Sector-Specific Analysis on the Creation of Entrepreneurial Startup Establishments in the United States

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Part I. Executive Summary

As globalization and advancements in communication technology reduce the barriers between international markets, the United States continues to shift towards an entrepreneurial economy, whose competitive advantage is characterized by the commercialization of knowledge and innovation (Audretsch 2000). Amidst attempts to recover from one of the worst recessions since the Great Depression, economists continue to analyze the role of entrepreneurship within the United States economy.

While many economists focus on the availability and characteristics of individual entrepreneurs, other scholars attempt to address economic factors that create the context in which entrepreneurial opportunities to obtain economic profit form. Despite the prevalence of research on the specific characteristics of entrepreneurs, critics assert that these studies are “too simple, making economic activity too much a function of individuals and underplaying the role of external structural influences” (Thornton 1999, 23). As a result, many scholars have begun analyzing factors that affect potential entrepreneurial opportunities such as the availability of capital resources, the prevalence of government regulation, levels of national unemployment rates, and the business cycle.

While the findings of these studies continue to highlight the important role of entrepreneurship within the U.S. economy, critics note the use of aggregate data as a potential confounding factor. According to Bates (1995), “the practice of grouping entrepreneurs into overly broad classifications, without regard to industry-specific conditions, although quite common in empirical research, only increases the imprecision of the research results and interpretations generated" (Bates 1995, 144)).
In order to contribute to the empirical analysis of entrepreneurship, this paper will analyze the effects of value added as a percentage of U.S. GDP (VA%GDP), national U.S. unemployment rates (UNEMP), and periods of recession (PROX) on entrepreneurship across each of the ten major U.S. industries\(^1\) from 1977-1999. This study defines entrepreneurship as the exploitation of profitable opportunities through the creation of a new organization that occurs as a context-dependent process and measures entrepreneurship by analyzing the number of new startups in the United States each year from 1977-1997.

The study finds that new establishments across U.S. industries exhibit varying responses to the selected explanatory variables, indicating that economic factors do not have universal effects on entrepreneurship across different U.S. industries. The study also finds that value added as a percentage of U.S. GDP had the largest effect on the number of new establishments across U.S. industries from 1977-1997, appearing statistically significant in six of the nine industry models and positive in five of the six. National U.S. unemployment rates exhibited the second largest effect on the number of new establishments across U.S. industries, appearing statistically significant and negative in three of nine industries. Finally, periods of economic recession, measured by a proxy variable, only appeared in one of the nine industry models, and it was not statistically significant. The results of this research suggest that economic predictors of entrepreneurship across major U.S. industries differ dramatically. As a result, as new data continues to highlight the link between entrepreneurship and economic growth, job

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\(^1\) As defined by the U.S. Census Bureaus’ Standard Industrial Classification System
creation, and policy, scholars must consider each industry independently in order to correctly predict and stimulate entrepreneurship in the United States.

Part II. Introduction

The Importance of Entrepreneurship within the United States’ Economy

As advancements in technology promote globalized markets, the United States continues to undergo a fundamental shift to a knowledge-based economy contingent on competitive advantages realized through the development of new ideas and innovations (Audretsch 2000). Because a large portion of technological advancements are made profitable through the introduction of new products and services, entrepreneurship has often been seen as a way for countries to gain competitive advantages by utilizing technology to create profitable products and services which contribute to economic growth (Shane 2000). As a result, scholars such as Joseph Schumpeter have touted entrepreneurship as a process of creative destruction that serves as a key driver of capitalist advancement and economic growth (Audretsch 2000).

Recently, scholars at the Ewing Marion Kauffman Foundation have introduced extensive data that details the role of entrepreneurship within the US economy. This research has become especially relevant as it relates entrepreneurship to economic growth and recovery from the recent 2008 recession. In its 2009 annual report, the foundation reported that the level of U.S entrepreneurial activity had reached its highest point in the last 14 years. Additionally, the foundation has linked entrepreneurship to other economic growth drivers such as job creation. According to Stangler, “one of the most important issues facing the United States is how to create new jobs” (Stangler 2010 (4)). Based on a
new dataset from the U.S. Business Dynamics Statistics, Tom Kane, a researcher at the Kaufmann Foundation, asserts that “startups aren’t everything when it comes to job growth…they’re the only thing” (Kane 2010, 2).

