of a credit supply-business survival spiral that significantly impacts establishments operating in nonmetro counties. Since 1980, the total number of commercial banks in the U.S. has declined from 14,400 to 4,600 (Aktug et al. 2021). Many of these banks were local community banks serving rural and remote counties. The concurrent shift toward digital banking and lending, also contracted sharply during the recession (Cole and Damm, 2020). Unsurprisingly, with a declining number of bank locations, the contraction in credit supply severely affected small businesses in nonmetro[27] counties. Results indicate that by 2009, decline in credit supply during this period led to the closure of approximately two out of three de novo establishments in All counties, more than three de novo establishments in a typical Metro County, and one out of ten de novo establishments in a typical Nonmetro county.

[27] Metro counties have at least one urban core of at least 50,000 people; adjacent counties have a high degree of social and economic integration with this core (OMB Standards, 2010). Nonmetro counties are geographical entities that include an urban area with a population between 2,500 and 49,999 that is not part of a larger labor market, and/or rural towns (population under 2,500) (ERS, USDA 2022).

Labor supply is another critical factor for any organization. I use portfolio theory to identify the labor market dynamics prevalent in counties during the study period. By employing employment and income-based risk and return measures, I find that labor market risk—manifesting both in jobs, and employees' personal income—positively influences the survival of de novo businesses operating in metro counties and further in metropolitan statistical areas. Including MSAs in the analysis assesses the robustness of the results observed in metro counties. This impact continued during the Great Recession, indicating that the threat of job loss and income modifies employee behavior. The decision to remain in the existing employment, even for a limited time, ensures a continued labor supply for de novo establishments, helping them survive through the recession and into the early post-establishment phase. Specifically, a one standard deviation increase in the WSI-portfolio during 1996-2005, on average, saves an additional 2.5 establishments in an MSA in 2010.

Current and consistent information about a regional entity's economic, social, and demographic characteristics is invaluable both for existing and prospective business owners. This information enables them to identify their target market, understand local demographic trends, assess the regional industrial structure, and stay informed about the government's local economic policies and initiatives. Additionally, access to 'better' information about the key constituents in the community allows local governments to identify their needs and allocate financial aid effectively and in a timely manner. Unfortunately, there are significant disparities in the frequency and reliability of the desired information in urban and rural counties. Businesses in urban counties have the benefit of accessing this information from private agencies in addition to public ones, while rural counties depend heavily on the latter, which publish this information less frequently. This disparity puts businesses operating in rural areas at a disadvantage. Rural counties disproportionately suffer from a lack of 'better' information, among other things, making it difficult to attract new businesses. The ACS was introduced in 2005 to help address these information asymmetries existing between rural and urban counties. The ACS's practical implementation created a gap in the dissemination of information between otherwise similar (economically, demographically) counties. I conduct a comparative case study analysis to investigate whether this gap in information dissemination has any significant economic impact. I find evidence of "information decay" on

establishment births in Limestone (AL), Natrona (WY), and Portage (WI) counties. Each additional year of utilizing existing information led to a reduction of 0.34 establishment births in Limestone County, 0.15 in Natrona County, and 0.42 in Portage County, strengthening the argument that the lack of 'better' information adversely impacted establishment births in these counties. Furthermore, using the novel synthetic control method, I create a hypothetical counterfactual for each county that received the earliest ACS release. I then use the difference-in-difference technique to estimate the economic impact by estimating differences in establishment births between treatment counties and their counterfactuals. I do not find a robust economic impact to substantiate my hypothesis.

Reviewing the findings in context of Figure 1, they reinforce the critical role of three key factors — credit supply, labor supply, and information — on newborn small businesses. These findings underscore how each of the three key elements independently exerts a modest but significant influence on small business survival. Moreover, due to the inherent spillover and multiplier effects, these elements collectively have the potential to generate an amplified positive impact on local and regional economies.

As demonstrated in Chapter 2, restricted credit supply by banks during recessions has a strong and consistent impact, particularly on de novo businesses operating in non-metro counties. This constraint appears to drive the closure of businesses across All counties, further illustrating the transmission of amplified spillover effects.

Interestingly, Chapter 3 emphasizes that a stable labor supply, representing the availability of Talent, helps de novo businesses in metro counties remain resilient during recessions. A counterfactual scenario where bank credit—or alternative financial support mechanisms—remained unconstrained during the recession, could reveal a similar outcome for de novo businesses operating in non-metro counties, thereby enhancing the resilience of local economies.

