The Pennsylvania State University

The Graduate School

Department of Agricultural Economics, Sociology, and Education

NATURAL DISASTERS AND PROPRIETORSHIPS: A NEW FORM OF

CREATIVE DESTRUCTION?

A Thesis in

Agricultural, Environmental, and Regional Economics and Demography

by

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Submitted in Partial Fulfillment
of the Requirements
for the Degree of

Master of Science

December 2013

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Abstract

Proprietorship is increasingly becoming a method of providing income in the absence of available wage and salary opportunities as well as providing a means of combating poverty at the county-level. Concurrent with this development, recent natural disasters that now include coastal "superstorms" raise the question of how sole-proprietors are impacted by fundamental labor market shocks, which can be both positive and negative. Of interest are both proprietorship *rates* and *earnings*. This paper finds major natural disasters produce negative shocks on proprietorship rate change in the initial period following disaster impact, followed by a positive shift in the medium-term (ranging from 5-6 years following disaster impact) and then a negative turn after 7 years. Major natural disasters produce different results for proprietorship earnings changes. For the initial period of observation, proprietorship earnings are positively impacted by major natural disasters for a period of 4-5 years following impact, and then turn negative from 6-9 years on. When extending this study 9-11 years out from the base year, only proprietorship earnings are impacted positively by major natural disasters. In the face of natural disasters, proprietorship allows impacted communities and those in the surrounding counties to reinvent themselves and restore themselves to prominence (perhaps even assume an upward trajectory of higher levels than previous to the disaster). The time horizon for recovering from natural disasters and their impacts on proprietorship growth deserve study and can provide policy makers valuable information into assessing the appropriate measures to be taken following disasters in restoring proprietorship activity to a region.

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ACKNOWLEDGEMENTS

I thank Dr. Stephan Goetz, my AEREC faculty advisor and mentor, for his strong guidance during the formulation, research, writing, revising, and submission of this thesis. His direction and expertise in entrepreneurship have contributed greatly to my research. I also thank Dr. Timothy Kelsey for not only serving on my thesis committee, but also as my assistantship supervisor during my time at Pennsylvania State University. His mentorship during my first semesters in graduate school was invaluable. I thank him for the opportunity to work on and have distributed my first publication. I also thank Dr. Leif Jensen for agreeing to sit on my thesis committee.

Special thanks are due to Dr. Ted Jaenicke, who assisted me through the graduate school application process and allowed for a meaningful experience at Penn State by helping ensure a good start to my graduate school experience. Without his efforts, I might not have attended graduate school at Penn State.

Finally, I thank my friends, in particular Brennen Poplus and Daniel Grave for helping me through my graduate school experience. The biggest message of thanks goes to my family, especially my mother, Dr. Nan Adams and my father, Mark Adams. All of these individuals have proven to be sources of guidance, motivation, and support to varying, unconditional degrees, during my academic career.

Chapter 1 - Introduction

Recent natural disasters that now include coastal "superstorms" coupled with rapid growth in proprietorship raise the question of how proprietors are impacted by these fundamental labor market shocks, which can be both positive and negative. Of interest are both proprietorship *rates* and *earnings*. If there is a relationship between these variables, an ensuing question would be what role public policy might play in terms of amplifying positive and mitigating negative impacts, or more generally, looking to sole-proprietors to enhance county economic resilience and post-disaster recovery.

In the past half century, the United States has witnessed substantial growth in the number of non-farm entrepreneurs, or sole-proprietors. The number of sole-proprietors in agriculture has diminished over time as workers left for urban areas, but the level bottomed out in the 1980s and remains relatively constant. This thesis focuses on growth in non-farm proprietorship, a term often synonymous with "self-employment." The ratio of sole-proprietors to wage and salary workers, or those workers who draw compensation from an incorporated business venture, has grown tremendously, standing at 0.12 in 1969 and more than doubling to 0.26 in 2011[1]. Becker (1984) noted that in the nonagricultural sector, 6.1 million people were sole-proprietors in 1948, but the number had declined to 5.2 million by 1970 upon which proprietorship began rising slowly in the early 1970s and more sharply in the second half of the decade. Blau (1987) attributed this trend to changing technology, industry structure, favorable tax rates, and social security benefits.

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[1] Bureau of Economic Analysis, Regional Economic Information System, 2012.

During this time, however, proprietorship net earnings declined steadily in relation to wage and salary workers' earnings. Average annual wages have grown more quickly for workers in the wage and salary category since 1969 and left the self-employed to earn lower wages either by choice or by force. Decreasing returns to proprietorship can have profound negative impacts in the coming years given that proprietorship represents an increasing percentage of total nonfarm employment. As the strength of regional economies increasingly relies on greater proportions of self-employed workers- and the entrepreneurs who start as self-employed individuals, who earn diminishing levels of income, sustaining economic growth becomes challenging but benefits can materialize as well.

Since the 2000 recession, the share of self-employed workers in the entire labor force has surged dramatically, but largely gone unnoticed by policymakers (Goetz, Fleming, and Rupasingha, 2012). The impacts of proprietorship to a local economy can be profound by providing direct and indirect job creation, wealth accumulation, and poverty reduction. In the United States, proprietorship has not attracted the attention it deserves "primarily because it is viewed as small-scale and low-paying, or it is viewed as a last resort for laid-off workers. Furthermore, the local economic impact of this sector has, not surprisingly, been the subject of only a few rigorous investigations, as is true for the impact of entrepreneurship in general" (Goetz et al, 2012, 315-6). Because of this, we attempt to shed light on the impacts of natural disasters on proprietorship rate growth and earnings. Understanding the determinants of growth in proprietorship is important not only for the direct creation of jobs for the self-employed themselves, but evidence exists that the self-employed also stimulate job creation elsewhere in the local economy (Goetz

and Rupasingha, 2013). Further, the recent recession has shown that monthly wage and salary employment creation rates have not kept pace with the number of new entrants into the workforce, further increasing the need to understand the phenomenon of proprietorship as a means to combat unemployment and poverty. This invaluable ability to create economic value by applying worker skills to unmet market needs fuels the further adoption of proprietorship and further promotes the importance of its study.

The application of worker skills to entrepreneurial or self-employed endeavors stimulates economic activity and reduces productivity loss for workers who would otherwise remain idle when few employment opportunities exist in regions throughout the country. It is an essential part of a dynamic economy. In the United States, regions have become the primary level at which to spur economic development and to create both employment opportunities and increasing standards of living (Deller & Goetz, 2009). At this localized level of analysis, Birch showed small firms as the most-contributing members of the business community in terms of employment growth (Birch, 1979; 1981; 1989). These small firms are responsible for a greater share of job creation in a region than large firms, creating the majority of new positions each year (see also Erdevig, 1986; Robson, 1996 for a more in-depth breakdown of job creation by firm stability and size). For the past half century at least, the innovation provided by smaller firms and entrepreneurs has significantly affected the structure of corporate America. From a historical perspective, the ease of entry and access to capital has led to a surge in entrepreneurship with only 90,000 new companies forming in 1950 to 200,000 by 1965 and upwards of 600,000 in 1981 (Birch, 1989, 35). This trend persists today with the increasing formation of new companies and proprietorships.

Returns to Proprietorship

Despite the notion that proprietorship only exists as a last resort and lower paying line of work when wage and salary work is not available (Aurand, 1983; Goetz, Rupasingha & Fleming, 2012; Becker, 1984; Quinn, 1980), a growing literature suggests proprietorship can have a tangible positive impact on local income and employment growth in lieu of wage and salary employment growth as well as provide a mechanism for reducing poverty at the county-level (Goetz et al, 2012; Henderson & Weiler, 2010; Rupasingha & Goetz, 2013). As discussed previously, the returns to the self-employed within the United States have trended downwards compared to wage and salary employment, with the self-employed making roughly 5% more on average in 1969 than wage and salary workers and dropping to as low as 43% below on average in 2009[2]. When parsing entrepreneurship data into components, some empirical studies examine the difference between the average earnings of wage and salary employees and those of self-employed workers and find some evidence that male entrepreneurs enjoy greater initial returns to proprietorship, on average, in a start-up than equivalent wage and salary positions and that the potential wages of entrepreneurs are not significantly different from wages of wage and salary employees (Evans and Leighton, 1989; Hamilton, 2000). However, in the longer-term Hamilton (2000, 626) finds that length of proprietorship plays a large role in wage differentials between self-employed and wage and salary workers, stating "short-stayers in proprietorship may not suffer a wage penalty, whereas long-stayers potentially experience substantial depreciation of their paid employment

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[2] While returns to proprietorship cannot be directly compared to returns to wage and salary employment because proprietorship returns measure both returns to capital and labor (Blau, 1987), the ratio still reveals a notable, secular pattern of interest.

human capital and hence may be more likely to receive low wage offers" if returning to wage and salary employment.

Without reference to proprietorship tenure, average returns to proprietorship versus wage and salary employment have fluctuated from 1969 to 2011, but have trended downward[3]. By examining the ratio of returns to proprietorship versus wage and salary employment in Figure 1, a clearer picture forms for the trajectory of proprietorship returns. A value of 1 illustrates parity in returns between the two employment classifications, with values above 1 indicating greater returns, on average, to proprietorship than wage and salary employment, and values below 1 indicating the opposite. The ratio of returns was greatest in 1969 and lowest in 2009. A large deterioration in returns to proprietorship relative to wage and salary employment occurred in the late 1970s, which did not recover until the 1990s brought the dot.com economic boom. Shortly after the economic recession of 2000-1, proprietorship returns dropped precipitously and never recovered to levels seen during the Rural Renaissance of the 1970s, a period when migration flows slowed from rural to urban America and thus kept higher shares of human capital and proprietorship compensation in rural areas. In 2011, self-employed persons earned just 63 cents for every dollar of income earned by wage and salary workers.

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[3] The Bureau of Economic Analysis (BEA) provides measurements for returns to proprietorship by examining the average nonfarm self-proprietor income as reported in the tax returns of individuals.
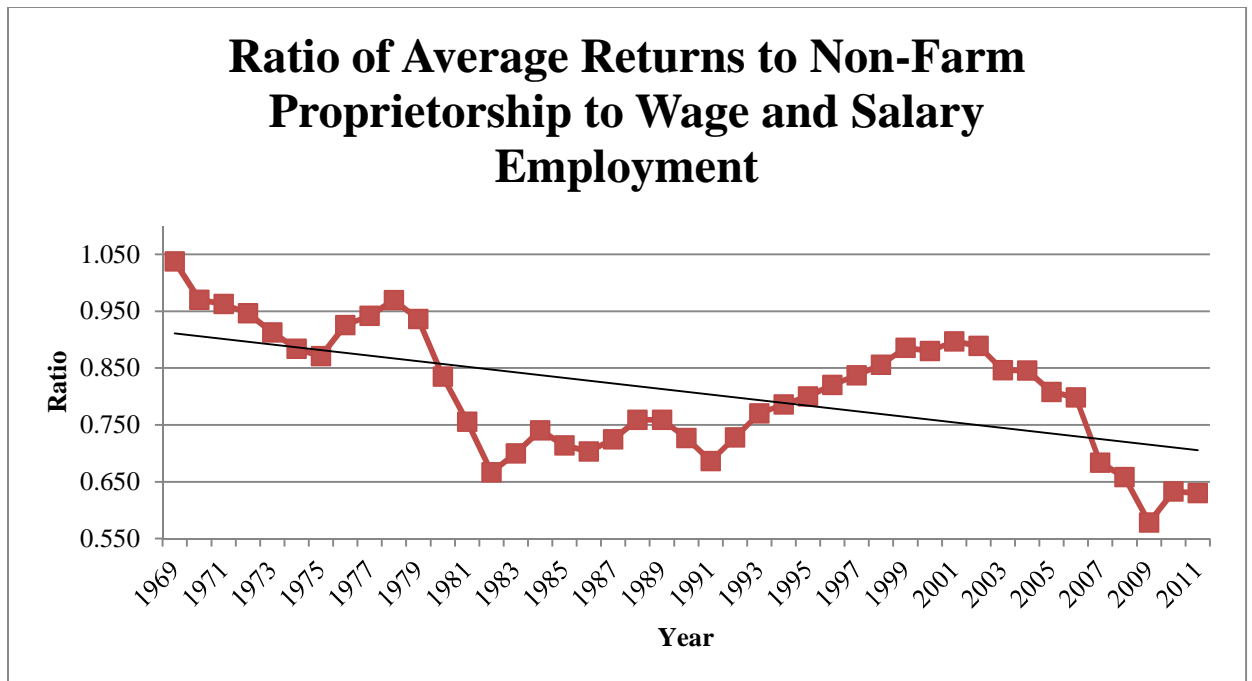
Figure 1; Source: BEA REIS, 2012

Table 1 provides more detailed data for the years 2000-2011, the time period examined within this study. The national data show initial increases in average returns to proprietorship that do not keep pace with increases in wage and salary returns realized throughout the period. In fact, the average returns for the self-employed across the nation declined 1.4% on average, whereas wage and salary returns increased by 37.8%. The initial increase in proprietorship returns between 2000 and 2001 was drastic but short-lived, 4.8% versus 2.8% for wage and salary workers. The self-employed never saw their average annual incomes equal the lowest year for wage and salary incomes, in 2000 at $35,054. The year with the highest ratio of returns to proprietorship versus wage and salary returns occurred in 2001 when self-employed workers earned just fewer than 90 cents for every dollar earned by wage and salary workers. This ratio eroded to just 63 cents per dollar by 2011, but dipped to as low as 58 cents per dollar during the depths of the Great Recession in 2009. The ratio of returns declined each consecutive year

nationally from 2001 to 2009, when it bottomed out and began to climb in 2010 and 2011 as the nation recovered from the economic recession, but not all regions across the nation experienced declines in returns to proprietorship.

Table 1: Returns to Proprietorship, 2000-2011

Returns to Proprietorship				
Year	Wage and Salary Returns	Average Proprietorship Returns	Ratio of Returns to SP vs. WS Returns	Average Annual Change in Returns to SP
U.S. Total				
2000	$35,054	$30,851	0.880	-
2001	$36,035	$32,318	0.897	4.76%
2002	$36,642	$32,577	0.889	0.80%
2003	$37,730	$31,931	0.846	-1.98%
2004	$39,389	$33,312	0.846	4.32%
2005	$40,807	$32,964	0.808	-1.04%
2006	$42,703	$34,082	0.798	3.39%
2007	$44,692	$30,545	0.683	-10.38%
2008	$45,778	$30,119	0.658	-1.39%
2009	$45,767	$26,458	0.578	-12.16%
2010	$46,982	$29,726	0.633	12.35%
2011	$48,301	$30,433	0.630	2.38%
Source: BEA REIS, 2012				

The returns to proprietorship varied by BEA economic region, as the BEA's New England, Mideast, Plains, Southwest, and Rocky Mountain economic regions saw proprietorship returns grow, albeit at much slower paces than the corresponding growth rates in wage and salary returns by region (BEA REIS, 2012). The Southeast economic region saw proprietorship returns decrease by 7.2% on average, the second-most of any region, while wage and salary earnings rose more than any other economic region, growing 41.5% on average. The overall trend for the nation holds regionally: proprietorship has become less attractive in a pecuniary sense. Despite these decreasing returns to proprietorship, other benefits must accrue to the self-employed to cause growth in the worker classification.

