

**The Relationship Between Prior and Subsequent New Venture Creation in the United States:
A County Level Analysis**

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Abstract

Minniti (2004; 2005) suggests that decisions to engage in entrepreneurship are interdependent and that the non-pecuniary network externalities and path dependencies of such decisions influence the geographical concentration of entrepreneurial activities. We apply her framework at the county level to study the association between prior and subsequent new venture creation in the U.S. Our results confirm the hypothesis that there is a non-linear relationship between prior new venture creation and subsequent new venture creation. Specifically, after controlling for population characteristics and economic conditions we find that new venture creation increases at an increasing rate based on the amount of prior entrepreneurial activity.

1. Executive Summary

Defining entrepreneurship as the creation of new ventures (Gartner, 1988) this study tests the relationship between prior and subsequent entrepreneurial activity in the U.S. Bygrave and Minniti (2000) suggest that the level of entrepreneurship in a community is influenced by the heterogeneous personal characteristics of its population, economic circumstances, and prior entrepreneurial activity. Minniti (2004; 2005) refines this framework by explaining that entrepreneurship generates a non-pecuniary externality for proximate individuals by providing them with information that reduces the ambiguity of new venture creation. Consequently, she proposes that entrepreneurial decisions are path dependent, and that new venture creation in a given community will increase at an increasing rate depending on the extent of prior entrepreneurial activities. Since information is distributed asymmetrically among individuals, Minniti proposes that the path dependency of entrepreneurship helps explain why different communities experience different levels of new venture creation despite similarities in population characteristics and economic conditions.

Our study applies this theoretical framework at the county level to explain the extent of new venture creation between 2000 and 2004 in the U.S. To measure prior and subsequent county-level entrepreneurial activity, as well as characteristics of the population and economy that have been shown to be related to new venture creation, data were collected from secondary sources including the U.S. Census, Profiles of America, USA Counties, and County Business Patterns. Our final database comprised 3,118 of the 3,141 counties in the U.S.

Using OLS regression analysis, our results confirm the non-linear relationship between prior and subsequent new venture creation. Thus, new venture creation appears to increase at an increasing rate based on the level of prior entrepreneurship. In addition, the results suggest that among the variables representing county population and economic characteristics, the rate of net migration and changes in gross county product appear to have the greatest positive impact.

We contribute to the literature by focusing on factors that are associated with differences in new venture creation across U.S. counties. By doing so we provide empirical support for Minniti's (2004; 2005) contentions regarding the importance of entrepreneurial culture in influencing the geographic concentra-

tion of entrepreneurial activity. Our study confirms that entrepreneurship begets more entrepreneurship in increasing quantities and suggests that future efforts to more fully investigate Minniti's theory are warranted.

Future research on the determinants of new venture creation using Minniti's model should be applied to different geographic units of analysis (e.g., cities, metropolitan areas), different regions (e.g., urban and rural), and in different nations to gain additional insights. Furthermore, the relationship between prior, current, and future entrepreneurial activity can have a number of root causes such as social networks, role models, and community culture, and these deserve investigation. The primary implications of this research are that entrepreneurial activities do indeed appear to be interconnected and self-reinforcing and that these attributes should be considered when designing public policy interventions to foster new venture creation.

2. Introduction

The U.S. enjoys one of the highest levels of entrepreneurial activity among industrialized countries (Minniti, 2004). Although incentives, support, and social mobility in the U.S. all contribute to its entrepreneurial leadership (Zacharakis, Reynolds, and Bygrave, 1999), the most important factor may be the strong entrepreneurial culture that has developed in the past three centuries. Indeed, individuals' decisions to engage in entrepreneurship appear to be interdependent rather than independent (Bygrave and Minniti, 2000; Minniti, 2004; Minniti, 2005).

Prior studies have analyzed the entrepreneurial decisions of individuals (Carter, Gartner, Shaver, and Gatewood, 2003; Zacharakis et al., 1999). Other studies have determined a variety of demographic, economic, and technological factors that promote entrepreneurial activity in various regions and/or sectors of the economy (Bull and Winter, 1991; Reynolds, Miller, and Maki, 1995; Reynolds, Storey, and Westhead, 1994; Wennekers, Van Stel, Thurik, and Reynolds, 2005). Recently, a new theoretical framework was developed that highlights how the level of entrepreneurship in a community creates the social conditions that foster more entrepreneurship (Bygrave and Minniti, 2000; Minniti, 2004; Minniti, 2005). However, empirical studies have not adequately tested this framework.

The purpose of this article is to fill this gap in the literature. We utilize the macro-economic theoretical framework originally proposed by Bygrave and Minniti (2000) and refined and elaborated by Minniti (2004; 2005) to study the relationship between prior and subsequent entrepreneurship at the county level in the U.S. For the purpose of this study we define entrepreneurship as the creation of new ventures (Gartner, 1988) and use the terms entrepreneurship and new venture creation interchangeably throughout the article.

Minniti's theoretical perspective of entrepreneurship complements previous work on the importance of social networks as sources of information (e.g., Shane and Cable., 2002). We contribute to the literature by testing the fundamental premise of Minniti's theory regarding the path dependent nature of entrepreneurship. Stated simply, she proposes that the relationship between the extent of prior and subsequent

new venture creation in a community is non-linear. Based on her work, we hypothesize that because entrepreneurial activity can provide critical information reducing the ambiguity of individuals regarding entrepreneurial practices and consequences (Minniti, 2005), the level of entrepreneurship in a given community will increase at an increasing rate according to the amount of such activity that took place in prior periods. We operationalize the concept of community at the county level of analysis because many public policy and planning decisions occur at this level in the U.S. and utilizing counties allow us to study both rural and metropolitan communities (Chrisman, 1985; Chrisman, Van Deusen, and Anyomi, 1992).