Although the analysis in Chapter 4 does not provide robust evidence regarding the impact of scarce information on economic activity, it does reveal the existence of "information decay." The lack of timely, and accurate information stifles Idea generation—one of the critical

components in the innovation process—potentially hindering economic development, particularly in non-metro counties.

The recent pandemic created an unprecedented global economic challenge, and authorities responded with fiscal and monetary measures. The Paycheck Protection Plan (PPP) in the U.S. was one such measure, aimed at preventing small businesses from closing and protecting employees from being laid off. Such measures highlight the financial vulnerability of small businesses and reinforce the need for a robust banking system.

There is currently exceptional churn in the US labor market as labor demand tussles with labor supply. This churn has created unprecedented wage growth in low-skilled jobs. However, there have been massive layoffs in high-paying industries like information technology and financial services. Scholars should closely watch employees' responses to the anticipated economic downturn and any consequent impacts on de novo businesses in rural and urban counties.

The federal government's recent Access Broadband Act (within the Consolidated Appropriations Act of 2021) allocated funds to promote broadband for economic development, small business support, and local participation (Bowers and McArdle, 2023). This impetus to establish digital infrastructure in rural and remote areas recognizes the need to remove geographical information asymmetries. Improved digital infrastructure, among other objectives, is expected to connect small business establishments with national and international markets, access digital banking products, and data from public information agencies. This will help small business establishments contribute to rural regional economies, just as they do in the urban centers. Sustained business growth in the rural counties is likely to promote local economic development and contribute to national economic growth.

A prominent constraint in these studies is the limited availability of data on the survival of de novo businesses. The survival rate for newborn business establishments in a county is available for the first five years only, which limits the scope of analyses. Since establishments in the dataset were born in 2005, they encountered the unprecedented economic downturn of the Great Recession, which became a part of the analyses in Chapters 2, 3 and 4. Including

data from the Great Recession allowed for a comparison of credit supply by banks before and during the recession, thereby strongly highlighting the impact of restricted credit supply on the survivability of de novo businesses. Additionally, in Chapter 3, the Great Recession helped establish the role of uninterrupted labor supply and its positive effect on new business survival, while the lack of such supply in otherwise normal times poses a severe challenge for de novo businesses. Thus, data from this economic downturn substantiates the challenges these businesses faced due to limited access to continuous credit and labor supply. Although efforts were made to address potential bi-causality to avoid any effect on the results found in both chapters, it is possible that it was not completely eradicated, although I strongly believe its magnitude, if any, was minimal. The short time series of the survival data also limited the scope of applying alternative econometric techniques to address potential endogeneity. In Chapter 4, however, the severity and breadth of the Great Recession likely obscured the impact of information dissemination from the ACS as measured through establishment births.

In the future, I aim to apply additional instrumental variables and include regions from the Rural-Urban Continuum Code (RUCC) to robustly establish the effect of changes in credit supply on de novo business survival. A notable finding in this chapter was the inconsistent impact of decline in credit supply on de novo businesses' survival in Metro counties. The local economy of an urban county is quite different from that of a nonmetro county. Investigating deeper, based on the rural-urban spectrum, will likely help identify the causes for the differences in the impact observed between metro and nonmetro counties and broadly if there exists any variation across counties specifically in the urban spectrum. In Chapter 3, I plan to investigate whether changes in labor supply during other recessions affect the survivability of new businesses. Though each recession is different, all impact unemployment in the economy. Finally, for Chapter 4, I intend to narrow my investigation to establishment births in specific industries like Retail or Restaurants, given their significant presence in all counties.