The data reported by the BEA do not fully capture the disparities between proprietorship returns and those for wage and salary employment, which might indicate even larger gaps than reported above. Hamilton (2000) suggests that nonwage benefits may represent 20 percent of paid employment compensation, indicating a sizable disparity between returns to proprietorship and wage and salary employment. Accordingly, BEA data do not include financial benefits in addition to wages and salaries in the tabulations of returns to employment such as contributions to employee insurance programs and pension funds and also payments made to government social insurance programs. Despite this underreported gap in earnings between the two worker classifications, arguments can be made that self-employed individuals often underreport income levels in order to avoid higher taxation. Hamilton (2000, 606) argues the variable used to indicate returns to proprietorship, termed net profit, "is analogous to the amount reported to the Internal Revenue Service and may be unreliable because of the tax incentives to underreport income" (see also Blau, 1987; Schuetze, 2000; Schuetze, 2008; Goetz and Rupasingha, 2013).

Observing these diverging returns to employment between the self-employed and wage and salary workers, what drives this growing class of self-employed worker? Assuming the self-employed respond to rational economic incentives, evidence shows that decreasing returns to proprietorship cannot be the motivating force behind growth in proprietorship. Some scholars argue self-employed individuals have no choice and resort to proprietorship only when other options persistently remain unavailable (Goetz et al, 2012; Aurand, 1983; Quinn, 1980; Becker, 1984). On the one hand, Henderson and Weiler (2010) show a strong relationship between the initial period of proprietorship

growth and the following period of wage and salary employment growth as entrepreneurs scale up successful business ventures and convert themselves into wage and salary workers, thus leading to higher returns to employment in the long-run. However, on the other hand in the short-run, Hamilton (2000) argues that for the self-employed returns are not necessarily payments-in-kind, but rather that they also derive utility from the personal freedom of "being your own boss." Quantifying this element of proprietorship is not possible with the BEA REIS data used in this analysis.

Growth in Proprietorship

As mentioned earlier, since 1969, proprietorship continues to represent a growing share of total employment[4]. Figure 2 shows the trend in proprietorship growth relative to total employment from BEA REIS data. Observing trends in proprietorship over the past four decades, the proprietorship growth rate averaged 3.2% annually between 1969 and 2011 (BEA REIS, 2012). Viewing this growth rate relative to total employment, the percentage of self-employed of the total employed in 1999 jumps when a drop off in wage and salary employment occurs during a national recession and resulting jobless recovery in the early 21st century. This trend followed the most recent recession as well when millions of people lost their jobs and were forced into proprietorship as a means of generating income. The recovery has led to a tapering off of proprietorship growth relative to wage and salary employment, however, as a resumption of trends seen between 1969 and 1999 began in 2009 onward.

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[4] US proprietorship data are available through the BEA and are based on federal tax forms filed with the Internal Revenue Service, specifically the federal tax form 1040 (Schedule C) for sole proprietorships and form 1065 for non-limited partnerships (Markeson & Deller, 2012).
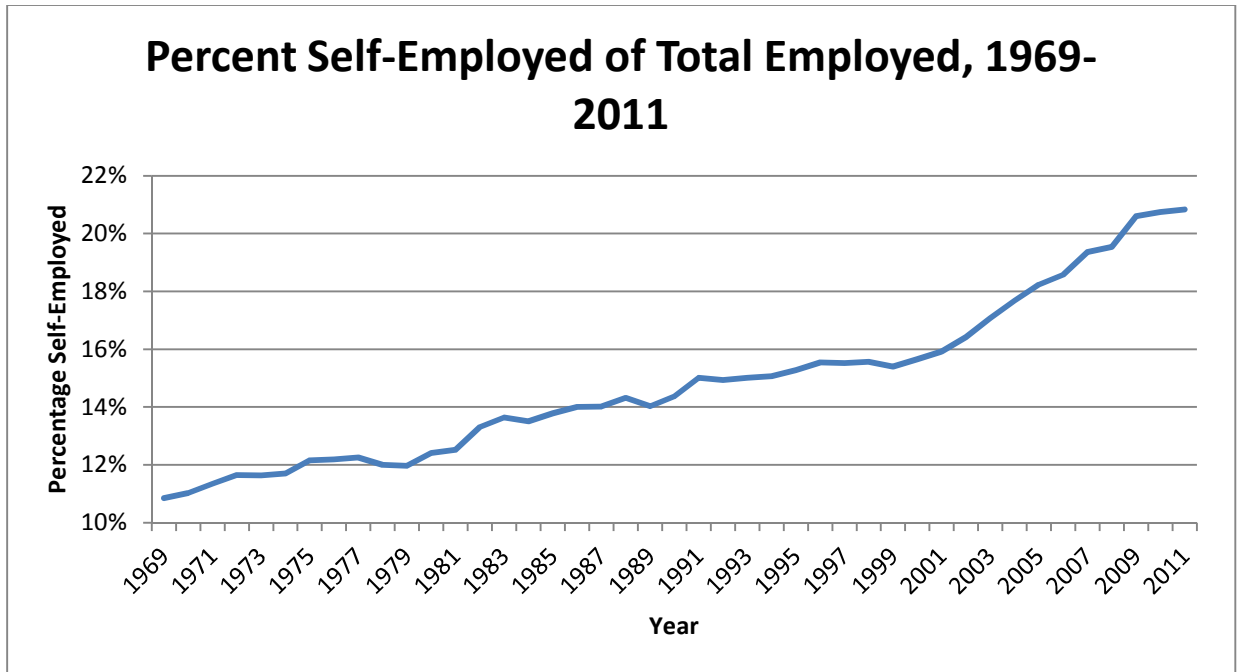
Figure 2; Source: BEA REIS, 2012

Concomitant with this trend in increasing proprietorship is the decline of once-thriving sectors in the American economy. Historically, the American economy derived a great amount of its economic might from agriculture but as the nation progressed, industrialization created a great shift in the productive outputs of the United States. America still garnered a substantial amount of wealth from its agricultural pursuits in the 20th century but that had lessened considerably from one hundred and fifty years ago when half of U.S. workers labored in fields (Moretti, 2012). The broad-based increase in productivity in agriculture from the inducements of modern forms of technology (tractors, fertilizers, genetically altered seeds, etc.) caused crops to be produced in much greater quantities and much more cheaply, thus dramatically decreasing reliance on labor in the sector. Moretti (2012, 37) highlights that "as agricultural productivity soared in the twentieth century, rural income rose but the need for agricultural workers declined, so farmers moved en masse to urban factories" and caused a great shift toward an industrial

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economy. The economy's transition from agrarian-based to industrial-based caused a great fall in agricultural employment, notably agricultural proprietorship as many farmers were self-employed before the 1970s and today (Becker, 1984). But similar to the productivity gains and resulting employment losses seen in agriculture, manufacturing has followed the same path. Figure 3 illustrates the dramatic decrease in manufacturing over the past 42 years in the United States and the rise in total proprietorship.
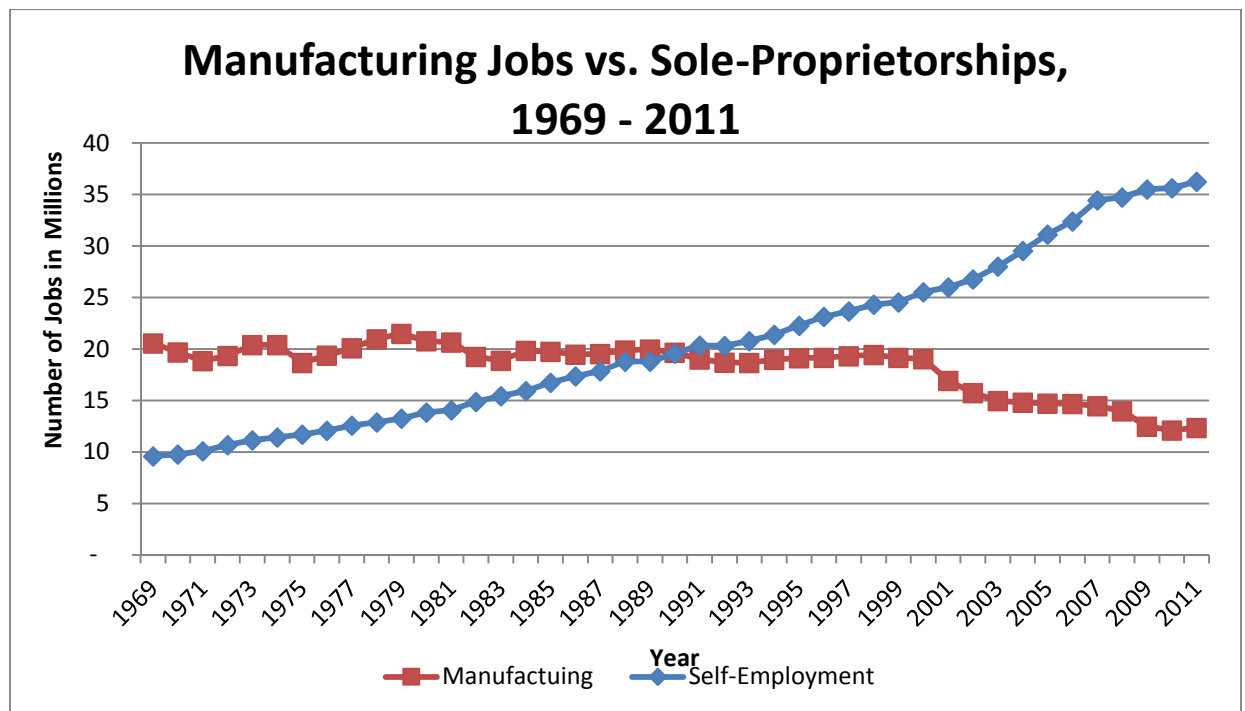
Figure 3, Source: BEA REIS, 2012

Over the past four decades, the same developments that affected the agricultural sector during the 19th and 20th centuries impacted the manufacturing sector. America still remains a top manufacturing country in the world, but over time, the improvements in productivity and technological innovation have slashed the employment necessary to support these output levels in the sector. Viewing the data in Figure 3, nearly 40% of manufacturing jobs have been lost from 1969 to 2011 while the opposite trend occurred

in proprietorship and wage and salary employment. Another industry within the economy benefitting from productivity gains and technological innovation is the information industry. Information jobs pertaining to print publication are seeing similar results as technological innovation moves increasing amounts of content to digital formats, thereby eliminating large portions of the print media and the supporting positions in that industry. This industry never served as a large driving force for widespread wealth creation in the United States, however, whereas manufacturing broadly created access to a middle-class lifestyle for predominantly unskilled to moderately-skilled labor in America. This industrialization epoch in the Western world has provided the foundation for the many economies in modern Asia to create a growing middle-class.

Part of the reason the manufacturing data began dropping precipitously in the last decade of the 20th century and onward comes from a governmental effort to reclassify data according to the North American Industry Classification System (NAICS) as opposed to the previous Standard Industrial Classification (SIC)[5]. The increased flexibility provided by NAICS caused the manufacturing division (SIC) /sector (NAICS) to be spread among more categories as the NAICS system sorted data by similar processes of producing goods or services together. However, the overall trend of decline in manufacturing remains clear as America transitions to a post-industrial economy and more people may increasingly resort to proprietorship at least partly due to job losses in manufacturing and other sectors of the economy. Further, manufacturing tends to be a

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[5] The move, meant to align the interests of data comparability with Canada and Mexico, reorganized the method of categorizing economic activity under a single economic concept. According to the Census Bureau, the economic units used in the NAICS system group similar processes of production of goods and services together and allows for easier comparability of "measuring productivity, unit labor costs, and the capital intensity of production; constructing input-output relationships; and estimating employment-output relationships and other such statistics that require inputs and outputs be used together," (U.S. Census Bureau, 1998).

capital-intensive sector and one which relies heavily on economies of scale to compete, thereby largely excluding proprietorship from serving as a major component of the sector's employment (Glaeser, 2007).

The rise of entrepreneurship and the self-employed play important roles in adopting our economy to a more services-oriented economy and one based on innovation and productivity. This conclusion stems from the connection between self-employed individuals finding work largely in industries which are less capital intensive and have lower barriers to entry while also more reliant on higher levels of human capital to utilize knowledge and innovation to stimulate economic activity. By applying these notions to the county-level, proprietorship facilitates growth in local and regional economies as well as stimulates wage and salary growth. Henderson and Weiler (2010) demonstrate that prolonged periods of proprietorship and entrepreneurship precede periods of wage and salary employment growth, which stems from entrepreneurs initially being classified as self-employed but switching to wage and salary employment as their companies scale up and hire more workers. The effects are exacerbated over longer periods of time as new firms form, which remains consistent with findings from Acs and Armington (2006) who show firm formations are positively associated with growth in regional employment. Goetz et al. (2012) suggest that proprietorship can produce positive impacts for regional economies, which have become the growth machines. Conclusively, research has shown that proprietorship and entrepreneurship have grown to become important catalysts for growing America's economy because the self-employed create jobs for themselves and also stimulate job creation in other sectors of the economy. Henderson and Weiler (2010) demonstrated a correlation between periods of proprietorship growth and subsequent

periods of wage and salary employee growth. Camp (2005) forms the Innovation-Entrepreneurship Nexus to capture the value in innovative ideas and how a region can benefit locally from these ideas. Several regions were early-adopters in developing environments which encourage entrepreneurship and proprietorship and have benefitted from forming a stronger link between innovation and entrepreneurship. Those regions which have not established the link between innovation and entrepreneurship have shown an inability to catalyze economic impact. Understanding this link between proprietorship, entrepreneurship, and innovation in a time of national recession and high unemployment proves timely and therefore is warranted.

Growth in Natural Disasters and Economic Output

Since the 1980s, the number of natural disasters reported in the United States has steadily increased from just over 50 in 1980 to 184 in 2012 (Munich RE, 2013). The prevalence of new technology to detect potential catastrophes, (i.e. identify tornadoes, severe thunderstorms), in accordance with the increased reporting by individuals has surely led to this increasing trend in natural disasters. But consensus has not been found regarding the increasing frequency of events as a natural problem or merely as effects from global climate change (Maynard, Smith, and Gonzalez, 2013; Kuczinski and Irvin, 2012). What is known for certain from the past and going forward is that economic losses resulting from natural disasters stand to increase. This is due to increasing urbanization and sprawl, net of all other factors (Maynard, Smith, and Gonzalez, 2013). Simply, more people are living in urban environment, which increases population densities and the exposure to economic losses resulting from natural disasters. This trend appears to continue in an unabated fashion and an understanding of how these natural disasters will impact proprietorship are vital.

With this growing trend in the number of natural disasters, it is increasingly important to understand the impacts of natural disasters on economic growth. Natural disasters have been shown to have positive effects on economic growth. This is slightly misleading however, as natural disasters induce damage to existing capital goods, which do not figure into the calculation of gross domestic product, as how previous studies measure economic growth following natural disasters (see Otero and Marti, 1995 and Albala-Bertrand, 1993). But rather, the purchase of replacement capital following natural disasters produces positive economic activity, despite an overall static level of capital

before the disaster and after replacement. Skidmore and Toya (2002) extended this short-run analysis by examining more dimensions of economic impact following natural disasters. By observing possible linkages among disasters, investment decisions, total factor productivity, and long-run economic growth a better picture of the increasing number of natural disasters and the effects on economic growth can be assessed. Skidmore and Toya (2002) showed that while controlling for many factors, different types of disasters affect economic growth in opposite ways. Climatic natural disasters positively correlate with economic growth, human capital investment, and growth in total factor productivity, whereas geologic disasters negatively correlate with these factors. The effects of natural disasters on economic activity are mixed but becoming increasingly important to be understood as the frequency and the damage produced by natural disasters continues to rise.