In the remainder of the paper, we discuss our theoretical foundations, the hypothesis development, methodology, and empirical results. We conclude the paper with implications for future research.

3. Theoretical Framework

The entrepreneurship literature has discussed a variety of external conditions that affect new venture creation (Bull and Winter, 1991; Gartner, 1985; Reynolds et al., 1994; Shapero and Sokol, 1982; Specht, 1993). Pertinent to this study, Bygrave and Minniti (2000) and Minniti (2004; 2005) suggest that the level of entrepreneurship in a community is influenced by (1) heterogeneous personal characteristics of the members of its population, (2) economic circumstances, and (3) prior entrepreneurial activity. The first two elements have been discussed and studied extensively in previous literature. While they are necessary components of any model that seeks to explain new venture creation their inclusion does not represent an original contribution to the literature. On the other hand, the third element is the core of Minniti's theory and upon which rests her unique contribution to the literature. Previous research on the influence of prior entrepreneurship on subsequent entrepreneurship has assumed a linear rather than a non-linear relationship (Armington and Acs, 2002; Shane, 1996) and thus has not fully captured the path dependent, self-reinforcing nature of entrepreneurial activity. As a consequence, we provide only brief attention to the population and economic characteristics that influence new venture creation and must, perforce, be included in the model. However, we more fully developing our discussion and hypothesis about the non-linear relationship between prior and subsequent new venture creation.

Regarding the first element of the framework, Minniti (2004) suggests that the relevant aspect of the personal characteristics of the members of a community's population is the extent to which these characteristics make individuals alert to opportunities (Kirzner, 1973). Alertness would seem to have three components relevant to this study. The first is the predisposition of individuals to engage in entrepreneurship since this increases their likelihood to search for opportunities to create new ventures (Shapero and Sokol, 1982). We use net migration to capture the relative propensities for entrepreneurship in a community since migrants have been shown to be more entrepreneurial than the general population (Hammarstedt, 2001). In fact, several studies have shown that net migration is positively related to new venture creation (Bull and Winter, 1991; Chrisman, 1985; Chrisman et al., 1992; Dennis-Jr., 1986).

The second is an individual's human capital. Research has shown a positive relationship between human capital and entrepreneurship (e.g., Bosma, van Praag, Thurik, and de Wit, 2004). Furthermore, individuals with higher levels of human capital would seem more likely to be able to translate environmental cues into possible venturing opportunities. Skilled labor and age are used to measure elements of human

capital. Skilled labor captures the extent to which the population possesses the education and abilities to start a business (Acs and Armington, 2004) and age is an indicator of experience (Mueller, 2006).

Finally, the degree to which individuals in a community are connected to one another could increase alertness since such connectedness would increase their exposure to information on potential venturing opportunities (Minniti, 2004). Age is also a measure of connectedness since older individuals are presumed to have larger social networks (Evans and Jovanovic., 1989). Natural increase in population is used as an additional measure. As Chrisman (1985) suggests, natural increase is an indicator of marriage and family formation and thus tends to be associated with stability and embeddedness. Furthermore, previous studies have shown a strong association between natural increase and new venture creation, particularly in rural communities (Armington and Acs, 2002; Chrisman, 1985; Chrisman et al., 1992; Lee, Florida, and Acs, 2004).¹

The second element, economic circumstances, is a macro component that is critical to both an individual's assessment of the attractiveness of entrepreneurship and a broader analysis of the incentives for entrepreneurship in a community. Income per capita, overall economic development, and levels of unemployment are used in this study to represent the potential opportunities for new venture creation that exist in the local environment. Prior research conducted at different levels of analysis such as countries, regions, counties, metropolitan areas, and cities have provided empirical support about how these components of the economic environment of a community fosters entrepreneurship. For example, several studies suggest that income per capita and economic development are important determinants of new venture creation (Begley, Tan, and Schock, 2005; Bull and Winter, 1991; Reynolds et al., 1995; Reynolds et al., 1994; Wennekers et al., 2005). Likewise, although the findings in the literature tend to be ambiguous as to the direction of the relationship, research results generally agree that unemployment has an important influence on new venture creation (Audretsch, 1994; Audretsch, Carree, Van Stel, and Thurik, 2005; Reynolds et al., 1995; Reynolds et al., 1994; Storey, 1991).

3.1 Prior entrepreneurship as a self-reinforcing network externality

Drawing on the threshold models of Granovetter (1978) and Crane (1991), Bygrave and Minniti (2000) propose that as the rate of new venture creation in a community increases, the probability of the next individual starting a business also increases because the decisions of entrepreneurs generate positive feedback mechanisms for would-be entrepreneurs. Thus, they suggest that after allowing for difference in the institutional and economic environments in different communities a non-linear relationship between prior and subsequent entrepreneurship exists with the latter increasing at an increasing rate as the former increases in magnitude.