As U.S. policy makers search for new ways to revitalize the U.S economy, entrepreneurship continues to rise to the forefront of public discussion. In fact, according to a poll administered by the Kauffman Foundation in 2009, 79 percent of respondents say entrepreneurs are critically important to job creation, and 72 percent of respondents believe that the government should do more to encourage individuals to start businesses. The poll also found that entrepreneurship is “gaining recognition as more important than the stimulus package in creating long-term economic stability” (Kaufman Poll 2009).

Part III. Summary of Contemporary Analysis of Entrepreneurship

The Struggle to Define Entrepreneurship

Despite the importance of entrepreneurship in the US economy, several barriers consistently hinder empirical analysis of its impacts—the most prevalent being the definition of entrepreneurship. Defining entrepreneurship has been, “the largest obstacle in creating a conceptual framework for the entrepreneurship field,” according to Scott Shane, a professor at the University of Maryland (Shane 2000, 218). While some scholars attempt to define entrepreneurship by characterizing the entrepreneur and his or her actions, Shane argues that entrepreneurship “involves the nexus of two phenomena: the presence of lucrative opportunities and the presence of enterprising individuals,” and he asserts that the field of entrepreneurship can be best defined as an analysis of “how, by whom, and with what effects, [profitable] opportunities to create future goods and
services are discovered, evaluated, and exploited” (Shane 2000, 218). As a result, entrepreneurship can be defined by the “discovery and exploitation of profitable opportunities,” which can be analyzed by addressing sources of opportunities, the process in which the opportunities are discovered, and means of exploitation of these opportunities (Shane 2000).

Patricia H. Thornton, a sociology professor at Duke University, also cites historic dissonance in defining entrepreneurship, explaining that critics complain that “the field lacks a distinct professional identity, one defined by a unified body of knowledge based on generally accepted social science theories” (Thornton 1999, 20). To ensure clarity, Thornton refers to entrepreneurship as “the creation of new organizations…which occurs as a context-dependent, social and economic process” (Thornton 1999, 20).

In the course of this study, I will define entrepreneurship as the exploitation of profitable opportunities through the creation of a new organization that occurs as a context-dependent process. In order to measure entrepreneurship in the United States, I will use the number of new establishments across major U.S. industries each year from 1977-1997 as measured by the United States Census Bureau’s Statistics of U.S. Businesses (SUSB).

Analysis of the Entrepreneur

In order to analyze entrepreneurship, scholars have attempted to address both the unique characteristics of individual entrepreneurs as well as economic factors affecting the creation of lucrative entrepreneurial opportunities. According to Thornton, the majority of early research was focused on characteristics of the entrepreneur. These
include studies linking cognitive and demographic traits to entrepreneurs. For example, scholars such as Elizabeth Gatewood postulate that “the cognitive orientation (i.e., ways of thinking) of potential entrepreneurs will have a significant influence on their willingness to persist in entrepreneurial activity in the face of…difficulties” (Gatewood 1995, 373). Other scholars such as Herron (1993) illustrate the fact that, “angel investors, and experienced successful entrepreneurs, when asked to identify the most important determinant of new venture performance, will undoubtedly answer ‘the entrepreneur’” (Herron 1993, 281). Despite these studies, many critics question the subjectivity and variance of supply-side factors. According to Shane, “it is improbable that entrepreneurship can be explained solely by reference to a characteristic of certain people independent of the situations in which they find themselves” (Shane 2000, 218).

Potential Economic Indicators of Entrepreneurship

Due to criticisms of analysis focusing solely on the characteristics of the entrepreneur, many scholars have begun addressing economic factors that might affect the prevalence of entrepreneurial opportunities to earn economic profit. Throughout the literature a large portion of scholars focus on access to start-up capital, unemployment, and business-cycle fluctuations as leading economic indicators of entrepreneurial activity. In examining these studies, however, many theories appear contradictory, and since economic factors often affect each other, confounding effects of multicollinearity exist.