Layout of the Thesis

The trend of decreasing returns to proprietorship concurrent with increasing

proprietorship provides an economic paradox to the untrained eye. Assuming individuals

respond to economic incentives rationally, the growing trend towards proprietorship

despite decreasing returns to this form of employment would seem counterintuitive as an

increasing supply of self-employed could lead to lower earnings. However, proprietorship

and entrepreneurial pursuits continue to serve as starting points for new business

formations (Acs & Armington, 2006); regional economic growth via eventual increased

wage and salary employment (Henderson & Weiler, 2010); or as a means of providing

income, reducing poverty, or realizing tangible benefits as a last resort when no wage and

salary opportunities exist (Rupasingha & Goetz, 2011). Returns to proprietorship do not

consist solely of pecuniary gains, and this important concept deserves further study to

recognize what motivates its continual growth. As a result, identifying the determinants

of proprietorship rate growth and proprietorship earnings change can produce policy

implications for nurturing further augmentation.

Given the evident importance of proprietorship both in terms of impacts on other

economic variables as well as on sheer growth in numbers, this thesis aims to understand

how natural disasters contribute to or reduce proprietorship rates and returns over time,

with particular reference to the period 2000-2011. With the exception of Zissimopoulos

and Karoly (2010), no other previous research has addressed this issue. If there is a link,

consideration of the self-employed could become an important part of federal disaster

planning, preparation, mitigation and recovery. The underlying hypothesis is that natural

disasters, which are exogenous events, are associated with increasing proprietorship rates

and returns as local labor markets adjust following a calamity. Further, this paper aims to understand these disasters in conjunction with previously identified determinants of proprietorship growth using models in the literature, which is described in Chapter 2. Chapter 3 describes the data and methods utilized for this analysis, Chapter 4 provides a discussion of the results, and Chapter 5 supplies concluding remarks and policy implications of this work. In particular, this work supports suggestions from the literature that government officials should pay particular attention to the self-employed following a disaster, given the positive effects they have in job stimulation in the medium-term, and on income growth and poverty reduction in the long-run.

Chapter 2 – Literature Review

Necessity is frequently said to be the mother of invention and innovation. Often, entrepreneurs emerge when there are no alternatives to the situation at hand and innovation is required. Those who are talented enough to identify distinct gaps in markets and who are also endowed with the necessary creative ability to offer a solution are seen as the innovative entrepreneurs in the new economy. But what types of people are best-suited to become entrepreneurs? Are these people the most talented? The most creative? The most educated? Are entrepreneurs specialists who benefit from a distinct competitive advantage or are they generalists who hold a more balanced spectrum of skills? Lazear (2005) affirms entrepreneurs "must be sufficiently well versed in a variety of fields to judge the quality of applicants" who apply to work for the entrepreneur- these being the specialized people (650). The definition derived for entrepreneur by Lazear (2005) is someone who can answer affirmatively the question "I am among those who initially established the business," yet these people can leave the business early. These people are usually responsible for creating the initial product or service of consequence, hiring the original team, as well as securing early financing for the business (Lazear, 2005). Other definitions exist for entrepreneur, such as those people who can reinvent a business or for those who are truly impactful, can reinvent an entire industry. Admittedly, fewer of the latter exist than the former, but both play central roles in the economic development seen by entrepreneurship and innovation. Also central to the definition of entrepreneur is the action to venture out on one's own and be self-employed for a time. The key quality of an entrepreneur is the ability to create economic value in areas previously deficient or lacking of innovation. This requires intimate understanding of how a business can fill this

market gap with a product or service capable of creating a sustainable competitive advantage, lest a larger firm move in and crowd out this venture.

As an alternative, entrepreneurs can provide individuals personalized service at a reduced cost because of low overhead costs as compared to larger firms, which have numerous departments and business segments which must be supported by revenues. Entrepreneurs can act like pygmy firms who fill in smaller market segments in which larger firms do not feel it is profitable enough to operate. Above all else, an entrepreneur must be savvy and understanding of the movements of an industry and able to adjust instantaneously to remain competitive or risk being pushed out of business by competitors. Those entrepreneurs who craft a truly innovative product or service can create economic growth and if successful, grow a business to create employment opportunities for others. As highlighted by Henderson and Weiler (2010), entrepreneurs who are successfully self-employed can grow wage and salary employment and thus positively impact unemployment rates across longer time ranges. When examining entrepreneurship rates relative to unemployment, Gohmann and Fernandez (2013) find that higher unemployment results in greater proprietorship and thus lower unemployment in the long-run. They find that this is a result of a push into proprietorship due to a lack of alternative wage and salary employment. In an alternative approach, they show that the longer term effects of proprietorship on unemployment are weaker but still support the notion that unemployment decreases in the long-run. They assert that from a policy perspective those areas which establish policies to nurture and reduce the costs of generating entrepreneurial capital can potentially reap positive short and long run impacts on unemployment by creating economic growth.

Audretsch and Keilbach (2005) examined the relationship between entrepreneurial capital and regional economic growth and found further evidence of entrepreneurs' critical role in growing the economy. The authors found that regions containing higher concentrations of entrepreneurial capital (more entrepreneurs and entrepreneurial activities in the form of new business formations between 1989 and 1992) rendered higher amounts of value-added output and thus higher labor productivity. Moreover, the researchers also believed the effects of entrepreneurial capital on economic growth would vary according to population density, metropolitan area size, as knowledge spillovers tend to be more pronounced in urban areas. Because of this, the entrepreneur is conceived to be the linking instrument which generates knowledge spillovers between existing market occupants. Specifically, this entrepreneurial capital was theorized to have a greater impact in urban areas whereas the impact would be weaker in rural areas. Camp (2005) produces similar findings in an American context, concluding U.S. labor markets with fewer people had difficulty achieving entrepreneurial optimization and thus by not reaching their potential, produced fewer entrepreneurs than otherwise would have been predicted by empirical models. Entrepreneurs generate economic value at the regional level and despite the increasing effects of globalization, regions remain a pivotal unit of focus and development going forward. Entrepreneurial capital opens pathways for economic development and growth and allows communities to reinvent themselves in light of exogenous shocks, as shown by the models in this paper. This is the true value of entrepreneurs: the adaptability and perseverance to create economic value when other opportunities or ventures do not exist.

In a formal sense, entrepreneurship serves as one of the four primary factors of production in classical economics alongside land, labor and capital. Entrepreneurship in its purest form is "the process of assembling necessary factors of production consisting of human, physical, and information resources and doing so in an efficient manner" to create a business venture (Lazear, 2005, 649). Entrepreneurship provides a much-needed source of innovation and productivity in an economy by creating jobs in a region while also providing additional income and wealth for employees and their families. Plyer and Ortiz (2011) argue that "while entrepreneurship includes cycles of business start-ups and failures, the ability of a region's entrepreneurs to identify market needs and gaps is a strong indicator of the creativity needed in today's innovation economy (20)." The results of this study lend support to the need to nurture this creativity and engender a generation capable of filling needs not currently being met as well as employing smart policy to facilitate further growth in this category of worker. The benefits garnered from creating something from nothing, as is often the case for the self-employed entrepreneur, stands to produce a host of benefits to society as a whole, especially in today's new innovation-based economy.

Innovation-Based Economy

Since the end of the Second World War to the present, a structural economic shift occurred in the American economy. Before the war, America derived an overwhelming majority of its economic might from occupations largely centered on unskilled labor and the goods and services created by these positions. During the shift to a post-industrial economic system, the economy transitioned into a bifurcated model in which two main groups of occupations formed: ones requiring large amounts of skilled labor and technical

expertise which can only be acquired through education and lifetime learning beyond high school, namely in postsecondary educational institutions and specialized non-institutional programs or on-the-job-training aimed at learning specific tasks; the other end requires little to no formal training and largely involves unskilled labor. Autor et al (2006) find the American labor market "[hollowed] out" in the late 1980s onward to include only abstract, higher-skilled positions and on the other end of the labor spectrum, manual labor positions with middle-skilled positions eroding due to the computerization of many industries. In order to avoid being left behind, every group of worker must adapt and rise to the new demands of the modern labor force or risk being left behind in the low end of a bifurcated economy. In our study, entrepreneurs must stay ahead of the curve and educate themselves to identify and fill market gaps with higher-skilled capabilities as well as continually increase productivity to be more effective.

Increases in productivity lead to a host of positive effects for an economy such as lower prices, higher incomes and rising standards of living. According to Moretti (2012), data show over the course of American history that expansion in per capita income has closely tracked the growth in labor productivity and this relationship shows no signs of changing. For many years, productivity in the post-industrial economy has increasingly relied on innovation and technological development in order to continue growing (Gabe, Stolarick, and Abel, 2012). Moretti (2012) concludes "throughout human history, innovation and technological progress have always been the significant drivers of improvement in people's standards of living. Innovation [and productivity are] the engines that [have] enabled Western economies to grow…in essence, our well-being hinges on the continuous creation of new ideas, new technologies, and new products

(40)." The shift in economic paradigms over the past half century has created a greater demand for human capital-intensive occupations and the facilities which generate these skills to stay ahead of the curve.

For this switch in emphasis to be met, numerous sources of change must occur and not just place the upmost importance solely on higher education, but a full complement of skills gained through numerous sources. As Heckman (2000, 4) points out, "the conventional wisdom espoused by most…places formal educational institutions in a central role as the main producers of the skills required by the modern economy. It neglects the crucial role of families and firms in fostering skill, and the variety of abilities required to succeed in the modern economy." Heckman (2000) notes three "blind spots" exist in the vision of individuals examining human capital accumulation in diverting undue attention solely to higher education: first, learning does not terminate with a college degree, but rather is a lifetime pursuit and a great deal of learning takes place outside of formal educational institutions; second, is the obsession of educational planners and policy makers with aptitude examinations and measures of cognitive abilities as indicators of educational efficacy; and third, is the fundamental mistrust by policy makers "of the wisdom of parents to choose wisely if offered choices about their children's education (5-6)." In the end, the ability to apply skills and creativity formed and nurtured during formal and informal education and training help to mitigate negative effects experienced by poor economic prospects. From this, the mix of creativity, innovation and technical expertise lead to proprietorship and entrepreneurship as viable means of generating sustainable economic growth and development.

While the literature on the individual-level and geographic area-level determinants of entrepreneurship has grown in recent years (e.g., Bates, 1990; Acs & Armington, 2006; Henderson & Weiler, 2010; Markeson & Deller, 2012; Goetz & Rupasingha, 2009; Goetz & Rupasingha, 2013), few systematic and rigorous studies explore the determinants of entrepreneurship or proprietorship at the U.S.-county-level or labor market area level (for labor market area focus see Acs & Armington, 2006; Markeson & Deller, 2012). Nor to my knowledge have any studies focused primarily on major natural disasters as a determinant of proprietorship growth. Because many natural disasters are relatively localized, Zissimopoulos and Karoly (2010) note that research tends to rely on local area employment and unemployment measures from the U.S. Bureau of Labor Statistics (BLS), BEA, or Census. In this fashion, Belasen and Polechek (2007) use localized Quarterly Census of Employment and Wages data on earnings and employment to assess the impacts of disasters on local labor markets in Florida. But before we discuss the literature pertaining to natural disasters' impacts on the economy, I visit a key concept from economic thought relevant to the foundational premise.

Creative Destruction

Schumpeter (1934) produced some important implications for the role of innovation in facilitating the business formation process and how it leads to economic growth. In particular, Schumpeter (1934) coined the concept of "creative destruction" as a powerful driver of economic growth. From this, he argued that vibrant economies are those which produce churn, or the replacement of existing economic entities with new business formations. During this process, innovation spurs the creative element of the economic cycle and is fueled by entrepreneurs who transform new ideas into marketable

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products and services in previously-serviced sectors of the economy. From this notion, these innovative products and services serve as foundational pieces of a dynamic economy. Today, the concept of innovation and the resulting knowledge and skills spillovers have revived interest in Schumpeter's "creative destruction" growth theory. More importantly to today's renewed interest however, has been the conceptual bridge between entrepreneurship and regional economic growth (Henderson and Weiler, 2010). As such, entrepreneurs create innovations which test the market against existing technologies, ideologies, or marketplace forces. Success is defined in this case by the ability of entrepreneurs to convert new products and ideas into profits sustainably, which thus leads to regional economic growth in incomes and employment outcomes. This success comes from the concept of churn put forth by Schumpeter (1934) and it is central to my hypothesis regarding the creative destruction forces resulting from major natural disasters. It should be noted that a key conceptual difference exists between the "creative destruction" hypothesis and the effects seen by natural disasters. In the traditional "creative destruction" hypothesis, the firms which lose in the market do so at the behest of competitive forces pushing them out of the market, whereas natural disasters are random in nature and do not result from a path-dependent set of events having firms be replaced by more innovative competitors. I posit that as major natural disasters destroy existing businesses or inexorably alter business practices in impacted communities, entrepreneurs enter into business for themselves by implementing innovations to rebuild the affected economy. This innovation thesis has gained wide support in the literature and has been identified as a key motivator of economic growth.

By extension of the logic employed in this study, innovation has grown to represent the fuel which drives a region's entrepreneurial engine and also as a competitive advantage against other dynamic regional economies. In areas of intense concentration of the production of innovation, agglomeration economies form, which are areas dense with knowledge and skills spillovers. These agglomeration economies further increase innovation and the creation of opportunities for entrepreneurs to enter into the market and thus drive further economic growth. This continual effect leads to a robust economy which can not only provide economic opportunities to those residing within the region's borders, but also serve as a magnet of sorts to draw outside talent into the thriving regional economy. This process once again creates knowledge spillovers and hubs of innovation, knowledge generation, and economic growth. To put this concept succinctly, regions which nurture innovation quite simply generate entrepreneurial activity and thus create faster, more sustainable rates of economic growth (Organization for Economic Cooperation and Development, 2003).

By considering time horizons for achieving entrepreneurial success, some different conclusions can be drawn. Henderson and Weiler (2010) find that entrepreneurship as an economic development strategy tends to produce benefits over longer time horizons, and entrepreneurial benefits accrue more consistently over a much longer time span than do the benefits of industrial recruitment, such as those found in Greenstone and Moretti (2003) and Felix and Hines (2011). Moreover, industrial recruitment provides a patchwork of economic development and does not necessarily develop in line with the goals of a region, but rather to the pursuits of the larger industries establishing a presence within the region. Entrepreneurs' resiliency and tenacity to

address market gaps and found business ventures which generate employment and income for local residents deliver benefits to the region across longer periods (Henderson & Weiler, 2010). Entrepreneurship often creates companies from scratch and therefore allows companies to grow outwardly from the economic region in which companies form, whereas industrial recruitment merely serves as an extension of the base company from another locale. Basing growing companies in close physical proximity creates greater knowledge and skills spillovers as well as provides a bottom-up, networked, and consumer-driven approach, further strengthening and enhancing the resiliency of the regional economy in the longer-term. The difficulty for politicians in adopting practices which nurture entrepreneurship is that there are not binary events which clearly indicate success and progress (i.e., ribbon cutting ceremonies). The benefits accrue slowly at first and are not as readily apparent as a new factory being constructed by a large firm or a new strategic business unit forming in the region by multinational corporations with brand appeal. Entrepreneurship instead creates numerous business ventures which grow together and create thicker labor markets and thus agglomeration economies over longer-periods of time, instead of the patchwork resulting from industrial recruitment. Henderson and Weiler (2010) state that, "this creates a very real policy challenge, [such] that the economic and political benefits of entrepreneurship are mismatched…[the] time horizon for economic development officials matters greatly and those with shorter-time horizons are unable to reap the political benefits of entrepreneurship due to the, at times, less than readily apparent success stemming from new business formations in agglomeration economies (27)." By paying attention to time horizons and extending these key concepts to the analysis of major natural disasters and their impacts on

entrepreneurship and proprietorship, we aim to apply this creative destruction notion to the proprietorship literature.