Minniti (2004; 2005) expands upon that initial framework by explaining that entrepreneurship generates a non-pecuniary network externality for proximate individuals by providing them with information about the practices, routines, and consequences of entrepreneurship. She suggests that such information

¹ It should be noted that each of these community attributes could also positively affect demand conditions and thereby further influence the extent of new venture creation.

allowing those with the human capital and other resources needed to pursue a given opportunity to reduce the ambiguity associated with venturing, which enhances the probability that they will take positive action. Her perspective is thus consistent with earlier work on the importance of role models (Gartner, 1985; Shapero and Sokol, 1982) although it expands on that work by more fully explaining their informational value. Furthermore, Minniti makes it clear, that the dissemination of information is an unintended consequence, rather than a planned outcome, of entrepreneurs engaging in decisions and actions that lead to venture formation.

Minniti (2004; 2005) thus proposes that entrepreneurial decisions are path dependent and self-reinforcing. Since information is distributed asymmetrically among individuals, Minniti proposes that the path dependency of entrepreneurship helps explain why different communities experience different levels of new venture creation despite similarities in population characteristics and economic conditions.

Thus, entrepreneurs interact in a complex network of relationships and continuously adapt to changing economic circumstances. The interactions of prospective entrepreneurs with their social environment enable them to observe and learn from the behaviors of others. The extent to which such information is available can increase or decrease the probability they will discover and act upon profitable opportunities (Kirzner, 1973). If entrepreneurship is not simply a function of individual propensities or economic conditions, the actions of entrepreneurs and would-be entrepreneurs is expected to be interdependent (Minniti, 2005). Therefore, increasing returns to the adoption of entrepreneurship and geographic concentration, rather than a uniform pattern of new venture creation across communities, should occur. Again, this implies that higher levels of new venture creation in the past may lead to levels of new venture creation in the future that increase at an increasing rate. Thus we hypothesize:

Hypothesis: The relationship between prior and subsequent new venture creation is non-linear. Specifically, prior entrepreneurial activity provides increasing returns to subsequent entrepreneurial activity.

4. Methodology

Data were collected from secondary sources including the U.S. Census, USA Counties, County Business Patterns, Bureau of Economic Analysis (BEA), and Profiles of America from the U.S. Department of Agriculture. U.S. counties were used as the unit of analysis. The intention was to include the entire population in the data analysis. However, missing data limited our analysis to 3,118 counties of the 3,141 counties in the U.S (99.2%).

Tests for normality were conducted. These tests indicated that some measures, including the dependent variables, did not follow a normal distribution, thus violating an assumption of multiple regression analysis (Hair, Black, Babin, Anderson, and Tatham, 2006). The skewness and kurtosis of some measures were outside the range that researchers suggest is necessary for a normal distribution (DeCarlo, 1997; Hildebrand, 1986). Because our purpose is to present results about the new venture creation activities in the country with the greatest generality, our tests were conducted with the full sample of 3,118 counties.

However, we also conducted robustness tests with a normalized sample of 2,400 counties after eliminating outliers (Lynch, 2003).

4.1 Measures

4.1.1 Dependent Variables. To measure the dependent variable we collected data from County Business Patterns. Establishments were used as the unit of analysis. Using establishments rather than enterprises means that our dependent variable includes instances where an existing firm opens a new location (establishment) in a county. Thus, both independent and corporate ventures are incorporated into our measure (Sharma and Chrisman, 1999).² However, this is consistent with our definition of entrepreneurship as the creation of new ventures (Gartner, 1988).

New venture creation was measured by the net changes in the number of establishments, measured in thousands between (1) 2000 and 2002, and (2) 2002 and 2004. We used these time periods because most of our county variables were collected from the U.S. Census conducted in 2000. The two-year lag is consistent with prior research conducted in the U.S. (e.g., Acs and Armington, 2004; Armington and Acs, 2002). We use absolute changes rather than relative changes (e.g. growth rates) to quantify the additions of new ventures to the county as this seemed more conducive for capturing the non-linear effects of prior new venture creation. Although we measure net changes in new venture creation rather than absolute changes, previous research suggests that firm deaths in a region remain relatively constant over time (Birch, 1987). Thus, the net changes should be highly correlated with the number of new ventures actually created.

4.1.2 Independent Variables. To be consistent with the time frame used to measure our dependent variable, the measure of prior entrepreneurial activity represents net changes in establishments (in thousands) from 1998 to 2000. The data come from *County Business Patterns*. We used the natural logarithm to reduce kurtosis and skewness (Tabachnick and Fidell, 1996). We used the square term to test for the non-linear effect. We also centered both variables to reduce potential problems of multicollinearity (e.g., Aczel and Sounderpandian, 2002).

4.1.3 Population and Economic Variables. Following the theoretical framework of Minniti (2004; 2005), we used seven variables to account for the relevant population characteristics and economic circumstances of the counties. Four variables were used to measure population characteristics: age heterogeneity index, the rate of population change by natural increase, net migration rate, and skilled labor. Three variables were used to measure the economic conditions of the county: the absolute change in Gross County Product from 1998 to 2000, income per capita in 2000, and unemployment rate in 2000.

² According to the US Census Bureau (2002: VI), "...an establishment is a single physical location at which business is conducted or services or industrial operations are performed. It is not necessarily identical with a company or enterprise, which may consist of one or more establishments. When two or more activities are carried on at a single location under a single ownership, all activities generally are grouped together as a single establishment. The entire establishment is classified on the basis of its major activity and all data are included in that classification."

Blau's (1977) index of heterogeneity was used to capture the age composition of the county.³ Richard et al. (2004) argue that the index is useful for capturing diversity and heterogeneity in groups. We collected data from Profiles of America on the proportion of the population in each of four age groups: 0-18 years old, 18-34 years old, 35-64 years old, and over 65 years old. To reduce problems of multicollinearity, we centered the index (e.g., Aczel and Sounderpandian, 2002).