Adequate Access to Capital

Within the literature, scholars debate whether or not limited access to capital
hinders entrepreneurship. According to William Kerr, a professor at the Harvard Business School, “adequate access to capital is one of the biggest hurdles to starting and growing a new business” (Kerr 2006, 1). Entrepreneurs can finance their new businesses through incurring debt, selling equity, or obtaining funding from family or friends. While scholars have attempted to use metrics such as credit availability to explore potential correlations between access to capital and entrepreneurship, most start-ups do not utilize formal forms of debt during their early stages. Instead, the majority of startups utilize insider funding from family and friends rather than outside funding from banks and venture capitalists (Fluck 1998). Despite a higher utilization of insider funding, negative shocks to outsider funding have still been attributed to dramatic reductions in entrepreneurial startups.

According Kate O’Sullivan, a writer for CFO Publications, “raising funding for a new business today is harder than it has been in decades,” and according to Louis Katz, “there are no bank loans right now… private equity firms are shoring up their existing companies rather than going out to find new businesses to finance” (O’Sullivan 2009, 35-36). Colleen DeBaise, a writer for the Wall Street Journal, finds that “the economic downturn [in 2008] has dimmed many entrepreneurs' hopes of opening a small business, as sources of funding have dwindled or dried up completely” (DeBaise 2010, 1).

Despite these arguments, other scholars argue that access to capital isn’t necessarily a paramount indicator of entrepreneurship. Gregg Fairbrothers, founder of the Dartmouth Entrepreneurial Network, negates the idea that reduced capital availability creates large negative impacts on startups, stating that "at the very seed stage of a business, there's no money at good times or bad times." (O’Sullivan 2009, 36). Spencer Ante, a writer for Businessweek, explains that lower input costs due to cheaper good availability during
downturns often reduces barriers to entry and increases a drive towards a faster rate of profitability and tighter financing strategies (Ante 2009, 49).

Unemployment Rates

Along with access to capital, scholars have also considered the effect of unemployment rates on entrepreneurship. While some argue that high unemployment rates hinder entrepreneurship, other scholars argue that high unemployment rates actually increase entrepreneurship.

According to Kedrosky, high unemployment rates can reduce the number of startups by making potential entrepreneurs less likely to leave the safety of their current employment in order to pursue new ventures. (Kedrosky 2008). Conversely, some scholars argue that higher unemployment rates actually increase entrepreneurship by freeing up human capital and creating a larger group of “necessity entrepreneurs”—people who start their own businesses because other income opportunities are gone (Stangler 2009, 3). According to John Tozzi’s article in BusinessWeek, the number of necessity entrepreneurs “increased sharply in the U.S during the [2007-2008] recession” (Tozzi 2010, 1).

Effects of Recessionary Pressures

The effect of periods of economic recession on entrepreneurship in the United States has also been debated. While some scholars believe that pessimistic market expectations of economic agents reduce entrepreneurship, others argue that recessions spur the innovation necessary to increase entrepreneurship.
According to research by Paul Kedrosky, the author of “Entrepreneurs and Recessions: Do Downturns Matter?” recessions create pessimistic market expectations for entrepreneurs and often deter their decisions to start a company (Kedrosky 2008). For example, entrepreneurs might expect companies founded during a recession to fail at higher rates, and as a result, they will postpone efforts to start new ventures (Kedrosky 2008).

Despite these arguments, other scholars argue that periods of economic recession can actually promote entrepreneurship. According to Lynda Applegate, a Harvard Business School professor, recessions “tend to spur innovation,” and “companies that survive the financial crisis by identifying and exploiting innovation will act as economic growth engines in the future” (Applegate 2009, 3). To illustrate this point, Applegate highlights the fact that 18 out of 30 companies in the Dow-Jones Industrial Average were formed during times of recession (Applegate 2009, 3). Dane Stangler, a researcher at the Kauffman Foundation, provides further support of Applegate’s idea through his analysis of Fortune and Inc. magazines’ lists of the largest and fastest growing companies. According to his research, over half of the companies on the 2008 and 2009 Fortune 500 lists and over half of the companies on the 2008 Inc. list began during a bear market or recession (Stangler 2009).