Natural Disasters and the Economy

Webb, Tierney, and Dahlhamer (2000) review the major findings of reports detailing the local area impacts of major natural disasters during the 1980s and 1990s. In the short-run, the broad trends point toward stronger short-term economic recovery following the disasters, often to higher levels of economic output than preceding the events. In general, those businesses poised to reap the most gains from major natural disasters were financially-sound, larger in nature, and largely insulated from exposure to the event in question. In particular, the indirect effects of energy, transportation, and telecommunications infrastructure disruption force businesses to shut down after natural disasters occur. Those companies which persevere through all of these service interruptions must then deal with reestablishing links with customers and suppliers to ensure they survived the natural disasters and often can fail, especially if these small businesses maintained marginal profits before the disaster (Webb, Tierney, and Dahlhamer, 2002). Typically, analysis at the labor market area level shows those larger companies which are located in engineered buildings; do not rely solely on local customers; possess the capacity to design and implement natural disaster response regimes; hold the financial resources necessary for recovery; and enjoy access to governmental recovery programs face better odds of persisting after a natural disaster (Alesch et al., 2001).

When examining the impacts of natural disasters, the levels of analysis and data aggregation play roles in determining the differential impacts witnessed by disasters on businesses within the affected communities (Kroll, Landis, Shen, and Stryker, 1990). Zhang et al (2007, 5) conclude that, "microanalytic studies are needed to provide guidance for community planners and business owners in developing better methods for reducing disaster impacts." At the labor market area level, Alesch et al. (2001) examined the natural disasters over a longer-term perspective and found that survival of businesses following natural disasters depended on individual business characteristics. Of these, management expertise in mitigating exposure and vulnerability to natural disasters prove useful as this expertise can lead to greater flexibility and response. Further, the creativity of the business owner served as a positive variable for the ability of a small business to recover. An additional benefactor in helping businesses recover from natural disasters comes from commercial insurance coverage. Taken together, Alesch et al. (2001) find these elements lead to better long-run outcomes for businesses affected by disasters.

Variation also occurs across business segments following natural disasters with sectors recovering at disparate rates. When analyzing the effects of natural disasters on economic resiliency at the county-level, studies show that the effects of natural disasters vary by sector. In some cases, post-disaster sectors assume recoveries which can even surpass pre-disaster outcomes (Ewing, Kruse, and Thompson, 2003, 2005a, 2005b). This is similar to the resilient regional economy presented in Simmie and Martin (2010), which can adapt successfully to shocks and improve the long-run equilibrium growth path. In order to demonstrate these county-level phenomena, these authors use US Counties data from the Census and BEA REIS data in order to observe proprietorship

growth relative to wage and salary employment at the county-level. This does not allow analysis at the individual-level, but illustrates more general trends seen at the Census region- and county-levels, providing for broader applicability.

The major contribution of our study comes from the analysis of exogenous shocks on a local economy. In particular, we analyze the impacts felt created by natural disasters as they can produce profound effects on a community's economic future. Of interest in this paper are the impacts on proprietorship growth of natural disasters as classified by FEMA's Major Natural Disaster Declarations. Zissimopoulos and Karoly (2010) observe the reactions seen by counties in the destructive path of Hurricane Katrina and show the importance of proprietorship as a means to recover from the disaster. Generally, Simmie and Martin (2010) highlight recovery trajectories for areas affected by exogenous shocks and introduce four options for recovery, and Zissimopoulos and Karoly (2010) indicate that proprietorship served as a valuable source of income in a period when employment was largely unstable or unavailable due to the drastic uncertainty revolving around the effects of Hurricane Katrina. Additionally, Belasen and Polechek (2007) find evidence of improved earnings growth following recovery efforts from hurricanes in Florida during an 18-year period from 1988 to 2005. Heightened levels of earnings occurred in counties directly affected by hurricanes and to a lesser extent, adjacent counties. However, the overall impact on employment created fewer opportunities for those seeking work and primarily heightened earnings for those employed or receiving work. This result isolates the impacts of hurricanes on employment and earnings and does not include other types of natural disasters.

Guimaraes, Hefner, and Woodward (1993) identify that while hurricanes disrupt economic activity in the short-run, quite often they lead to larger economic gains in the future. In particular, this work, in concert with findings from Skidmore and Toya (2002), indicate that experiencing a natural disaster reduces the expected return to physical capital (which the storm would destroy) and causes a substitution effect toward favoring human capital. Thus, as the demand for human capital increases, the expected return to labor increases and leads to positive changes in earnings and employment. However, as Zissimpoulos and Karoly (2010) and Belasen and Polechek (2007) point out after Hurricane Katrina, such employment opportunities are not necessarily present and returning residents or labor can resort to proprietorship as a means of generating income. Because of this conclusion, I expect counties affected by natural disasters to experience higher rates of growth in proprietorship and returns to proprietorship. This component of changes in elf-employment across the period, (*MD*), is broken apart on an annual basis to provide for better causal relationships in determining the factors affecting proprietorship growth.

Loayza and Olaberria (2012) find different results when they explored the effects of natural disasters by type of disaster and economic sector for both developed and developing countries. From their results, three major insights emerged. First, disasters do impact economic growth, though not always negatively and the impact differs substantially across the type of disaster experienced as well as economic sector. Second, even though moderate disasters have positive growth effects on certain economic sectors, the most severe disasters do not yield the same impacts. In fact, the impact of 10% of the largest disasters in any category led to insignificant or negative impacts on economic

growth. The logic here is that when a natural disaster becomes a severe event, the mechanisms which could potentially make it positive for growth are weakened. The third insight deals with the sensitivity in developing countries to natural disasters and bases economic growth outcomes on magnitudes of disasters and inter-sectoral linkages. Taking these findings into account I seek to identify the amalgamated effects of natural disasters and do not break out disasters by severity. Results from this paper will be unable to test the findings from Loayza and Olaberria (2012). However, I do hypothesize that natural disasters which have wider and more destructive effects lead to greater proprietorship growth due to the demonstrated effects to produce income in the face of limited opportunities, innovation and entrepreneurial activity following disasters.

Proprietorship Growth

Drawing on recent research by Acs and Armington (2006), Goetz and Rupasingha (2009), Goetz and Rupasingha (2013, working paper), and Markeson and Deller (2012), I develop a model to identify the determinants of proprietorship growth shares at the U.S.-county level. In particular, this study extends the work of Markeson and Deller (2012) by introducing the effects of the Federal Emergency Management Authority's (FEMA) Major Disaster declarations on counties between 2000 and 2009, the United States Department of Agriculture's (USDA) Creative Class dataset, and includes previous measures of amenity, demographic and economic variables which have been shown to impact proprietorship growth shares. I then extend this 2000 baseline data across 2009 to 2011 in order to assess the validity of our findings across a different period, thus allowing for the generalization of our findings.

Acs and Armington (2006) build on two previous empirical studies, *Innovation and Small Firms* (Acs and Audretsch, 1990) and *Innovation and the Growth of Cities* (Acs, 2002). The latter work demonstrates the importance of innovation in driving growth at the city and regional levels. Stemming from this original finding, Acs (2002) noted the failure to answer the question of "Why is entrepreneurship important for regional growth?" Acs and Armington (2006) address this question by exploring New Growth Theory (NGT) concepts toward understanding the determinants of new firm formations, and sectors across 394 spatial units (called Labor Markets Areas or LMAs) which vary among economic characteristics. The model employed within the study measures the dependent variable over the years 1995 and 1996 and uses regressors measured in 1994. Acs and Armington (2006) focus on modeling growth as a function of firm size, sector specialization, sole-proprietor shares, levels of educational attainment, growth in income and population, as well as the unemployment rate within the LMA.

Acs and Armington (2006) postulate that counties with a presence of large firms often coincide with fewer new firm formations because knowledge developed within the firm does not spill over into the community. This leads to a crowding out effect which dampens smaller, more entrepreneurial firms. In particular, Acs and Armington (2006) find that counties with specialized industries, which are measured by the number of firms in one industry per 1,000 county inhabitants, provide greater propensities for entrepreneurs to form new firms due to exposure to different management and production processes practiced within the specialized industry present. The knowledge spillover from this thick, specialized industry shows higher probabilities of entrepreneurs translating firm-specific operations methods into new firm ideas. Concurrent with this

postulation, is the notion that a greater presence of existing self-employed workers in the county and higher educational attainment levels are associated with higher rates of new firm formation. This extends from the conception that higher levels of human capital and an existing entrepreneurial climate lead to greater potential for innovation and thus firm formation. Evidence has shown that human capital has had profound effects on increasing opportunities to individuals seeking to become entrepreneurs. A more concrete examination and definition of human capital is necessary to understand the reasoning behind its strong causal effect on the growth of entrepreneurs and their earnings.

Human capital can characterize many elements of human mental capacity and ability. There exists human capital for leadership, resource management, innovation, broad technical skills, and more. Because human capital encompasses many aspects of the human condition, great weight should be given to understanding how to measure the concept, how to develop it, and ultimately how best to employ it with available resources. Measurement of human capital can be tricky, as many parts of the concept are not quantifiable. The easiest measure of human capital comes from observing student enrollment in educational institutions and workforce development programs. Further, Simon and Nardinelli (1996) contend the presence of business professionals who possess knowledge-based human capital associated with the production and spread of information, is most concentrated in modern, economically sustainable cities. For more than a century in the United States, urban areas containing a higher proportion of educated residents have grown faster than comparable areas containing lower levels of human capital stock, and thus have contained a growing share of information-based professionals (Simon and Nardinelli, 1996; Glaeser, 1994). This concurrent growth of

information-based professionals (i.e. lawyers, accountants, brokers, etc.) and educational attainment produces viable economic growth. Therefore, measurement of both the access to quality educational institutions for the attainment of actionable skills and the number of information-based business professionals shall serve as metrics for evaluating human capital as the engine of economic growth in the modern economy. And those areas able to build large bases of human capital tend to experience lower levels of unemployment and poverty in the wake of economic tumult.

In urban areas struggling with higher levels of poverty and lack of wage and salary employment opportunities, the accumulation of human capital proves pivotal to combating these ails. Glaeser (2005) contends that human capital allows urban areas to reinvent themselves and also insulates them from negative economic shocks. In the case of Boston, the city encountered repeated periods of crisis and decline stemming from changing economic conditions, but high levels of human capital provided the city's workers with opportunities to pivot from one skilled industry to the next as a way of reinventing itself (Glaeser, 2005). Glaeser (2005) examines how Boston has shown the ability to reinvent itself three times: first in the early 1800s as the provider of seafaring human capital for a maritime trading and fishing industry, in the late 1800s as a manufacturing town established on the hard work of immigrants, and finally in the late 1900s as a center of the new information economy. He concludes that "Boston's experience certainly suggests that human capital is most valuable to a city during transition periods when skills create flexibility and the ability to reorient towards a new urban focus (6)." This human capital has provided numerous wage and salary and proprietorship opportunities for the residents of Boston. Acs and Armington (2006)

highlight the relationship between proprietorship and lack of employment opportunities and use the unemployment rate as a measure for the degree individuals are driven into proprietorship. Goetz and Rupasingha (2009) extend this research by including financial variables omitted from Acs and Armington (2006), as they capture the potential effects of access to financing in the firm formation process.

Goetz and Rupasingha (2009) identify factors associated with net growth in the ratio of non-farm proprietorship to all full- and part-time workers between 1990 and 2000 at the county-level. The data used to calculate the number of proprietorship come from the BEA non-farm proprietors data source and these are based on federal tax Form 1040 (Schedule C) for sole proprietorships and Form 1065 for partnerships data. Goetz and Rupasingha (2009, 426) acknowledge that these proprietorship data cannot be equated with entrepreneurs, but argue that proprietors have "more in common with [entrepreneurs] than with wage-and-salary workers, or workers who choose to remain unemployed after a lay-off." Further, Glaeser (2007) contends two imperfect measures of entrepreneurship come from the proprietorship rate and average firm size within a geographic location. Glaeser (2007, 2) notes a problem with both measures across time "is when entrepreneurs are successful, they will hire more workers, and this will cause the proprietorship rate in the industry to fall and the number of firms per worker to decline." Henderson and Weiler (2012) study this phenomenon and come to a similar conclusion that a period of proprietorship growth is followed by wage and salary growth across metropolitan areas nationwide. Identifying the determinants of proprietorship growth and the data used to measure entrepreneurship serve as important elements in facilitating continued economic growth and development.

Goetz and Rupasingha (2009) illuminate how county-level economic and social variables work to influence rates of proprietorship growth relative to wage-and-salary growth, using a set of variables not employed by previous studies. An innovation presented by Goetz and Rupasingha (2009) is the examination of both individual- and community-level characteristics to uncover the relative importance of each variable type instead of relying on one or the other in isolation. Additionally, the study recognizes policy levers available to decision-makers which can impact the growth of proprietorship shares across time. A final key contribution comes from the first effort to model county-level spillover effects using new spatial econometric techniques.

Additional variables included in the Goetz and Rupasingha (2009) model for regression analysis are measures of financial returns and their use as proxy to measure returns to potential entrepreneurship and the level of risk associated with those returns; homeownership characteristics and banking variables, which serve as measures of access to capital for sole-proprietors; community income levels to model demand; an index of ethnicity fractionalization; basic socioeconomic and demographic variables; natural amenities; and some economic policy variables at the state-level to measure economic freedom and the business climate. Goetz and Rupasingha (2013) expand this set of variables by including informative measures of financial liquidity via availability of bank branch offices.

Chapter 3 – Model and Methodology

Studies have examined local proprietorship growth at the county-level across various timelines and in this analysis we expand upon models implemented in Goetz & Rupasingha (2009, 2013), Markeson & Deller (2012), and Acs & Armington (2006) to include variables measuring major natural disasters and creative class data. In doing so, this study attempts to highlight the effects of these phenomena on growth of proprietorship rates at the county-level. Data comes from the Census Bureau's US Counties Database, the Federal Emergency Management Authority's (FEMA) Major Disasters Declarations, and the Bureau of Economic Analysis's Regional Economic Information System.

Many studies have used different measures for entrepreneurship, proprietorship and self-employment. Most studies which focus on national and state-level phenomena use the percentage of individuals who are self-employed as the measure (Gohmann, 2012; Blanchflower, 2000). Proprietorship often serves for an accurate measure because it is available and consistently measured across countries and states. This measure is not perfect however as many individuals who are employed with a firm, organization, or other entity are classified as wage and salary workers but also engage in entrepreneurial activities as an additional means of generating income. For example, a doctor may consult on the side, thus earning both a salary from the primary employment and also proprietorship income. As a result, proprietorship may function as a more accurate measure of the legal and economic situation and how it affects entrepreneurship at the county-level.