Following prior research (Armington and Acs, 2002; Chrisman, 1985; Chrisman et al., 1992; Lee et al., 2004), we collected data from Profiles of America to measure the rate of population growth by natural increase (births minus deaths) in each county from 1990 to 2000.

Likewise, we collected data on the rate of net migration from 1990 to 2000 from Profiles of America. The net migration rate represents the number of people who immigrated into a county less the number of people who emigrated from the county divided by the county population.

We used the proportion of the population with college degrees to measure the level of skilled labor available in 2000 (Lee et al., 2004). This a proxy measure for the human capital needed to start a business (Armington and Acs, 2002). The data come from the U.S. Census.

Researchers have used changes in gross domestic product to measure economic development in a region (Carree, Van Stel, Thurik, and Wennekers, 2002). However, there is no statistic available to depict gross product at the county level. For this reason, we use the following formula to estimate the absolute changes in Gross County Product (GCP) from 1998 to 2000:

$$\frac{\text{GSP 2000} * \text{County Employees in 2000}}{\text{Total Employees in State 2000}} - \frac{\text{GSP 1998} * \text{County Employees in 1998}}{\text{Total Employees in State 1998}}$$

Data on Gross State Product (GSP) were obtained from the BEA. Employment data come from County Business Patterns on employers' reports during the week of March 12th each year. To obtain county level estimates we divided the GSP (in millions of US\$) by the total number of employees in each state. The result is the GSP per employee in each state. We multiplied this amount by the number of employees in the county to obtain the estimated GCP for both 1998 and 2000.⁴ We used the natural logarithm to reduce kurtosis and skewness (Tabachnick and Fidell, 1996).

We collected data from USA Counties to measure the level of income per capita by county in 2000. Income per capita is obtained by dividing the total income of all people over 15 years old by the total county population (US-Census-Bureau, 2006). We used the natural logarithm to reduce kurtosis and skewness (Tabachnick and Fidell, 1996).

We collected data from the U.S. Department of Agriculture's Profiles of America to measure the unemployment rate in each county in 2000. The U.S. Bureau of Labor Statistics compiles the data from local area unemployment statistics.

³ The formula for the index is: $1 - \sum p_i^2$ where p is the proportion of a category and i is the number of categories.

⁴ It is important to note that the measure assumes that the employees in each county in a state are equally productive.

4.1.4 Control Variables. We also controlled for business and population density, county type, industry sector, and region. The measures are discussed below.

Prior research has determined that the concentration of business activity is an appropriate control when modeling new venture creation efforts (Acs and Armington, 2004). Using data from County Business Patterns, we constructed a measure of business density by dividing the number of establishments in 2000 by the number of employees in 2000. We used the natural logarithm to reduce skewness and kurtosis (Tabachnick and Fidell, 1996).

Population density was used as a control because of the impact it has on entrepreneurship and total employment (Audretsch and Fritsch, 2002; Reynolds et al., 1995). We used data from the U.S. Census to control for the size of the county. The natural logarithm was calculated to reduce skewness and kurtosis (Tabachnick and Fidell, 1996).

The work of Chrisman (1985) and Chrisman et al. (1992) suggest it is important to control for county type. The 2000 U.S. Census groups counties into three categories: (1) those that belong to a metropolitan statistical area, (2) those that belong to a micropolitan statistical area, and (3) rural counties that do not fall in the first two categories.⁵ To avoid overspecification, two categorical variables, Metro and Micro, were constructed to identify counties that are part of metropolitan or micropolitan statistical areas, respectively.

Prior research has established the need to use industry variables to control for the effects that they have on new ventures (Armington and Acs, 2002; Chrisman, Bauerschmidt, and Hofer, 1998). For example, Krugman (1991) explains that regions with higher levels of manufacturing activity present opportunities for the location of new firms because these places contain a large pool of labor, a wide variety of infrastructure services, and large economies of scale that minimizes costs for exporting goods to other regions. To capture industry effects at the county level, we collected data from County Business Patterns to estimate the proportion of establishments in 2000 in retail, manufacturing, and service industries using 2-digit NAICS codes. The retail variable measures the proportion of establishments that are in the 44 and 45 NAICS codes. The manufacturing variable measures the proportion of establishments in the 33 NAICS code. Services are measured by the proportion of establishments in the 51-56, 61-62, and 71-72 NAICS codes.

Studies indicate there are regional differences across the U.S. in terms of innovations that may effect entrepreneurial activity and economic growth (Audretsch and Feldman, 1996). We used categorical va-

⁵ The U.S. Census Bureau (2000b: 82238) defined county types as follows: “Metropolitan Statistical Area — A Core Based Statistical Area associated with at least one urbanized area that has a population of at least 50,000. The Metropolitan Statistical Area comprises the central county or counties containing the core, plus adjacent outlying counties having a high degree of social and economic integration with the central county as measured through commuting. Micropolitan Statistical Area — A Core Based Statistical Area associated with at least one urban cluster that has a population of at least 10,000, but less than 50,000. The Micropolitan Statistical Area comprises the central county or counties containing the core, plus adjacent outlying counties having a high degree of social and economic integration with the central county as measured through commuting.”

riables to identify counties in different regions of the country following an established classification of states (Chrisman, 1999).⁶

4.2 Data Analysis

Ordinary Least Squares (OLS) regression was used to test the hypothesis. Despite the normality problems, additional tests did not reveal problems of multicollinearity among the independent variables used in the regression models. Because prior entrepreneurship activity and new venture creation measure changes in establishments at different periods of time, we also estimated the Durbin-Watson statistic. Owing to the normality problems of the data, problems of autocorrelation were found on the OLS regression models, although those were not found on the robustness tests conducted with the normalized sample of 2,400 counties.