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Appendix

Table 20. Results for Business Survival Rate, 2009

	SR 2009		
	All	Metro	Nonmetro
Lag 1 Survival Rate	**1.365*** **	**1.486*** **	**1.283*** **
	(0.0401)	(0.104)	(0.0424)
Lending per capita	**0.00345**	**0.0715** **	**0.00154**
(lpc)	(0.00804)	(0.0362)	(0.00813)
Lag 1 Lending per capita	**-0.0129** **	**-0.0668*** **	-0.00838
(L1.lpc)	(0.00622)	(0.0258)	(0.00641)
Annual Change in lpc	**0.00561*** **	**-0.0439** *	**0.00540*** **
(chng)	(0.000609)	(0.0262)	(0.000561)
Lag 1 Annual Change in lpc	**0.0102*** **	**0.0383*** **	**0.00513**
(L1.chng)	(0.00366)	(0.00962)	(0.00379)
Lag 2 Annual Change in lpc	**0.0120*** **	**0.0145** *	**0.00902*** **
(L2.chng)	(0.00311)	(0.00796)	(0.00322)
Births*Deaths	-0.000745*	-0.00146**	-0.000650
	(0.000411)	(0.000604)	(0.000435)
BA Share, 2000	-0.000333**	-0.000118	0.000744***
	(0.000151)	(0.000163)	(0.000233)
Birth Rate, 1998	-0.000953	-0.000828	-0.00185**
	(0.000846)	(0.00160)	(0.000939)
Death Rate, 1998	0.00240**	0.00326	0.000965
	(0.00107)	(0.00222)	(0.00108)
County Specialization, 2006	0.0502***	0.0541***	0.0192**
	(0.00668)	(0.00967)	(0.00774)
Median Age, 2000	0.00132***	0.00172***	0.00101***
	(0.000252)	(0.000400)	(0.000289)
Amenity Score	-0.00377***	-0.00245***	-0.00493***
	(0.000425)	(0.000529)	(0.000561)
Density, 2000	-0.00299***	-0.00190**	-0.282***
	(0.00112)	(0.000836)	(0.0532)
Demand Shock, 2000-2005	-0.00104**	-0.000476	-0.00143***
	(0.000428)	(0.000368)	(0.000444)
Distance to MSA	0.0134***	0.0161***	0.00557**
	(0.00192)	(0.00603)	(0.00242)
Marg dist MSA> 250k	0.00365***	0.00945***	0.000876
	(0.000734)	(0.00154)	(0.000804)
Marg dist MSA> 500k	-0.000839	0.000709	-0.00123*
	(0.000646)	(0.00140)	(0.000671)
Marg dist MSA> 1000k	0.00223***	0.00437***	0.00121*
	(0.000638)	(0.00111)	(0.000714)
Constant	-0.536***	-0.688***	-0.410***
	(0.0353)	(0.0877)	(0.0402)
R-sq	0.758	0.794	0.718
N	3021	800	2221

Robust Standard errors are reported **p<0.10,** p<0.05, *** p<0.01*

Table 21. Summary of Instrumental Variable Tests of Strength, & Presence of Endogeneity

		All	**Metro**	**Nonmetro**
2009	Endogeneity Test statistic* [chi2 (p-value)]	3.814 (0.0508)	1.664 (0.197)	3.67 (0.054)
	IV Test Statistic (F -stat)	**17.55**	0.115	**14.51**

**Ho: variables are exogenous*

Table 22. Diagnostic Tests for Dynamic Panel Data Model

Wooldridge Test

Variable	**Null Hypothesis**	**Test Statistic**	**Prob.**
Survival Rate	Ho: No first -order autocorrelation	F(1, 3030) = 880.756	Prob > F = 0.00
Lending-per-capita	Ho: No first -order autocorrelation	F(1, 3030) = 576.045	Prob > F = 0.00

=> Existence of First-order autocorrelation, both in Survival Rate and lending-per-capita

Glejser Test

Dataset	**Null Hypothesis**	**Test Statistic**	**Prob.**
Panel	Ho: No Heteroscedasticity	Glejser LM Test = 999.54	Prob > Chi2 (14) = 0.00
Cross-sectional	Ho: No Heteroscedasticity	Glejser LM Test = 138.12	Prob > Chi2 (16) = 0.00

=> Existence of Heteroscedasticity

CD-Pesaran Test

Unit*	**Null Hypothesis**	**Test Statistic**	**Prob.**
Metro	Ho: Cross-sectional Independence	CD-Pesaran Test = 1.818	Prob = 0.0691
Micro	Ho: Cross-sectional Independence	CD-Pesaran Test = 3.421	Prob = 0.0006

=> existence of cross-sectional dependence in Metro and Micro counties

*Test could be administered only in Metro (800) and Micro (600) counties due to the limit to matsize in STATA in case of 'All,' 'Nonmetro,' & 'Towns'.