This paper modifies the following ordinary least squares model to model the sole proprietorship growth rate ($Prop_i$) in county i, which is the number of sole-proprietors in 2009 minus the number of sole-proprietors in 2000 divided by the number of wage and salary employees in 2000. The model of the proprietorship rate growth ($Prop_i$) in county i is a function of initial proprietorship rates (X), Demographic Characteristics (*DC*), County Characteristics (*CC*), Amenity Features (*A*), and Major Disasters (*MD*):

$$Prop_i = (prop_t - prop_{t-10})/wsemp_{t-10}$$

$$= f(X, DC, CC, A, MD) \tag{1}$$

$$= f(\ x_i + \ _i)$$

The primary interest in this study is to examine and expand on the vector x in Equation 1. Our model selects regressors found to affect proprietorship rate growth (or proprietorship density) from the literature on individual and broader socioeconomic county characteristics associated with entrepreneurial activity. Previous work has focused on the characteristics of the individual entrepreneur or on the local market conditions affecting entrepreneurship and new firm formation. In our study, proprietorship (*Prop_i*) rate growth is measured at the county level by the county growth rate in proprietorships between 2000 and 2009. Further, this baseline 2000 year is extended onto 2009 through 2011 data to generalize the applicability of the model across time. The proprietorship rate growth is driven by numerous factors. Of note in this study are the types of individuals present in a county (referring to demographic and socioeconomic characteristics); the economic conditions present in a county; the quality of life in the county (referring to local amenities); and major disasters which impact the county. Based on the extant

literature on economic recovery from major natural disasters, it is hypothesized that those counties which experience major natural disasters have higher levels of proprietorship rate growth relative to wage and salary employment, all other factors being held constant. The reasoning for this follows from numerous studies concluding the positive effects seen for wage and salary employment in terms of wage growth and long-term employment growth. It is posited that the same effects will appear for proprietorship as it has increasingly grown to represent a sizable portion of the economy as individuals work for themselves. Not all types of major disasters included in the FEMA dataset are included as major disasters in this paper. Included disasters are those which have wider and more devastating effects on a community, specifically six types: hurricanes, tropical storms, flooding, tornadoes, tsunamis, and earthquakes. As an additional analysis, there is an examination of proprietorship earnings. It is hypothesized that earnings decrease as more switch into proprietorship roles, but major natural disasters serve as a confounding factor.

County-level characteristics are used to account for localized economic conditions (unemployment rate, poverty rate, percentage of self-employed persons) and include both asset (median home value) and income (per capita income) variables, and industrial- and government-employment concentration (percentage of persons employed in construction, retail, services, and government). Additional measures are used to describe the economic characteristics of each county. Used in this study are the number of banks per 10,000 residents as a proxy for access to credit, a variable hypothesized to facilitate ease of access into entrepreneurship and new firm formation. The access to capital for nascent firms serves as a pivotal bridge between firm formation and access to Angel Investment

capital, venture capital investment, or an array of other financing options geared toward helping young business ventures survive and grow.

The data do not capture the effects of tightened lending standards formalized in response to the loose money available to borrowers during the middle of the decade because our banking variable reflects data in 2000. This is a period in which banks began to grow and mortgage lenders greatly expanded in their efforts to serve what would soon become a housing boom (and consequently, the shuttering of offices due to the following bust). However, the number of banks per 10,000 residents still aims to capture the effects of available financing to aid entrepreneurs in starting businesses and removing barriers to entry. An additional variable included to measure the stability felt within a county are the number of people who have remained in the same house from 1995 to 2000. The literature has shown that housing tenure affects the predictability and sustainability of the business environment within a community and thus has been included in our study as a potential determinant of proprietorship rate growth and earnings changes.

Acs and Armington (2006) suggest a higher share of existing self-employed workers in the community is associated with a higher rate of new firm formation and entrepreneurial activity. To account for this, a measure is included for the initial share of self-employed workers for the total employed persons within a community. It is posited that this reflects two factors, the first being a more conducive existing sole-proprietor climate and the second being more potential for innovation that builds on human capital spillovers present within a locality. Or, in the process of sole-proprietors interacting, the expected interactions between them generate potential innovations and knowledge spillovers which could lead to productivity and efficiency gains. This also captures the

cultural influences and attitudes towards proprietorship preceding and up to 2000. Some shortcomings of this research are the ability to capture the innate abilities of individuals at the county-level or the presence of entrepreneurship programs which can influence entrepreneurial abilities and outcomes (such as ones discussed in Hynes and Richardson, 2007). However, the effects of these programs would largely be reflected in the initial share of proprietorship at the beginning of the period and then measured across the period (Goetz & Rupasingha, 2013). In addition, the compound population growth rate from 2000 to 2003 is included to control for the desirability of a community for migrants and opportunities for generating demand from a larger market.

As noted by Goetz and Rupasingha (2013), particular attention should be given to the problem of endogenity in the regressors included in this study. Such an instance could occur if for example areas with high minority populations provide a larger population pool of self-employed workers, and at the same time the self-employed may be attracted to communities with more diverse composition, thus causing biased parameter estimates in the model. An attempt in this study is made to mitigate this concern by using time lags (such as the growth in proprietorship occurring subsequent to the initial period during which regressors are measured), and thus I can claim quasi-exogenity for the results; further, the study relies on precedents set in the literature by using time lags.

The study measures local industrial- and government-employment concentration by the percentage of civilian employment in construction, retail, services, and government. Previous work shows that expectations for construction and services employment should be for a positive impact on proprietorship growth due to the prevalence of small-firms in these economic segments; whereas this study should expect

retail to impact proprietorship growth negatively due to the large number of retailers not being locally owned. As a measure of the size of local government, the percentage of the civilian population employed in public administration is included. Because evidence exists for the higher presence of tax burdens to decrease the number of proprietorships (Goetz & Rupasingha, 2013), the study also expects government employment will likely have a negative impact on local proprietorship growth.

In order to apply an evaluation of quality for the pool of sole-proprietors and consumers in a county, the study uses demographic data to describe members of the county. Much work has recognized the importance of human capital in the creation of sustainable and successful proprietorships. As a result, measures are included for educational attainment, a proxy for human capital and the ingenuity and skills required to start, operate, and grow a small business, in the form of individuals with less than a high school diploma and those with a bachelor's degree or more. There is an expectation that higher levels of educational attainment have positive impacts on proprietorship growth.

As further measures of county-level demographics, Markeson and Deller (2012) include percentages for the populations aged between 15 and 24 and those aged 65 or more. This study holds the same expectations for these age groups, where counties with higher proportions of 15 to 24-year-olds will have a negative correlation to proprietorship growth, and counties with a higher proportion of the population over the age of 65 will see a positive correlation for proprietorship growth due to the importance of experiential knowledge in starting a business venture. It is expected that the younger demographic will not have the requisite knowledge to apply creative and novel innovation to industry and as time passes they will gain invaluable on-the-job training and experience which can

provide a starting point for other entrepreneurial pursuits. In particular, gaining the experience to identify specific market gaps not catered to by current businesses operating in the industry in question. It is believed that this hands-on experience will provide market niches for entrepreneurs to generate economic returns for not only themselves, but potentially generating employment outside of themselves as business ventures yield profits. Other demographic measures for ethnicity highlight correlations between the ethnic heterogeneity and proprietorship growth at the county-level. Goetz and Rupasingha (2009) find that more ethnic heterogeneity creates a positive influence on entrepreneurship, so the expectation is that as counties become increasingly heterogeneous in various ethnic categories there will be increases in proprietorships. This expectation follows from the literature which shows that aversion to discrimination causes minorities to work for themselves and not be forced to confront prejudices or other forces preventing them from getting ahead or performing on an equivalent level to those in the majority. The motivations to work for oneself or others like oneself breeds a strong entrepreneurial spirit by creating economic growth, avoiding discrimination or repressive elements of the majority, strengthens trust and lowers transaction costs.

As mentioned previously, measures for poverty and unemployment are included in this model. Because of reactionary proprietorship, or the notion that individuals do not have alternative employment options and resort to proprietorship, there is an expectation that higher levels for these two measures impact proprietorship growth in a positive manner. Goetz and Rupasingha (2009) identify proprietorship as a means of reducing poverty and providing alternative income to individuals. Therefore there is the expectation that higher concentrations of poverty and unemployment impact

proprietorship growth positively due to the reactionary proprietorship element. An additional factor impacting proprietorship formation is the presence of natural amenities at the county-level. Using data from the USDA's Economic Research Service, natural amenity scale measurements are included with the expectation that higher scores (indicating better natural amenities at the county-level) will attract more footloose sole-proprietors and thus across time experience higher proprietorship growth. Markeson and Deller (2012) find that winter natural amenity variables have a positive, statistically significant impact on proprietorship growth between 2000 and 2008. The study emphasizes the impact of natural amenities and thus parsed them into six categories, whereas in this study one amalgamated measurement of natural amenities is included (McGranahan, 1999). Miller (1976) proposed that similar variables could be represented by a single scalar measure and this study follows this optimization approach.

Examining the spatial aspects of proprietorship growth provides further insight into the motivating forces behind its ascendancy. A variable accounting for the urban influence is included and has the expectation that urban, suburban, or counties adjacent to the former two county-types impact proprietorship growth positively. Recent research suggests that urban areas have higher firm entry rates relative to rural areas because of greater economic spillovers. And because in most areas, economic activity is spatially concentrated, a population density variable is included to differentiate between different metropolitan classes with the assumption that denser metropolitan areas contain higher propensities to produce agglomeration economies, or the converse. Despite some of the concentration present in agglomeration economies and the natural advantages which accrue to specific productions and locations (presence of natural resources, amenities,

etc.), Ellison and Glaeser (1999) argue that natural advantages alone are unable to account for the observed degree of agglomeration in a community. Spatial concentration for agglomeration economies is particularly helpful for traded industries, or those industries which produce goods or services mostly sold outside of the region, because natural advantages can accumulate in the form of reduced costs or productivity advantages (Moretti, 2012). However, it should be noted that the benefits derived from agglomeration economies can be offset with higher factor costs associated with density or congestion (traffic, infrastructure upkeep, etc.), including land and labor costs (Greenstone, Hornbeck, and Moretti, 2004). Because of these causal links and the close ties to innovation and productivity gains necessary for successful entrepreneurship and proprietorship, there is the expectation for higher levels of population density to facilitate higher levels of proprietorship rate growth. Additionally, this study includes Census spatial categories to isolate the effects of the major disasters by region. There is the expectation that the regions which experience the most major disasters have the greatest positive impact on proprietorship growth.

FIGURE 4 – Major Disasters by County, 2000-2011
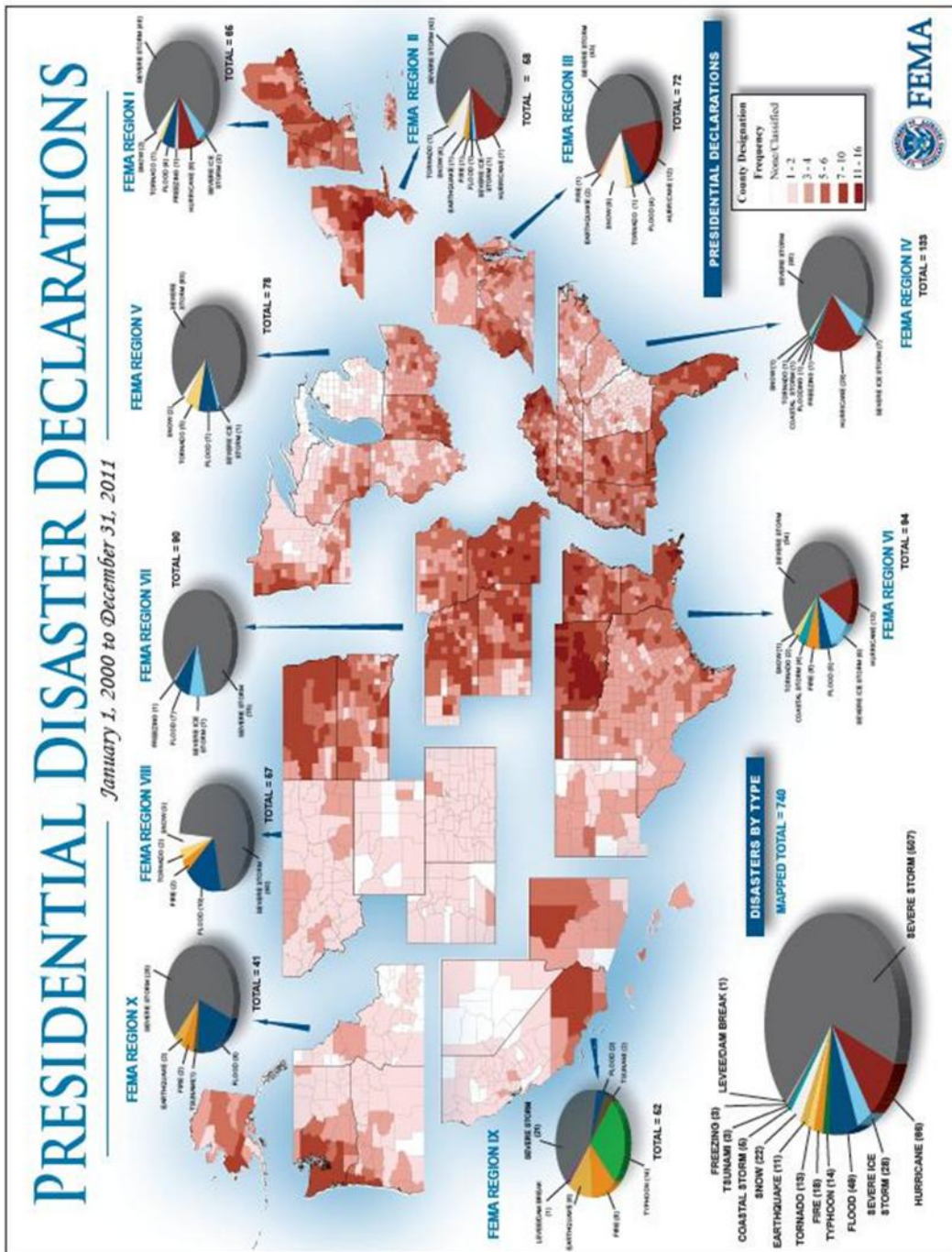
FIGURE 5 – Proprietorship Rate Growth by County, 2000-2011
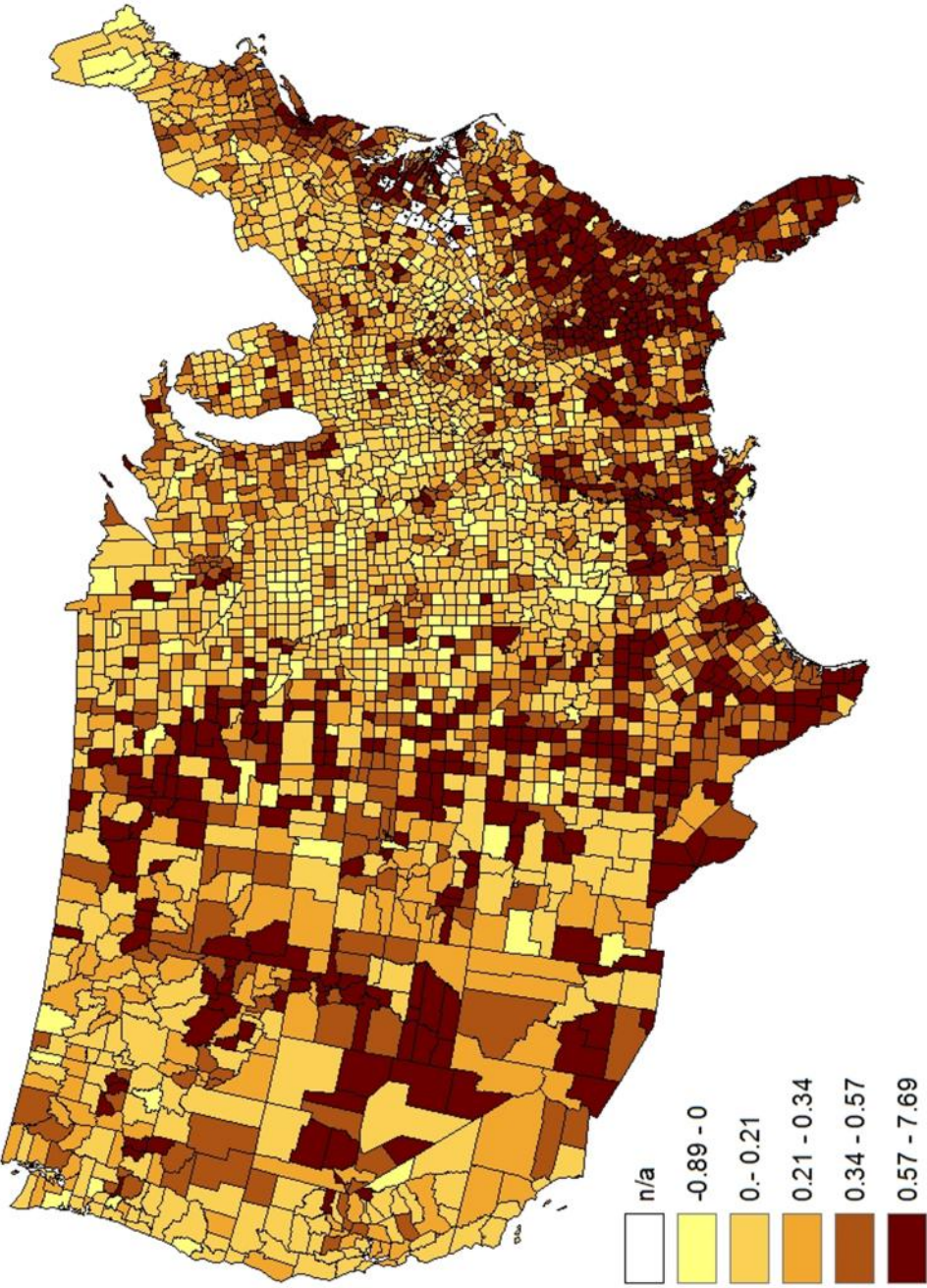
7 Scale represented by percent change. When reading the scale, counties experiencing 0.57-7.69 change in proprietorship rate change are exhibiting between 57% and 769% proprietorship rate growth.
Map source: Yicheol Han.