5. Results

Table 1 (*see tables at the end of this paper*) provides the means, standard deviation, and correlations for the county-level variables used in the models. Table 2 presents the OLS regression results using new venture creation from 2000 to 2002 as the dependent variable.

Model 1 is the base model with only the control variables. The model is significant ($p < 0.001$) and the adjusted R^2 is 0.07. Business density, population density, metro counties, service industries, and the south and west regions were all significant at the 5% level or better.

Model 2 adds the variables representing population characteristics and economic conditions to the base model. The adjusted R^2 increases to 0.17 and the change in R^2 is significant ($p < 0.001$). All the variables except the unemployment rate in 2000 are significant ($p < 0.05$). Gross county product 98-00 and net migration rate 90-00 appear to have the highest relative influence on new venture creation. Interestingly, among the control variables only business density remained significant in model 2 ($p < 0.01$), a finding that appears to be consistent with Minniti's (2005) discussion of the importance of entrepreneurial history.

Model 3 adds prior entrepreneurship activity. The adjusted R^2 increases to 0.19 and the change in R^2 is significant ($p < 0.001$). The variables representing population characteristics and economic conditions remain significant, as does business density. Most importantly, prior entrepreneurial activity is positively related to subsequent new venture creation ($p < 0.001$). This confirms the relationship found in prior studies (e.g., Shane, 1996).

Model 4 is used to test our hypothesis as we introduce the square term of prior entrepreneurship activity. The adjusted R^2 for model 4 nearly doubles, increasing to 0.37. The change in R^2 is significant ($p <$

⁶ Chrisman (1999) aggregates the SBA's classification of 10 regions in the US as follows: Southern region (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas); Northern region (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Ohio, and Wisconsin); Western region (Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming); Eastern region (Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia).

0.001). Again, the significance of the population and economic variables remains relatively stable. Business density is not significant in model 4 but the variables representing metro countries and the south region become significant. However, in support of the hypothesis and the principle contentions of Bygrave and Minniti (2000) and Minniti (2004; 2005), the coefficients of prior entrepreneurial activity and its square term are both positive and significant ($p < 0.001$). A comparison of the standardized beta coefficients also reveals that prior entrepreneurial activity and the square of that are far and away the most important variables in the model in terms of explaining variations in subsequent new venture creation.

Table 3 presents the OLS regression results using new venture creation from 2002 to 2004 as the dependent variable. Model 5 is the base model where the control variables are entered. The model is significant ($p < 0.001$) and the adjusted R^2 is 0.16. Business density, population density, service industries, and all three regional variables are positively related to new venture creation at the 1% significance level or better. The micro county variable has a negative relationship with new venture creation ($p < 0.001$).

Model 6 adds the variables representing population characteristics and economic conditions to the base model. The adjusted R^2 increases to 0.35 and the change in R^2 is significant ($p < 0.001$). Only natural increase ($p = 0.05$), net migration ($p < 0.001$), and gross county product ($p < 0.001$) are positively related to new venture creation during the 2002-2004 time period. Age heterogeneity is marginally significant ($p < 0.10$). Excepting the micro county and north region variables, the control variables retain significance. Retail industries are also significant related to new venture creation in model 6.

Model 7 includes prior entrepreneurship activity. The adjusted R^2 increases to 0.38 and the change in R^2 is significant ($p < 0.001$). The significance of the various variables representing population characteristics, economic conditions, and the control measures are stable. Again, the important finding is that prior entrepreneurial activity is positively related to subsequent entrepreneurial activity ($p < 0.001$).

Model 8 provides further support for our hypothesis. The adjusted R^2 increases to 0.59 and the change in R^2 is significant ($p < 0.001$) when we add the square term of prior entrepreneurship activity. General stability exists in the significance of the majority of variables included in the analysis. Importantly, both prior entrepreneurial activity and the square of that variable are positively related to subsequent entrepreneurial activity ($p < 0.001$). Furthermore, as above, these variables have standardized beta coefficients that are substantially greater than any other variable in the model. Thus, these results support our hypothesis and Minniti's (2004; 2005) contention that there are increasing returns to entrepreneurial activity over time.

5.1 Robustness Tests

Although we conducted our analysis with almost the entire population of US counties, problems of normality may have biased our results. Therefore, we conducted robustness tests with a normalized sample of 2,400 counties from 47 states (counties from Delaware, the District of Columbia, Hawaii, and Rhode Island are not included in the sample). Table 4 (*see end of this paper*) provides the results of the complete models for the 2000-2002 and 2002-2004 time periods with the reduced sample. Both prior entrepreneurship activity and its square term are positive and significant ($p < 0.001$) for both of the time periods analyzed using the reduced sample.

In sum, the OLS regression models provide evidence to support the Minniti and Bygrave (1999) framework as well as strong support for our hypothesis. It is important to note that the findings were consistent regardless of whether new venture creation was measured over the period of 2000-2002 or 2002-2004 and whether the full sample or reduced sample was used. This suggests that the results were not sensitive to the lag between the time periods used to measure our independent and dependent variables or biased by potential violations of the assumptions of multiple regression analysis. It also suggests that the impact of prior entrepreneurship activity on subsequent new venture creation endures for a reasonable period of time, as suggested by Minniti (2004; 2005).