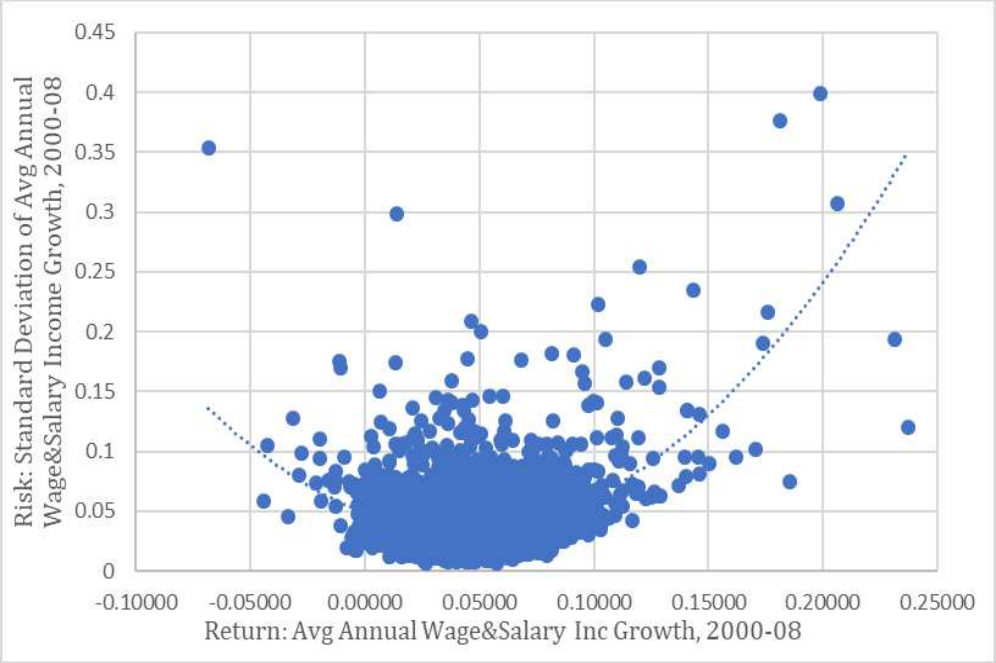

Figure 9. County Wage and Salary Income Risk and Return, 2000-2008

Table 23. Test of Risk–Return Trade-off in MSAs.

	Metropolitan Statistical Areas	
	Estimate	Std Error
Constant	0.018***	0.0005
Growth	-0.122**	0.0599
Growth Squared	4.992***	1.367
N	374	
Log-likelihood	1326.19	

p<0.1 , **p<0.05 ,*p<0.01*

Table 24. Key regional variables and data source[28]

Regional Variable	Source
Self Employment Rate	*REIS/BEA*
Amenity Score	*McGranahan Index, USDA Economic Research*
Share of Pop. Living in Rural, 2000	*USCB, Decennial Census 2000*
Share of pop. with BA+, 2000	*USCB, Decennial Census 2000*
Share of pop. With High School but No BA+, 2000	*USCB, Decennial Census 2001*
Bank Deposits per capita2005	*Federal Deposit Insurance Corp (FDIC) & BEA*
Median Home Value, 2000	*USCB, Decennial Census 2000*
Owner Occupied Houses,2000	*USCB, Decennial Census 2000*
County Income percapita,2000	*USCB, Decennial Census 2000*
County Employment,2000	*USCB, Decennial Census 2000*
County Income per capita growth, 2000-2007	*USCB*
County Employment growth, 2000-2007	*USCB*
Distance to nearest Metro	*USDA*
Employment-pop ratio,2000	*REIS/BEA*

[28] Regional Economic Information Systems (REIS), Bureau of Economic Analysis (BEA), United States Department of Agriculture (USDA), United States Census Bureau (USCB).

Table 25. Counties with pop. slightly greater than 65k (Received 1-yr ACS)