FIGURE 6 – Proprietorship Earnings Growth by County, 2000-2011

Map legend:
n/a
-2.45 - -0.61
-0.61 - -0.45
-0.45 - -0.31
-0.31 - 0.00
0.00 - 3.60
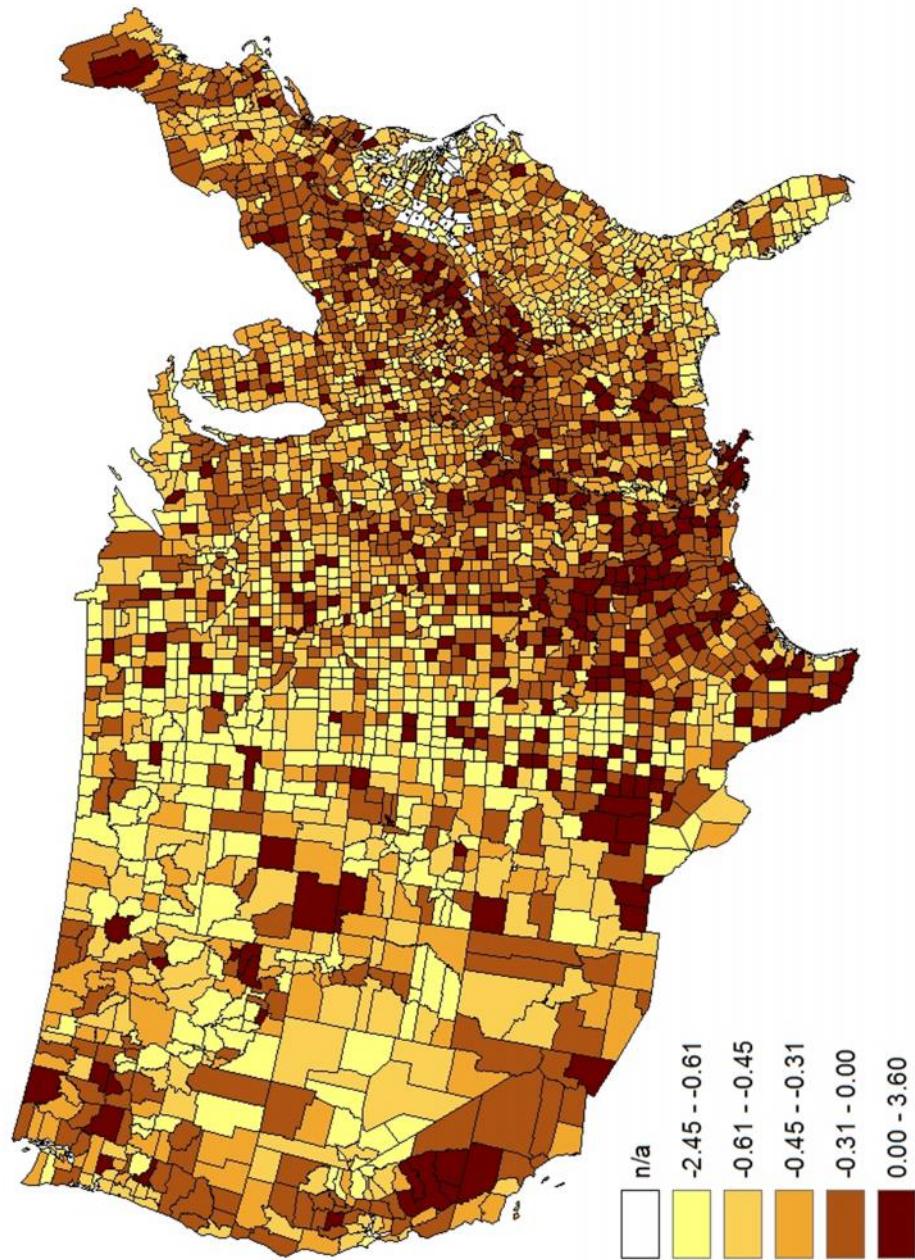
8

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[8] Scale represented by percentage change. When reading the scale, counties experiencing between 0 and 3.60 change in proprietorship earnings are exhibiting between 0% (flat) and 360% change in proprietorship earnings.
Map source: Yicheol Han.

One additional variable included in this analysis comes from Florida's (2002) analysis of the creative class. The measure showing the percentage of the population employed in creative occupations is included and there is the expectation that higher levels of creative class representation spurs higher levels of entrepreneurship. The increasing reliance on innovation as a means to account for economic growth suggests that entrepreneurs will need to be innovative and as Florida (2002) shows, the creative class demonstrate higher levels of innovative-thinking and correspond to areas of higher economic prosperity.

The basic variables used in the regressions of this study are defined in Table 2, which also provides the hypothesized directions of the effects of variables and the descriptive statistics.

Table 2: Variables, Expected Signs, Definitions and Summary Statistics

Variable	Expected Sign	Definition	Mean	Std. Dev.	Min.	Max.
Dependent variables, Goetz and Rupasingha (2009) definition (see text)						
dv0009b	(+)	Proprietorship Rate '00-'09	0.086	0.133	-0.57	1.89
dv0911b	(+)	Proprietorship Rate '09-'11	0.049	0.098	-0.17	0.72
perchginSEinc0009	(-)	Proprietorship Income % '00-'09	-0.391	0.235	-0.983	1.803
perchginSEinc0911	(+)	Proprietorship Income % '09-'11	0.118	0.153	-0.499	1.395

Table 2 (continued)

Variable	Expected Sign	Definition	Mean	Std. Dev.	Min.	Max.
Independent variables						
1. Demographic Characteristics						
Hsgrad2000	(-)	% only HS graduates in 2000	0.348	0.065	0.11	0.53
Somecol2000	(+)	% Some college in 2000	0.204	0.044	0.09	0.37
Bachormore2000	(+)	% Bachelor's or more in 2000	0.164	0.076	0.05	0.61
perpop1524, 2000	(-)	% Population ages 15-24 in 2000	0.135	0.032	0.06	0.45
per65, 2000	(+)	% Population ages 65+ in 2000	0.148	0.041	0.02	0.35
Medage2000	(+)	Median Age in 2000	37.405	3.938	20.60	54.30
perblack2000	(+)	% Black in 2000	0.087	0.144	0.00	0.87
pernatamer2000	(+)	% Native American in 2000	0.017	0.065	0.00	0.94
perasian2000	(+)	% Asian in 2000	0.008	0.016	0.00	0.31
perhispan2000	(+)	% Hispanic in 2000	0.063	0.122	0.00	0.97
perforborn2000	(+)	% Foreign born in 2000	0.034	0.048	0.00	0.51
2. County Characteristics						
perunemply2000	(+)	% Unemployment in 2000	0.058	0.026	0.00	0.33
percapinc05	(+)	Per capita income in 2005	17055	7701	461.00	118288
banks2000	(+)	# of Bank branches per 10,000 residents in 2000	4.675	2.773	0.00	26.81
Medhomevalue2000	(+)	Median home value in 2000	83613	47285	0.00	1,000,000
popden2005	(+)	Population density in 2005	228	1725	0.08	70158
popgrow0009	(+)	Population growth between 2000-2009	0.032	0.125	-0.39	0.90
povrate09	(+)	Poverty rate in 2009	0.148	0.062	0.00	0.52
persamehouse2000	(+)	% Same house (1995-2000)	0.201	0.032	0.01	0.35
perconstemply2000	(+)	% Employed in Construction in 2000	0.073	0.023	0.01	0.21
perservemply2000	(+)	% Employed in Services in 2000	0.600	0.078	0.26	0.83
perretailemply2000	(-)	% Employed in Retail in 2000	0.108	0.019	0.00	0.26
perpubadmin2000	(-)	% Employed in Government in 2000	0.050	0.028	0.01	0.42
percreative2000	(+)	% Employed in Creative Class in 2000	0.17121	0.059	0.000	0.54

Table 2 (continued)

Variable	Expected Sign	Definition	Mean	Std. Dev.	Min.	Max.
shareselfemply00	(+)	Share of proprietorship in 2000	0.283	0.149	0.02	1.72
shareselfemply09	(+)	Share of proprietorship in 2009	0.370	0.227	0.03	2.80
shareseincome00	(+)	Share of SE inc in 2000	1.152	0.244	0.535	3.690
shareseincome09	(+)	Share of SE inc in 2009	0.505	0.194	0.013	2.771
urbinflu2000	(-)	Spatial classification (see text)	5.621	2.709	0.00	9.00
3. Natural Amenities						
natamenscale2000	(+)	Natural Amenity Scale (see text)	0.058	2.299	-6.40	11.17
4. Major Disasters						
census1		New England	0.022	0.147	0.00	1.00
census2		Middle Atlantic	0.049	0.216	0.00	1.00
census3		East North Central	0.143	0.350	0.00	1.00
census4	(+)	West North Central	0.203	0.403	0.00	1.00
census5		South Atlantic	0.173	0.378	0.00	1.00
census6	(+)	East South Central	0.120	0.325	0.00	1.00
census7	(+)	West South Central	0.154	0.361	0.00	1.00
census8		Mountain	0.092	0.290	0.00	1.00
census9		Pacific	0.043	0.204	0.00	1.00
md00	(+)	Major Disasters in 2000	0.214	0.417	0.00	2.00
md01	(+)	Major Disasters in 2001	0.226	0.468	0.00	3.00
md02	(+)	etc.	0.274	0.490	0.00	3.00
md03	(+)	etc.	0.301	0.553	0.00	3.00
md04	(+)	etc.	0.436	0.711	0.00	4.00
md05	(+)	etc.	0.326	0.552	0.00	3.00
md06	(+)	etc.	0.157	0.397	0.00	2.00
md07	(+)	etc.	0.306	0.656	0.00	6.00
md08	(+)	etc.	0.422	0.693	0.00	5.00
md09	(+)	etc.	0.278	0.541	0.00	3.00

Data are measured in 2000 except where indicated. 3,044 observations included in sample.

Source: Authors.

Chapter 4 – Results

The base model (BM) includes the variables displayed in the descriptive statistics

with the exceptions of the share of self-employed persons in 2009, Census regions and

the major disaster variables (together termed *MD*, which will provide a baseline to

compare the major natural disaster results) to understand the determinants of

proprietorship rate growth between 2000 and 2009. The second set of models change the

dependent variable from measuring changes in proprietorship rate growth during 2000 to

2009 to cover the years 2009 to 2011 using the same 2000 base year variables. This

model substitutes the initial proprietorship share in 2000 variable with the equivalent

variable for 2009. From here, the Census regions and major natural disaster variables are

included in each model. This will be the same process for examining the effects on

proprietorship earnings. These results are presented in Tables 3 and 4 (in the following

results), respectively.

Table 3: Results, standardized beta coefficients ( )

Dependent variable is sole-proprietor rate growth

Variable	2000-09 BM	2000-09 *MD*	2009-11 BM	2009-11 *MD*
1. Demographic Characteristics				
hsgrad2000	0.015	0.024	-0.126***	-0.145***
somecol2000	0.042	0.125	0.145***	0.177***
bachormore2000	0.660***	0.681***	0.307***	0.288***
perpop1524, 2000	-0.317**	-0.221	-0.280***	-0.271***
per65, 2000	-0.399***	-0.604***	-0.230**	-0.302***
Medage2000	0.001	0.005**	0.002	0.003*
perblack2000	0.183***	0.152***	0.044***	0.022
pernatamer2000	0.040	0.062	0.136***	0.136***
perasian2000	-0.107	0.071	0.001	0.110
perhispan2000	0.060**	0.064**	0.053***	0.015
perforborn2000	0.099	0.107	0.139**	0.127**
2. County Characteristics				
perunemply2000	-0.565***	-0.531***	-0.294***	-0.273**
percapinc05	-0.000***	-0.000***	-0.000***	-0.000***
banks2000	0.000	0.001	0.005***	0.005***
Medhomevalue2000	-0.000***	-0.000***	-0.000***	-0.000***
popden2005	0.000***	0.000***	0.000***	0.000***
popgrow0009	0.224***	0.215***	-0.061***	-0.059***
povrate09	0.030	0.105*	0.058	0.103**
persamehouse2000	-0.174**	-0.100	-0.301***	-0.257***
perconstemply2000	0.154	0.049	-0.080	-0.113
perservemply2000	-0.193***	-0.208***	-0.028	-0.038
perretailemply2000	-0.286**	-0.210	-0.971***	-0.953***
perpubadmin2000	0.139*	0.094	0.391***	0.364***
percreative2000	-0.394***	-0.428***	-0.398***	-0.391***
shareselfemply00	0.325***	0.331***	N/A	N/A
shareselfemply09	N/A	N/A	0.024***	0.021***
shareseincome00	N/A	N/A	N/A	N/A
shareseincome09	N/A	N/A	N/A	N/A
urbinflu2000	-0.003**	-0.003**	0.001	0.001*
3. Natural Amenities				
natamenscale2000	0.002	-0.001	0.001	-0.002

Table 3 (continued)

Variable	2000-09 BM	2000-09 *MD*	2009-11 BM	2009-11 *MD*
4. Major Disasters				
census1		0.027		(omitted)
census2		0.026		0.026**
census3		0.001		0.000
census4		0.009		0.005
census5		0.0339**		0.013
census6		0.022		0.003
census7		0.022		0.036***
census8		0.021		0.023*
census9		(omitted)		0.009
md00		-0.015***		-0.017***
md01		-0.001		0.000
md02		-0.007		-0.010***
md03		0.002		0.003
md04		0.003		0.003
md05		0.008*		0.008***
md06		0.012**		-0.001
md07		-0.008**		-0.007***
md08		0.001		-0.004
md09		-0.011**		-0.002
Adj. R-squared	0.310	0.316	0.377	0.394

*p<0.10; **p<0.05; ***p<0.01

In this section, the study first considers the effects of the initial proprietorship rates, as they produce large t-scores. The initial share of self-employed persons in 2000 both in the absence and presence of the *MD* variables yield high t-scores, indicating highly statistically significant results. These findings point to the important precondition of existing proprietorship rates in 2000 as determinants for proprietorship growth across the period of analysis. This serves as a straightforward result, as it would be expected for the success of previous self-employed persons to entice new individuals into proprietorship. Since the study observes this growth at the county-level as opposed to the

individual level, it cannot identify the motivating reasons for entering into proprietorship and can only solidly rely on qualitative reasons previously discussed.