6. Discussion and Conclusions

This study tested the theoretical framework developed by Bygrave and Minniti (2000) and Minniti (2004; 2005). The results provide significant insights into the factors that influence new venture creation in U.S. counties between 2000-2002 and 2002-2004. The notion that prior entrepreneurship acts as a non-pecuniary network externality that generates increasing returns to entrepreneurship (Minniti, 2005) is supported. Not only does an increase in prior new venture creation have a positive impact on subsequent new venture creation, the increase in new venture creation appears to occur at an increasing rate. This suggests that the importance of entrepreneurship for the economic development of a region may be even greater than previously believed. Thus, entrepreneurship begets more entrepreneurship in increasing quantities. If one accepts the explanation developed by Minniti (2004; 2005) as a basis for the evidence presented in this article, this occurs as a consequence of the information entrepreneurship provides to aspiring entrepreneurs that reduces ambiguities and alters the incentives to search for opportunities to start ventures. What we have added to this understanding is that the growth in entrepreneurship through these mechanisms indeed appears to be non-linear. This finding contributes to our understanding of the geographic variations in rates of entrepreneurship and the upward and downward economic spirals that are often observed in some communities.

Our study therefore contributes to knowledge about entrepreneurial activities in the U.S. by being one of the first to test the theoretical framework developed by Bygrave and Minniti (2000) and Minniti (2004; 2005), using the most current data about new venture creation activities in the U.S. at the county level. We contribute to management theory and practice by confirming that entrepreneurship is primarily a local phenomenon and entrepreneurial acts are interdependent. Importantly, our results did not change qualitatively when the lag intervals used between the measurement of the variables and new venture creation were altered or when we used the full or partial data set to test our hypothesis.

In addition, by focusing on counties, we were able to provide interesting results at a level of aggregation that differs from prior studies that have focused on individuals, cities, labor market areas, or metropolitan areas. In that regard, counties represent a unit of analysis that captures entrepreneurial activities in rural areas, which have not been well represented in prior research endeavors. Finally, while our findings confirm that population characteristics and economic conditions, particularly net migration and gross county product, are of great consequence to new venture creation they also suggest that the entrepreneurial history of a community may be of even greater import.

7.1 Limitations

Before concluding it is necessary to discuss the limitations of our study. First, problems of normality, kurtosis in particular, violated the assumptions of the regression analysis used to study the full population of counties. However, our robustness tests conducted with a normalized sample of 2,400 counties provided consistent support of our hypothesis.

A second methodological limitation is our inability to obtain a more precise measure for gross county product. Deriving this construct from GSP implied that this measure was a function of the number of employees in the county vis-à-vis the number of employees in the state. While this assumption was reasonable under the circumstances, we recognize the limits of its validity since it is likely that the productivity of employees in different counties will vary.

A third and more general methodological limitation is our measures of population characteristics and economic conditions. Although these seemed reasonable given our purpose and theoretical framework, other measures, such as the presence of a university, are possible and may yield further or greater insights. For example, other measures besides natural increase may be more appropriate for capturing the connectedness of the population. Furthermore, although natural increase captures some of the demand considerations associated with venturing opportunities (Chrisman, 1985), the full effects of population increase through this means are likely not to occur for many years.

In short, efforts to refine and expand upon the measures used in this study to operationalize Minniti's (2004; 2005) theoretical framework are needed.

7.2 Implications for Future Research and Practice

Besides dealing with the limitations of the current study, there are a number of additional implications for future research and practice that follow from this research. Thus, future research needs to explore the relationship between prior and subsequent new venture creation, as well as macro-level factors that influence venture start-up decisions at other levels of analysis such as cities, metropolitan areas, and regions. For example, counties appear to be very appropriate for the analysis of rural areas but may be less valuable for analyzing urban areas where agglomeration effects may be more prevalent. Future research should address if there are differences in the factors that influence new venture creation in urban or rural areas and how entrepreneurial cultures may affect the development of new ventures in such areas. This would involve testing for interactions or estimating separate models, rather than merely using control variables to account for these differences.

It is also necessary to explore how levels of community support, in terms of resources, networking, and culture, affect new venture creation. While we obtained the effects expected from the theoretical framework used, we were not able to isolate the causes as fully as needs to be done. In the same vein, prior entrepreneurial activity may affect subsequent activity for several reasons including competitive imitation, expanded opportunities for suppliers or producers of complementary products and services, reductions in ambiguity, or changes in the attitudes toward entrepreneurship on the part of individuals in a given community. Our findings support the theoretical position of Bygrave and Minniti (2000), and Minniti (2004; 2005) but more work is needed to isolate the various potential causes of new venture creation.

Moreover, new venture creation is influenced by population characteristics and economic conditions. Specifically, net migration and gross county product appeared to have the greatest influence, as measured by the standardized beta coefficients in the different models analyzed. With regard to net migration, newcomers may be more alert to new venture creation opportunities and may provide information and opportunities to other potential entrepreneurs as well. Future research that helps disentangle the influence of migration on entrepreneurship and economic development would be valuable, particularly given the current national debate regarding immigrants.

Changes in gross county product were also strongly related to new venture creation in both periods examined. This suggests that the current level of economic activity in a county has an important influence on future entrepreneurial opportunities. As argued, information, alertness, and incentives are all important in the new venture creation process (Kirzner, 1973; Minniti, 2004; Minniti, 2005). Additional work that helps us better understand the interrelationship among these factors is needed.