CountyID	County Name	State	2005 pop	Region
6115	Yuba County	California	66,934	Far West
6033	Lake County	California	64,491	Far West
41035	Klamath County	Oregon	65,662	Far West
41053	Polk County	Oregon	70,366	Far West
53009	Clallam County	Washington	69,050	Far West
53007	Chelan County	Washington	69,450	Far West
53027	Grays Harbor County	Washington	70,104	Far West
39101	Marion County	Ohio	66,062	Great Lakes
55097	Portage County	Wisconsin	67,924	Great Lakes
17001	Adams County	Illinois	67,093	GreatLakes
18109	Morgan County	Indiana	69,571	GreatLakes
26073	Isabella County*	Michigan	66,465	GreatLakes
26103	Marquette County	Michigan	65,403	GreatLakes
26037	Clinton County	Michigan	69,129	GreatLakes
34033	Salem County	New Jersey	65,763	Mideast
36053	Madison County	New York	69,861	Mideast
42037	Columbia County	Pennsylvania	64,662	Mideast
20103	Leavenworth County	Kansas	71,671	Plains
27141	Sherburne County	Minnesota	80,917	Plains
29043	Christian County	Missouri	66,742	Plains
38035	Grand Forks County	North Dakota	66,557	Plains
56025	Natrona County	Wyoming	69,857	Rocky Mt
1049	DeKalb County	Alabama	67,262	Southeast
1115	St. Clair County	Alabama	72,349	Southeast
1083	Limestone County	Alabama	70,123	Southeast
1051	Elmore County	Alabama	73,438	Southeast
5145	White County	Arkansas	71,774	Southeast
12035	Flagler County	Florida	75,712	Southeast
13127	Glynn County	Georgia	71,814	Southeast
21029	Bullitt County	Kentucky	68,090	Southeast
22045	Iberia Parish	Louisiana	73,994	Southeast
28067	Jones County	Mississippi	66,395	Southeast
37109	Lincoln County	North Carolina	69,327	Southeast
37193	Wilkes County	North Carolina	66,725	Southeast
45073	Oconee County	South Carolina	69,623	Southeast
45047	Greenwood County	South Carolina	68,092	Southeast
45031	Darlington County	South Carolina	67,575	Southeast
45059	Laurens County	South Carolina	69,653	Southeast
47141	Putnam County	Tennessee	67,609	Southeast
47059	Greene County	Tennessee	65,181	Southeast
51015	Augusta County	Virginia	69,157	Southeast
51165	Rockingham County	Virginia	71,338	Southeast
51069	Frederick County	Virginia	68,869	Southeast
51019	Bedford County	Virginia	64,300	Southeast
54033	Harrison County	West Virginia	68,388	Southeast
4001	Apache County	Arizona	68,612	Southwest
35061	Valencia County	New Mexico	68,890	Southwest
40125	Pottawatomie County	Oklahoma	67,897	Southwest
40037	Creek County	Oklahoma	68,353	Southwest
40101	Muskogee County	Oklahoma	70,545	Southwest
48021	Bastrop County	Texas	69,085	Southwest
48409	San Patricio County	Texas	68,498	Southwest

Table 26. Counties with pop. slightly less than 65k

(Received 3-yr ACS, potential candidates for the synthetic control group)