Examining the Demographic Characteristics, *DC*, shows similar, though slightly different results in the presence or absence of the *MD* variables. Without considering the *MD* variables, the effects of higher levels of educational attainment, increased presence of individuals ages 65 or older, and the percentages of minority residents (in particular Hispanic and black), all yield similar effects on proprietorship rate growth. In the base model, the percentage of the population ages 15-24 also becomes statistically significant, albeit at the $p<.05$ level. When the *MD* variables are introduced, this age group falls out of significance, though only slightly. One more *DC* variable becomes statistically significant: the median age of residents in the county at the $p<0.05$ level. The results are all in line with the findings of Markeson and Deller (2012) with the exception being the addition of the statistical significance of the 65 or older population.

For the County Characteristics, *CC*, some differences occur between these results and the literature, but largely match up with expectations and previous studies. This study finds that urban influence, or the spatial county designation of urban, suburban, adjacency to a metropolitan area, or rural produces a negative impact on proprietorship growth as counties become more rural in nature. These results are consistent across the base and MD models. This indicates the negative effects of rural settings on proprietorship growth or the positive effects of a metropolitan area on proprietorship growth. Consistent with this result, the study finds in both models that the population density observed in 2005 to be statistically significant and yielding a minimally positive effect on proprietorship growth.

The measure included for stability of a county, the percentage of residents residing in a home for 5 years prior to 2000 produces a negative influence on proprietorship growth, whereas Markeson and Deller (2012) find this to be positive. This variable is not statistically significant at any accepted level of significance in the *MD* model. The population growth between 2000 and 2009 is highly statistically significant and contributes positively to proprietorship rate growth. This result appears in both the base and *MD* model. In examining the percentages of employment by sector affecting proprietorship growth, the study does not find construction shares to be significant; does find government employment to be barely statistically significant; retail employment's effects to be the opposite of results in the literature; and similar results for the percentage of individuals employed in service-oriented industries. In the *MD* model, the retail and public administration percentages drop out of significance.

The study finds the effect of the unemployment rate of the county to be negative, indicating higher unemployment rates lead to lower proprietorship rate growth, counter to expectations. Even more interesting is the large impact, showing a large effect on the rate growth of sole-proprietors. This finding shows that in times of low unemployment proprietorship rate growth occurs most. This is in line with the findings from Goetz & Rupasingha (2009) but Markeson & Deller (2012) did not find this measure to be statistically significant. Per capita income is highly statistically significant but has a very marginal effect as the coefficients in both the base and *MD* models are very close to zero. The poverty rate does not become statistically significant in the base model, but it does in the *MD* model, though barely at the $p<0.1$ level of significance. It does have a positive coefficient, which is consistent with the literature in that proprietorship is a mechanism

for reducing poverty by providing employment opportunities when wage and salary employment is unavailable.

One final finding of the *CC* variables is the significance of the creative class and its opposing effect to proprietorship rate growth. Unexpectedly, the share of individuals employed in creative occupations in a county works against increasing proprietorship rate growth. The advent of the importance of innovation in creating economic value and the fact that this population produces a disproportionately large amount of innovation relative to the population as a whole (Florida, 2002) would seem to be a positive effect on proprietorship growth. However, these findings indicate the opposite. In only one iteration of the models in the study was the expected effect found, but this excluded many important factors in determining the reasons for proprietorship rate growth and is discarded.

When observing the effects of natural amenities, the study quite unexpectedly finds them narrowly to miss statistical significance in the base model. In Markeson and Deller (2012), only one of their six natural amenity categories were significant, the climate 2 amenity variable-group, so this result might not be altogether surprising as one portion of the lumped natural amenity variable might be significant, but taken together, the summed categories barely miss significance. In the *MD* model, however, the variable does not come close to achieving statistical significance.

Moving on to the focus of this research: the effects of *MD* by year and by Census region on the proprietorship rate growth. Looking at the effects of *MD* across time, the analysis shows 2000, 2005, 2006, 2007, and 2009 to be the years in which *MD* affected

proprietorship rate growth. 2002 scarcely missed statistical significance and various

iterations of the model fall in and out of significance. The most statistically significant

finding occurred in 2000, with a p-value lower than the p<0.01. The distinction cannot be

made with the current data as to the type of *MD*, and are classified as the six previously-

listed types of natural disasters declared by FEMA. However, the different categories of

natural disasters FEMA uses to classify events could have a strong bearing on the impacts

felt by proprietorship rate growth. An interesting trend appears in the coefficients for

these statistically significant years: the strongest effect for proprietorship rate growth is

negative and occurs in 2000. Then, in the middle years, 2005 and 2006, the effects on rate

growth turn positive and they then return to negative in 2007 and 2009. This indicates a

parabolic nature of *MD* on proprietorship rate growth across time. As more time passes

the effects turn negative whereas in the intermediate term, *MD* produce positive effects as

counties recover from *MD* and promote proprietorship rate growth as a means of

resiliency following calamity. The changing of the 2007 variable back to negative tells us

about the parabolic effect with the 2009 variable slightly reinforcing the nature of the

results[9]. These trends are presented in Figure 7.

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[9] Additional results from Davlasheridze's dissertation (2013) "Hurricane Disaster Impacts, Vulnerability and Adaptation: Evidence from the US Coastal Economy" indicate an amalgamation of all disasters across 20 years years into one variable yields a total net negative effect on employment across time, consistent with findings from this model when all *MD* variables are lumped together.
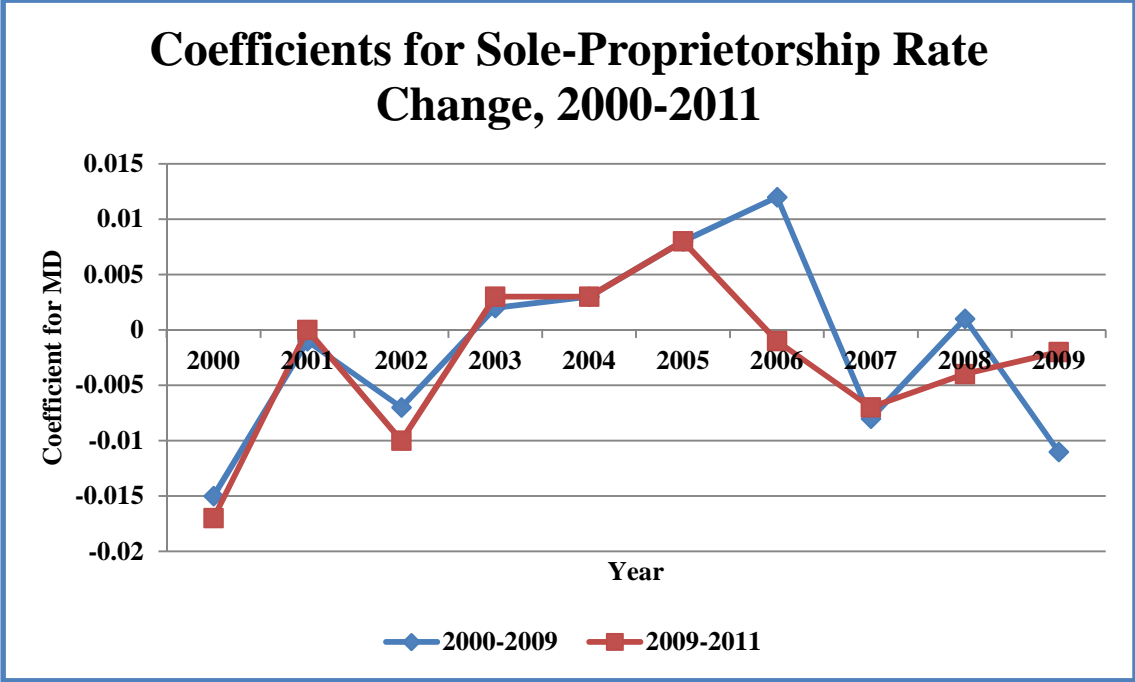
Figure 7, Source: Author

Not all of the results fall in line with expectations when examining the impacts of

MD on proprietorship rate growth. The trend shows a greater need to examine the

duration of effects felt by *MD* on proprietorship rate growth by viewing the data with

different lag times to identify if the trend persists or if there is merely uniqueness to these

data. Looking at the Census regional variables, only one proves to be statistically

significant, Census region 5. This is the South Atlantic region of the country, which

suffered 1,162 *MD* out of 8,224 in the total sample. This area of the country suffers from

multiple types of *MD* including hurricanes, tornados, and severe thunderstorms and

resides on the Atlantic and Gulf Coasts.

Table 4: Results, standardized beta coefficients ( )

Dependent variable is sole-proprietor earnings change

Variable	2000-09 BM	2000-09 *MD*	2009-11 BM	2009-11 *MD*
1. Demographic Characteristics				
hsgrad	-0.343***	-0.150	-0.048	0.016
somecol	-0.760***	-1.117***	-0.286***	-0.305***
bachormore	-0.950***	-0.960***	-0.239**	-0.250**
perpop1524	-0.671***	-0.446*	0.512***	0.474***
per65	1.050***	0.950***	-0.199	-0.184
medage00	-0.024***	-0.019***	0.002	0.002
perblack	-0.118***	0.039	-0.012	-0.019
pernatamer	-0.332***	-0.270***	0.080	0.037
perasian	0.045	-0.835**	-0.203	-0.260
perhispan	0.019	-0.107*	0.038	-0.030
perforborn	0.084	0.495***	-0.116	0.012
2. County Characteristics				
perunemply	0.680***	0.386*	-0.156	0.137
percapinc05	N/A	N/A	N/A	N/A
banks	-0.003	-0.006***	-0.002	-0.002*
medhomevalue00	-0.000***	-0.000***	0.000	0.000
popden2005	0.000***	0.000***	0.000	0.000
popgrow0009	-0.126***	-0.038	-0.045	-0.038
povrate09	0.006	-0.098	-0.316***	-0.406***
persamehouse	-0.148	-0.249*	0.075	0.084
perconstemply	-0.663***	-0.700***	-0.512***	-0.811***
perservemply	0.599***	0.587***	-0.001	-0.009
perretailemply	0.944***	1.132***	0.609***	0.616***
perpubadmin	-0.824***	-0.619***	-0.733***	-0.716***
percreative	0.969***	1.067***	0.401***	0.395***
shareselfemply00	N/A	N/A	N/A	N/A
shareselfemply09	N/A	N/A	N/A	N/A

Table 4 (continued)

Variable	2000-09 BM	2000-09 MD	2009-11 BM	2009-11 MD
shareseincome00	-0.098***	-0.135***	N/A	N/A
shareseincome09	N/A	N/A	0.053***	0.022
urbinflu	0.004*	0.004*	-0.005***	-0.003**
3. Natural Amenities				
natamenscale	0.005**	-0.001	-0.002	-0.002
4. Major Disasters				
census1		(omitted)		(omitted)
census2		-0.023		0.012
census3		-0.062**		0.023
census4		0.053*		0.047**
census5		-0.114***		0.029
census6		0.033		0.053**
census7		0.086***		0.094***
census8		0.044		0.050**
census9		0.112***		0.010
md00		0.011		0.000
md01		0.000		0.015**
md02		0.027***		0.019***
md03		0.027***		0.007
md04		-0.013**		0.009**
md05		0.004		0.010*
md06		0.008		-0.003
md07		0.005		0.014***
md08		0.001		0.004
md09		-0.019**		-0.009
Adj. R-squared	0.218	0.294	0.093	0.130

*p<0.10; **p<0.05; ***p<0.01

Looking at these data with the effects on proprietorship earnings growth produces many more statistically significant variables. In the base model, every *DC* variable is statistically significant at the p<0.01 level of significance except the percentage of Asian, Hispanic, and foreign born in a county. With the exception of percentage of the population ages 65 or older, all these variables demonstrate negative effects on proprietorship earnings changes between 2000 to 2009, which is not altogether surprising

as proprietorship earnings dropped considerably during the time period. When the *MD* variables are inserted, the results change slightly. All common statistically significant variables keep the same signs for their coefficients, but some variables fall in and out of significance. Specifically, the high school graduates variable falls out of significance, as well as the percentage of black residents. The percentages of Asian, Hispanic and foreign born residents at the county-level become statistically significant with the former two having negative impacts on proprietorship earnings and the latter, percent foreign-born, positively impacting earnings.

The *CC* variables show results in line with expectations for some variables. Higher unemployment, statistically significant at the p-value $p<0.01$ level, significantly pushes up proprietorship earnings. In the base model, the number of banks per 10,000 residents is not significant but in the *MD* model, but become significant and negatively impacts proprietorship earnings. Median home value and population density produce similar results on earnings in the base and expanded-*MD* model negatively and positively, respectively. The percentage of residents living in the same house for 5 years prior to 2000 is significant and negative in the *MD* model. The percentages of employment in the examined sectors are all statistically significant at the $p<0.01$ level and fall in line with expectations. Interestingly, the creative class variable in the rate growth models negatively impacts rate growth, but in relation to proprietorship earnings, it produces a highly significant and highly positive effect on earnings growth. This could be a result of a consolidation of earnings for a decreasing share of people or even those who remain employed in creative occupations earn increasingly more while others leave for other employment sectors. Urban influence is significant at the $p<0.1$ level and

positive for proprietorship earnings growth, showing metropolitan areas generate proprietorship earnings growth more than rural areas. The base model shows natural amenities to be significant and positive at the $p < 0.05$ level.