Our study and its theoretical basis also provide implications for policymakers. The results suggest that entrepreneurial activities do indeed appear to be interconnected, self-reinforcing, and path dependent. Therefore, these attributes should be considered when designing public policy interventions to foster new venture creation in order to ensure that the impact is not transitory. For example, proper incentives are needed but unless enough *new* potential entrepreneurs are inspired to take the plunge incentives alone may not be enough to change entrepreneurial rates over time. Furthermore, policy makers should consider whether fostering new venture creation by individuals who are not embedded in the community will transmit the ambiguity-reducing information needed to inspire further entrepreneurship among those who might take advantage of that information.

In conclusion, this article provides support for the contention of Minniti (2004; 2005) that there are positive returns to prior new venture creation. By doing so we contribute to knowledge regarding why entrepreneurial actions tend to concentrate geographically and why otherwise similar communities experience different levels of new venture creation over time. Entrepreneurship appears to have historic, social, and economic elements that can create positive network externalities. The influence and interplay of these factors deserves further attention and hopefully our findings will inspire additional investigations.

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Table 1: Descriptives and Correlations

	Mean	SD	1	2	3	4	5	6	7	8	9	
1. New Venture Creation 02-04	58.22	273.11	1									
2. New Venture Creation 00-02	41.38	251.95	0.78***	1								
3. Prior Entrepreneurship Activity	0.04	0.26	0.41***	0.31***	1							
4. Business Density (Ln)	-2.42	0.40	-	0.14***	-0.07***	0.09***	1					
5. Population Density (Ln)	3.75	1.69	0.30***	0.18***	0.20***	-0.66***	1					
6. Metro County	0.35	0.48	0.26***	0.19***	0.19***	-0.31***	0.57***	1				
7. Micro County	0.22	0.41	-	0.08***	-0.05**	-0.06**	0.03+	-0.39***	1			
8. Manufacturing	0.05	0.02	-0.03+	-0.01	-0.01	-0.30***	0.21***	0.02	0.07***	1		
9. Retail	0.24	0.04	-	0.13***	-0.09***	0.15***	0.05**	-0.20***	-0.29***	0.06**	-0.05**	1
10. Service	0.40	0.07	0.28***	0.15***	0.20***	-0.27***	0.39***	0.28***	0.03	-	0.27***	-0.39***
11. South	0.40	0.49	-0.01	-0.01	0.08***	-0.11***	0.06**	0.01	0.03+	0.02	0.31***	
12. North	0.30	0.46	-	0.08***	-0.06***	-0.05**	-0.01	0.00	-0.07***	0.02	0.16***	-0.04*
13. West	0.17	0.37	0.08***	0.08***	0.10***	0.27***	-0.38***	-0.08***	-0.02	-	0.21***	-0.22***
14. Age Heterogeneity Index	0.00	0.01	-	0.07***	-0.06**	0.12***	-0.11***	0.04*	-0.17***	0.11***	0.11***	0.28***
15. Skilled Labor 2000	0.17	0.08	0.29***	0.17***	0.30***	-0.14***	0.38***	0.37***	-0.04*	-	0.21***	-0.38***
16. Natural Increase Rate 90-00	0.03	0.05	0.21***	0.20***	0.20***	-0.32***	0.27***	0.36***	0.05**	-0.04*	-0.12***	
17. Net Migration Rate 90-00	0.08	0.15	0.17***	0.21***	0.19***	0.03	0.15***	0.22***	-0.05**	0.06***	-0.24***	
18. Gross County Product 98-00 (Ln)	7.47	0.32	0.56***	0.34***	0.42***	-0.30***	0.50***	0.38***	0.10***	-	-0.01	-0.19***
19. Income per Capita 2000 (Ln)	10.02	0.22	0.27***	0.14***	0.28***	-0.26***	0.48***	0.44***	-0.06**	0.00	-0.41***	
20. Unemployment Rate 2000	0.05	0.03	-	0.09***	-0.07***	0.10***	0.07***	-0.19***	-0.21***	0.04*	-0.02	0.15***

N=3,118 +p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 1: Descriptives and Correlations – continued

	10	11	12	13	14	15	16	17	18	19
1. New Venture Creation 02-04										
2. New Venture Creation 00-02										
3. Prior Entrepreneurship Activity										
4. Business Density (Ln)										
5. Population Density (Ln)										
6. Metro County										
7. Micro County										
8. Manufacturing										
9. Retail										
10. Service	1									
11. South	-0.18***	1								
12. North	-0.07***	-0.53***	1							
13. West	0.19***	-0.36***	-0.29***	1						
14. Age Heterogeneity Index	-0.19***	0.13***	0.18***	-0.28***	1					
15. Skilled Labor 2000	0.62***	-0.23***	-0.04*	0.17***	-0.34***	1				
16. Natural Increase Rate 90-00	0.22***	0.07***	-0.19***	0.19***	-0.31***	0.24***	1			
17. Net Migration Rate 90-00	0.08***	0.16***	-0.15***	0.04*	-0.26***	0.70***	0.17***	1		
18. Gross County Product 98-00 (Ln)	0.42***	-0.08***	-0.07***	0.06***	-0.08***	0.03 ⁺	0.29***	0.29***	1	
19. Income per Capita 2000 (Ln)	0.46***	-0.30***	0.11***	0.07***	-0.21***	0.09***	0.15***	0.20***	0.46***	1
20. Unemployment Rate 2000	-0.15***	0.12***	-0.17***	0.12***	0.02	-0.08***	0.12***	-0.09***	-0.12***	-0.46***