CountyID	County Name	State	2005 pop	Region
6069	San Benito County	California	55,155	Far West
6109	Tuolumne County	California	56,531	Far West
6103	Tehama County	California	59,866	Far West
15007	Kauai County	Hawaii	62,070	Far West
41011	Coos County	Oregon	63,914	Far West
53045	Mason County	Washington	54,213	Far West
53071	Walla Walla County	Washington	57,385	Far West
39009	Athens County	Ohio	63,433	Great Lakes
39087	Lawrence County	Ohio	62,758	Great Lakes
39167	Washington County	Ohio	62,230	Great Lakes
55021	Columbia County	Wisconsin	54,880	Great Lakes
55017	Chippewa County	Wisconsin	59,184	Great Lakes
55111	Sauk County	Wisconsin	57,600	Great Lakes
17199	Williamson County	Illinois	63,710	GreatLakes
18065	Henry County	Indiana	47,492	GreatLakes
18173	Warrick County	Indiana	55,910	GreatLakes
26117	Montcalm County	Michigan	63,384	GreatLakes
26067	Ionia County	Michigan	64,168	GreatLakes
26149	St. Joseph County	Michigan	62,674	GreatLakes
36051	Livingston County	New York	64,142	Mideast
36043	Herkimer County	New York	63,196	Mideast
42025	Carbon County	Pennsylvania	61,804	Mideast
42015	Bradford County	Pennsylvania	62,033	Mideast
33001	Belknap County	New Hampshire	61,201	NewEngland
50023	Washington County	Vermont	59,222	NewEngland
50021	Rutland County	Vermont	63,825	NewEngland
20015	Butler County	Kansas	61,846	Plains
20161	Riley County	Kansas	63,192	Plains
20155	Reno County	Kansas	63,611	Plains
27035	Crow Wing County	Minnesota	59,874	Plains
27013	Blue Earth County	Minnesota	58,793	Plains
27131	Rice County	Minnesota	60,868	Plains
27111	Otter Tail County	Minnesota	57,206	Plains
29187	St. Francois County	Missouri	61,889	Plains
29101	Johnson County	Missouri	51,312	Plains
29145	Newton County	Missouri	55,148	Plains
31079	Hall County	Nebraska	54,557	Plains
30049	Lewis and Clark County	Montana	58,387	Rocky Mt
1071	Jackson County	Alabama	53,146	Southeast
1033	Colbert County	Alabama	54,652	Southeast
1009	Blount County	Alabama	55,289	Southeast
5085	Lonoke County	Arkansas	59,960	Southeast
5115	Pope County	Arkansas	57,099	Southeast
12119	Sumter County	Florida	63,697	Southeast
12023	Columbia County	Florida	64,147	Southeast
12089	Nassau County	Florida	64,794	Southeast
13179	Liberty County	Georgia	61,435	Southeast
13031	Bulloch County	Georgia	63,847	Southeast
13285	Troup County	Georgia	62,561	Southeast
13047	Catoosa County	Georgia	59,894	Southeast
13295	Walker County	Georgia	63,519	Southeast
21145	McCracken County	Kentucky	64,712	Southeast
21199	Pulaski County	Kentucky	59,245	Southeast
22113	Vermilion Parish	Louisiana	55,269	Southeast
22001	Acadia Parish	Louisiana	59,003	Southeast
28087	Lowndes County	Mississippi	59,609	Southeast
37163	Sampson County	North Carolina	62,475	Southeast
37161	Rutherford County	North Carolina	63,096	Southeast
37031	Carteret County	North Carolina	62,025	Southeast
45043	Georgetown County	South Carolina	59,887	Southeast
45057	Lancaster County	South Carolina	62,845	Southeast
47063	Hamblen County	Tennessee	60,482	Southeast
51143	Pittsylvania County	Virginia	61,294	Southeast
54079	Putnam County	West Virginia	54,078	Southeast
54049	Marion County	West Virginia	56,665	Southeast
54055	Mercer County	West Virginia	61,464	Southeast
35025	Lea County	New Mexico	56,400	Southwest
35005	Chaves County	New Mexico	61,491	Southwest
35035	Otero County	New Mexico	62,761	Southwest
40145	Wagoner County	Oklahoma	63,380	Southwest
40047	Garfield County	Oklahoma	57,039	Southwest
48347	Nacogdoches County	Texas	61,402	Southwest
48471	Walker County	Texas	64,667	Southwest
48203	Harrison County	Texas	62,775	Southwest

Table 27. Results from model, including both D-i-D and Information-Age Estimators

FIPS	Treatment County	State	Region	1999-2008		1999-2016	
				Diff-in-Diff Estimator Coeff	Information_age Estimator Coeff.	Diff-in-Diff Estimator Coeff.	Information_age Estimator Coeff.
1083	Limestone	AL	SouthEast	0.0014998	-0.0032200	0.0059004	-0.0031903
1115	St Claire	AL	SouthEast	-.0215013**	-.038131*	-.023572***	-.0052777**
54033	Harrison	WV	SouthEast	-0.0076352	-0.0011449	-0.007022	-0.0002461
40125	Pottawatie	OK	SouthWest	0.001869	0.000602	-.0101458***	-0.001553
40101	Muskogee	OK	SouthWest	0.001005	-0.002453	-0.000573	-0.002402
53009	Clallum	WA	FarWest	.0095594*	.0027429**	0.001473	0.001379
55097	Portage	WI	Great Lakes	0.002643	-0.002953	0.006531	-.0025415**
26073	Isabella	MI	Great Lakes	0.005378	-0.001547	-0.000305	-0.001644
34033	Salem	NJ	MidEast	-0.005930	-0.000273	-.0143*	-0.001875
56025	Natrona	WY	Rocky Mountain	-0.019946*	-.0031123**	-.0086709*	-.0018343**
20103	Leavenworth	KS	Plains	0.0061594	0.0025570	0.0022862	0.0015049

,,*** represent 10%, 5%, and 1% levels of significance*