When looking at the *MD* variables, the years and regions impacted by major natural disasters change from the ones affecting proprietorship rate growth. The Census regions expand from just region 5 to include 3, 4, 7, and 9. Regions 3 and 5 have negative effects on earnings growth, whereas 4, 7, and 9 positively impact earnings growth. A pattern consistent with the literature emerges for the *MD* variables. Over longer periods of time, proprietorship earnings grow more, while more recent natural disasters hurt earnings growth. In 2002 and 2003, *MD* helped earnings growth, while 2004 and 2009 worked against proprietorship earnings growth. Over longer periods of time, earnings growth associated with natural disasters increases returns for individuals drawing income from proprietorship. Figure 8 plots the coefficients for the *MD* variables over the period.
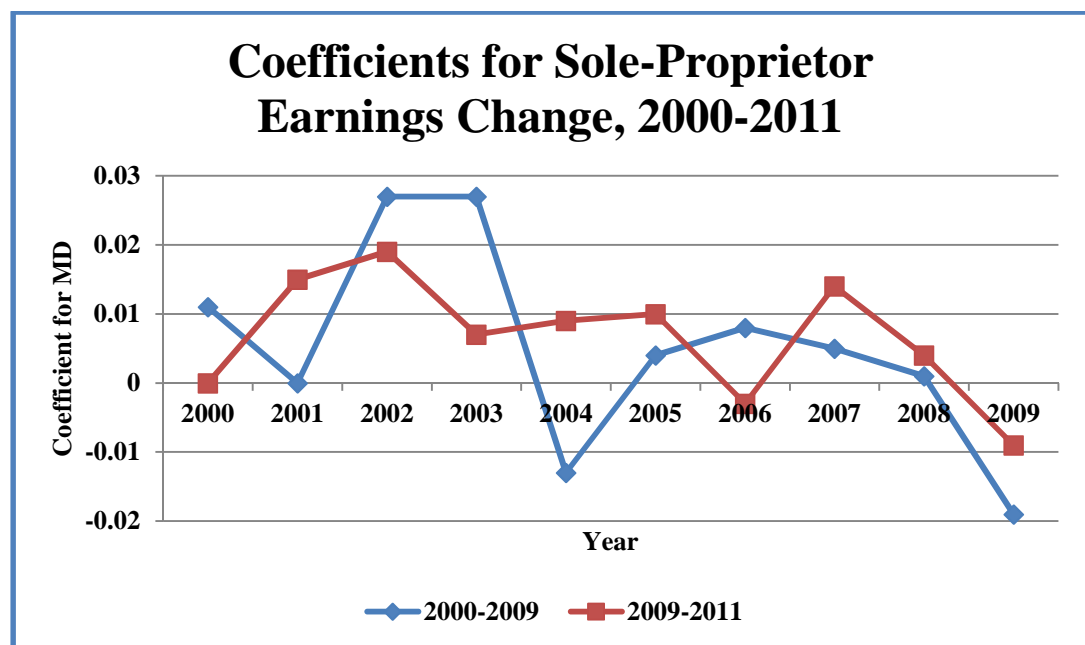

Figure 8, Source: Author

A final analysis which draws these previous models over the 2009 to 2011 time frame yields encouraging, though conflicting, findings for proprietorship rate growth. The same cannot be said for proprietorship earnings changes. The *DC* variables change in significance and sign when the time frame shifts. In the 2009-2011 extension, educational attainment becomes more influential in all categories (high school graduates, some college, bachelor's or more) and high school graduates in the long-run hurt proprietorship rate growth, consistent with the causal factors found in the extant literature. Higher levels of education and middle-aged (25-64) individuals produce higher levels of proprietorship rate growth. This result coincides with the notion that individuals with higher levels of human capital and more employment experience feel capable of venturing out on their own and employing innovation-based practices to generate economic value.

With these highly statistically significant results, the observation can be made that the greatest proprietorship rate growth occurs in counties with higher proportions of individuals ages 25-64, which showed mid-career individuals to be the most likely to be self-employed. The variables for percentage employment by sector shed more light on the sectors most affecting proprietorship rate growth. The retail sector worked against proprietorship rate growth, consistent with the literature as national department stores expand and force out smaller, self-employed competitors; while construction and services sector employment did not prove to be statistically significant in either the base model or the *MD* model. The expectation for services employment to aid in advancing the proprietorship rate growth was inconsistent with the literature and did not yield the expected, statistically significant result. In light of this finding a conclusion cannot be made that proprietorship rate growth occurs primarily in counties with larger

representations of service sector employment; however, this study can rely on previous findings in the literature bearing out this conclusion.

Some additional *DC* variables help proprietorship rate growth in both the base and *MD* model, namely the percentage of the population being Native American and foreign-born. The base model had higher levels of the percentage of the population being black as a positive indicator for proprietorship rate growth, holding all else constant. In general, the models of this study indicate that results which were significant in 2000-2009 were either more statistically significant in 2009-2011 or variables which narrowly missed significance in 2000-2009 are now significant in the 2009-2011 model. The R-squared term also rose in 2009-2011 to explain more than 40% of the variance whereas nearly 32% of the variance was explained in the 2000-2009 models.

The *CC* variable trends hold when comparing the two time periods with a few exceptions. The banks variable becomes statistically significant and positive in both the base and *MD* model in 2009-2011 in addition to the added significance of population growth in 2000-2009 becoming negative in its effect on proprietorship rate growth. Another result comes from the stability measure becoming statistically significant in both models for 2009-2011. Previously, only the base model in 2000-2009 had statistical significance for this variable and it was negative, as the two in the 2009-2011 models are. Once again the percent creative class variable remains significant *and* negative in the two time periods, further conflicting with expectations across different time periods. The initial share of self-employed individuals of wage and salary employment remains positive and significant, indicating cultural attitudes toward proprietorship rate growth were not negative but rather supportive in fostering an environment accepting of

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proprietorship as an alternative to wage and salary employment. Metropolitan proximity fades from importance in the base model in 2009-2011 but remains significant in the *MD* model for the period and turns positive. This indicates higher scores, or more rural areas, positively affect proprietorship rate growth. Consistent with findings in the 2000-2009 models, natural amenities are not significant in either of the later models.

The *MD* variables change considerably in the two sets of models. The Census regions change in significance, with region 5 dropping out of significance and Census regions 2, 7, and 8 becoming factors positively affecting proprietorship rate growth. The major disaster variables show a similar trend as what was displayed in the 2000-2009 model: initially hurting proprietorship rate growth but then helping in 2005 and then again turning negative in 2007. 2005 seems to be a year in which proprietorship rate growth occurred in an irreversible trend. This year coincides with some particularly devastating natural disasters along the Gulf Coast with Hurricanes Katrina and Rita affecting numerous states and causing tremendous amounts of damage. The hypothesis of time frames affecting the impacts of the natural disasters did not hold up across a later sample. The 2005 and 2006 disasters in the original 2000-2009 model rendered positive proprietorship rate growth and then the 2005 disasters produced the same result between 2009 and 2011. However, these results do not take into account the full effects of the national recession which just began to set in at the end of the sample. Higher poverty rates did help to facilitate proprietorship rate growth, consistent with the literature, whereas higher unemployment rates did not bear this trend out, but rather the converse was found. A different sample which encompasses both the peak of the economy before the recession and the recovery might yield more promising results in line with the

literature if this phenomenon had borne out in previous models. This question extends beyond the scope of this study and merits future research.

The results for proprietorship earnings changes between 2009 and 2011 generate low R-squared statistics, with only 10.05% of the variation explained in the base model and 14.25% for the *MD* model. Regardless, the results do highlight some interesting consistencies with the findings of factors affecting proprietorship earnings changes between 2000 and 2009. Higher educational attainment leads to lower proprietorship earnings, counter to most any model explaining earnings changes. This result holds for both the base model and the *MD* model and are statistically significant for some college education at the p<0.01 level and bachelor's or more at the p<0.05 level. A popular trend during the national recession was to return to school in order to avoid the depths of the recession while also enhancing human capital stock in order to avoid a gap in employment history. The extent of this pattern cannot be assessed in this dataset and largely results from anecdotal evidence. This explanation may serve merely as part of an amalgamation of causal factors affecting the decline induced by higher levels of educational attainment in this period for explaining the decline in proprietorship earnings. Due to the conflicting results of these variables with the literature, a host of factors outside the scope of the independent variables included in this model must explain the negative effect on proprietorship earnings. This is due to the high levels of significance for the education variables and the suggestions proffered would be minor phenomena and cannot fully explain the reasons behind proprietorship earnings decline in the 2009-2011 model. No other *DC* variables show to be statistically significant in either the base or the *MD* models.

CC variables provided for more statistically significant variables in determining the causal factors affecting proprietorship earnings change between 2009 and 2011. For the *MD* model, the presence of banks serves as a negative factor affecting proprietorship earnings change. This access to capital would normally promote the ability of entrepreneurs to start and then fund ongoing operations in the start-up and expansion phases of a business venture. These are the periods when financing proves pivotal to success for a start-up as the nascent years of a firm's life burn cash before gaining the ability to turn a profit. As proprietorship earnings rose during this period, perhaps entrepreneurs were able to fund their business ventures through their personal earnings and did not need access to additional financing to grow their businesses or proprietorship positions. The poverty rate for counties produced negative impacts on proprietorship earnings when extended into 2009 to 2011. This variable did not affect proprietorship earnings in the 2000 to 2009 model. In determining the causal effects of the poverty rate for proprietorship rate growth however, the variable positively impacted rate growth in both the 2000-2009 and 2009-2011 models.

The employment concentration by sector produced similar results for affecting proprietorship earnings change between the 2000-2009 model and the 2009-2011 model. Interestingly, the initial share of self-employed income to wage and salary income in the 2009-2011 was not statistically significant in the *MD* model, whereas it was highly significant in the base 2009-2011 proprietorship earnings model. It narrowly missed significance but nonetheless fell out of explaining causal influence on proprietorship earnings changes between 2009 and 2011. The urban influence remains significant in both the base and *MD* models for 2009-2011 but the coefficient turns from positive to

negative. This indicates that the earnings of self-employed individuals were more positively affected by operating in rural locales as opposed to metropolitan counties and those adjacent counties. Thus, proprietorship is more attractive in rural areas in the absence of wage and salary employment. Once again, the study finds a consistent trend in the natural amenities variable such that it has no causal impact on proprietorship earnings change in either the base or *MD* models.

Turning the analysis to the *MD* variables, the study finds all statistically significant variables to affect proprietorship earnings positively. Namely, four Census regions, 4, 6, 7, and 8, all have statistically significant impacts on proprietorship earnings growth during the period. These regions, 3 of which were the most impacted regions by natural disasters during 2000-2009 (4, 6, and 7) all experienced significant proprietorship earnings growth. Census region 8 is a largely rural area, including the states of Montana, Wyoming, Utah, Colorado, and the Dakotas, fall in line with larger proprietorship earnings growth in rural areas shown by the urban influence variable. The major natural disasters all produced positive proprietorship earnings growth with the largest growth impacts felt in the first two statistically significant years (2001 and 2002), and then the most recent statistically significant year (2007). The effects of the middle two years (2004 and 2005) were both positive as well, but 2004 was only half the average impact of the 2001, 2002, and 2007, while 2005 produced a larger effect but also was only significant at the p<0.10 level. These results coincide with the literature in expressing the positive effects of income growth following major natural disasters, but break with findings for proprietorship earnings growth seen in the 2000-2009 model. The major disasters variable for 2009 had a negative coefficient but missed statistical significance

by a very narrow margin. This would have kept with the 2000-2009 *MD* findings, where more recent years produce negative proprietorship earnings growth, while longer time frames produced positive growth.

Chapter 5 – Conclusions and Future Research

Following World War II, a commonly-held policy of attracting large firms to locate within counties shifted toward a focus on localized economic development as a means of enhancing local competitive advantage and economic resiliency (Shaffer et al., 2006). A dramatic shift has occurred over the previous 40 years when the number of individuals who derive income from proprietorship has more than doubled. With this shift in employment classification however, a steep decline in proprietorship earnings has occurred relative to wage and salary earnings. Goetz & Rupasingha (2009) indicate a role for proprietorship as a means to reduce poverty, though as more individuals enter into proprietorship and their corresponding earnings decrease, emphasis is needed to ensure this trend is sustainable. Because of these trends and suggestions from the literature, I find a role for government assistance in the form of policy support in aiding proprietorship rate growth is needed. In order to make proprietorship a sustainable means of generating income relative to wage and salary employment, an emphasis on job-skills training, educational programs aimed at improving productivity, as well as additional focus on increasing educational attainment in the knowledge-based economy is essential.

Goetz et al. (2012) point out "proprietorship earnings compared to wage and salary earnings per worker have fallen by about one half in rural areas, after having been on par or higher for most of the 1970s during the natural resources boom" (316). Seeing these disparate returns to proprietorship, it is not a far stretch to see why the argument proprietorship serves as a last-resort form of employment exists. However, these lower returns do not necessarily connote a lower level of welfare received from proprietorship. In fact, one of the main features of proprietorship comes from the previously-discussed

notion of being "one's own boss." Hamilton (2000) argues that despite self-employed

workers necessarily earning lower starting wages than those available from an employer,

the earnings gap is not necessarily due to lower skill levels for self-employed workers.

However, in order for the dynamic effects of proprietorship to be more valuable, a

suggestion by Goetz et al. (2012) is to create "policy and educational programs directed

at improving the productivity and earnings of the self-employed, [which] could have high

payoffs in terms of local economic growth and opportunity" (321). With the economic

transition witnessed during the latter part of the 20th Century, the training and skills

necessary to increase productivity and innovation have become paramount.

Proprietorship has proven to be a strong method to fight poverty and 5-7 years

after the natural disaster, a meaningful way of generating income in recovery efforts.

When looking at the impacts of natural disasters on earnings across an even longer time

frame, 11 years, natural disasters increase proprietor earnings. As a whole, natural

disasters negatively impact proprietorship immediately following a disaster as well as

numerous years after the event, but in the interim years, proprietorship growth is present.

This could be due to delays in receiving initial recovery aid or a lack of demand for

products and services from the sectors of the economy which traditionally attract self-

employed individuals. More study is needed to assess the impacts of disaster recovery

funding for determining the impacts on proprietorship. Self-employed persons gravitate

toward certain sectors of the economy, primarily those with lower capital thresholds,

higher required levels of human capital, and those in metropolitan areas. These

metropolitan areas tend to be diverse, densely populated, and have desirable natural

amenities to attract entrepreneurs. Realizing the economic impact created by

proprietorship in the wake of natural disasters deserves the attention of policy-makers and more efforts to understand these phenomena are merited. These findings should be expanded to include recent events surrounding the national recession and natural disasters, Hurricanes Irene and Sandy in particular, as more data comes available to see the applicability of these findings to combating poverty across Census regions and providing employment opportunities when wage and salary employment is not readily available.

At the county-level, entrepreneurship produces recognizable benefits to a local community. The impact of entrepreneurship also extends beyond just the community generating economic value from entrepreneurial activity and spills over into adjacent communities as new upstart firms founded by entrepreneurs employ people from neighboring counties to fuel their growth. For future study, a spatial regression designed to assess the direct and indirect impacts of natural disasters would provide additional insight into the resiliency effects of proprietorship. It is hypothesized that in the face of natural disasters, entrepreneurship allows impacted counties and those in the surrounding counties to reinvent themselves and either restore themselves to prominence (perhaps even assume an upward trajectory of higher levels than previous to the disaster). The time horizon for recovering from natural disasters and their impacts on proprietorship growth deserves study and can provide policy makers valuable information into assessing the appropriate measures to be taken following disasters in restoring entrepreneurial activity to a region. A region's resiliency quite often can be tied directly to the prominence of its entrepreneurial capital and the attention given by politicians and the region as a whole.

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Appendix - Notes and descriptions of data sources and agencies

Bureau of Economic Analysis, **Regional Economic Information System** – This program produces detailed data concerning economic activity at the regional, state, metropolitan area, BEA economic area, and county levels. Regional economic accounts provide insight into the geographic distribution of U.S. economic activity and growth. The estimates provided by the BEA allow the federal government to determine the distribution of funds to states as well as allows academic researchers, businesses, trade associations, and labor organizations to use the estimates for applied economic and general market research.

United States of America Counties, Census Bureau – This data source contains over 6,600 data items for the United States, States, and counties from a variety of data sources. Files include data published for the 2010 population as well as many other items from the 2010 Census of Population and Housing, the 1990 and 1980 Censuses, and the 2007, 2002, 1997, and 1992 economic censuses. Information in USA Counties is derived from several general topics to provide a rich dataset to implement analysis at the county-level for social research. Files contain a collection of data primarily from the U.S. Census Bureau and other Federal agencies, such as the Bureau of Economic Analysis, the Bureau of Labor Statistics, and others.

United States Department of Agriculture, Economic Research Service – Based on information and results from Florida (2002), the creative class thesis showed that these occupations may be particularly relevant to understanding how US communities grow. The ERS creative class codes indicate a county's share of population employed in occupations which require individuals to "think creatively." The variables used to construct the ERS creative class measure include number and percent employed in creative class occupations and a metro/non-metro indicator for all counties, 1990 and 2000. A special break-out of employment in the arts is included and listed as the "bohemian class."