N=3,118 ⁺p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Table 2: Regression Models using New Venture Creation from 2000 to 2002 as Dependent Variable

	Model 1	Model 2	Model 3	Model 4
Business Density (Ln)	0.08 **	0.07 **	0.06 *	0.01
Population Density (Ln)	0.24 ***	0.02	0.03	0.01
Metro County	0.08 **	0.02	0.03	0.06 **
Micro County	-0.02	-0.01	-0.01	0.01
Manufacturing	0.01	0.00	0.00	-0.02
Retail	0.01	0.03	0.03	0.01
Service	0.05 *	0.03	0.04	0.03
South	0.08 **	-0.04	-0.03	-0.05 *
North	0.04	-0.01	-0.01	-0.01
West	0.19 ***	0.04	0.03	0.01
Age Heterogeneity Index		0.06 **	0.05 **	0.04 *
Skilled Labor 2000		-0.06 *	-0.07 *	-0.09 ***
Natural Increase Rate 90-00		0.12 ***	0.11 ***	0.06 ***
Net Migration Rate 90-00		0.19 ***	0.16 ***	0.09 ***
Gross County Product 98-00 (Ln)		0.32 ***	0.26 ***	-0.05 *
Income per Capita 2000 (Ln)		-0.05 **	-0.05 **	-0.05 **
Unemployment Rate 2000		-0.03	-0.05 +	-0.09 ***
Prior Entrepreneurship Activity			0.17 ***	0.63 ***
Prior Entrepreneurship Activity Square				0.61 ***
F-value	23.42 ***	37.36 ***	41.31 ***	97.73 ***
R ²	0.07	0.17	0.19	0.37
Change in R ²		0.10 ***	0.02 ***	0.18 ***
Adjusted R ²	0.07	0.17	0.19	0.37

N=3,118 +p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 3: Regression Models using New Venture Creation from 2002 to 2004 as Dependent Variable

	Model 5	Model 6	Model 7	Model 8
Business Density (Ln)	0.11 ***	0.08 **	0.07 **	0.02
Population Density (Ln)	0.41 ***	0.09 **	0.09 **	0.07 **
Metro County	0.02	-0.01	0.00	0.03 +
Micro County	-0.08 ***	-0.03	-0.02	0.00
Manufacturing	-0.01	-0.01	-0.01	-0.03 *
Retail	0.03	0.03 +	0.03 +	0.02
Service	0.13 ***	0.05 *	0.06 **	0.06 **
South	0.13 ***	0.05 *	0.06 *	0.04 *
North	0.08 **	0.03	0.04	0.03 +
West	0.25 ***	0.08 **	0.08 **	0.05 ***
Age Heterogeneity Index		0.03 +	0.03 +	0.01
Skilled Labor 2000		-0.03	-0.05 +	-0.07 ***
Natural Increase Rate 90-00		0.05 *	0.03 +	-0.02
Net Migration Rate 90-00		0.13 ***	0.10 ***	0.03 *
Gross County Product 98-00 (Ln)		0.53 ***	0.45 ***	0.11 ***
Income per Capita 2000 (Ln)		-0.03	-0.03 +	-0.02 +
Unemployment Rate 2000		0.00	-0.02	-0.06 **
Prior Entrepreneurship Activity			0.19 ***	0.70 ***
Prior Entrepreneurship Activity Square				0.66 ***
F-value	62.21 ***	98.19 ***	105.11 ***	241.26 ***
R ²	0.17	0.35	0.38	0.60
Change in R ²		0.18 ***	0.03 ***	0.22 ***
Adjusted R ²	0.16	0.35	0.38	0.59

N=3,118 +p<0.10, *p<0.05, **p<0.01, ***p<0.001

Table 4: Results of Robustness test

	New Venture Creation 2000-02	New Venture Creation 2002-04
Business Density (Ln)	0.01	0.01
Ln Population Density	0.03	0.03
Metro County	0.04 ⁺	0.03
Micro County	-0.02	-0.02
Manufacturing	0.04 [*]	-0.04 [*]
Retail	0.01	-0.01
Service	0.01	-0.04 [*]
South	-0.07 [*]	-0.12 ^{***}
North	-0.05 ⁺	-0.11 ^{***}
West	-0.01	-0.06 [*]
Age Heterogeneity Index	0.01	0.02
Skilled Labor 2000	0.05 [*]	0.13 ^{***}
Natural Increase Rate 90-00	0.12 ^{***}	0.08 ^{***}
Net Migration Rate 90-00	0.23 ^{***}	0.18 ^{***}
Gross County Product 98-00 (Ln)	-0.01	0.35 ^{***}
Income per Capita 2000 (Ln)	0.07 ^{**}	0.00
Unemployment Rate 2000	-0.05 [*]	-0.04 [*]
Prior Entrepreneurship Activity	0.25 ^{***}	0.30 ^{***}
Prior Entrepreneurship Activity Square	0.11 ^{***}	0.13 ^{***}
F-value	55.75 ^{***}	185.32 ^{***}
R ²	0.31	0.60
Change in R ²	0.01 ^{***}	0.01 ^{***}
Adjusted R ²	0.30	0.59

N=2,400 ⁺p<0.10, ^{*}p<0.05, ^{**}p<0.01, ^{***}p<0.001