Exploring Entrepreneurship Across Industries

While many scholars analyze aggregate data on the number of startups and entrepreneurs in the U.S., few provide industry-specific analyses of entrepreneurship. In his work, Bates refers to this “practice of grouping entrepreneurs into overly broad
classifications, without regard to industry-specific conditions” as “quite common,” explaining that this tendency “only increases the imprecision of the research results and interpretations generated” (Bates 1995, 144). In order to increase the precision of empirical analysis, some scholars have begun addressing important industry characteristics that affect entrepreneurship. Two key characteristics include industry growth size and varying barriers to entry.

**Industry Growth Rates**

According to McDougall (1994), industry size and growth rates serve as a key component of industry structure, and they act as primary indicators of market attractiveness for new ventures, serving as “the most important criterion” for venture capitalist funding decisions (McDougall 1994, 538). When considering the effect of industry growth on startups, Porter (1980) argues that rapid industry growth ensures that incumbents can maintain a strong financial performance even though a new entrant takes some market share. As a result, new ventures entering into rapidly growing industries would provoke less retaliation by incumbent firms (McDougall 1994, 538).

**Industry Barriers to Entry**

In addition to industry growth rates, industry-specific barriers to entry have been linked to entrepreneurial activity. These barriers include economies of scale, product differentiation, capital requirements, switching costs to buyers, unequal access to distribution channels, and cost disadvantages independent of scale (Porter 1980). According to Bates, the nature of different barriers varies substantially across small
business sectors (Bates 1995, 144). As a result, scholars such as Sandberg (1987) find that: 1) new ventures are more successful in industries with heterogeneous products than in those with homogeneous products; 2) new ventures are more successful in industries which are in the development or growth stages of evolution; and, 3) disequilibrium makes successful entry more likely. (Sandberg 1987,20)

**Part IV. Research Statement**

In order to contribute to contemporary analysis of U.S. entrepreneurship, this paper will look to further analyze why and when entrepreneurship occurs in different industries across the United States. To do this, the paper will address the potential effects of several economic factors upon the creation of new establishments across major U.S. industries\(^2\) from 1977-1997\(^3\). Specifically, this paper will attempt to answer the following research question:

**Which of the following economic characteristics have the greatest effect on the number of new establishments across major industries in the United States: value-added as a percent of U.S. GDP, national unemployment rates, or periods of economic recession?**

\(^2\) As characterized by the United States Census Bureau's Standard Industrial Classification System (SIC)

\(^3\) Due to changes in industrial classification codes, which occurred in 1997, data from 1998-Present cannot be combined with the pre-1998 data, and therefore, must be omitted.
Part V. Methodology

Overview

In order to answer this research question, I will address data trends as well as paired correlations and multi-linear regressions to determine the potential effects of the three economic factors (dependent variables) on the creation of new establishments in the United States (independent variable).

Defining Entrepreneurship as a Dependent Variable

Within this paper, I define entrepreneurship as the exploitation of profitable opportunities through the creation of a new organization that occurs as a context-dependent process. To measure entrepreneurship in the United States I will use the number of new establishments each year as measured by the United States Census Bureau’s Statistics of U.S. Businesses.

Selecting Explanatory Variables

In order to further analyze why and when entrepreneurship occurs in different industries across the United States, I have selected value added as a percentage of U.S. GDP (VA\%GDP), national unemployment rates (UNEMP), and a proxy variable for periods of economic recession (PROX) as my explanatory variables.

By addressing value added as a percentage of U.S. GDP, I look to determine the degree in which industry size affects the number of new startups in the United States across different industries. Through trend analysis I also attempt to make projections regarding the effect of changes in VA\%GDP on new establishments across different
industries. By addressing national unemployment rates, I look to determine the effect of unemployment rates on new establishments across different U.S. industries. Finally, I use a proxy variable for recession in order to determine whether periods of economic downturn affect the creation of new establishments across various industries.

**Characterizing Industries**

In this paper, I categorize major U.S. industries using the Standard Industrial Classification (SIC) system as defined by the United States Census Bureau from 1977-1997 (Figure 1). Additionally, when making references to industry-specific characteristics, I am referring to the characteristics of one of the nine major industry groups. (This analysis does not analyze the characteristics of individual industries within the subset of major industries.)

### Figure 1

<table>
<thead>
<tr>
<th>SIC Code</th>
<th>Major Industry Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>07--</td>
<td>Agriculture, Forestry, and Fisheries (AGR)</td>
</tr>
<tr>
<td>10--</td>
<td>Minerals and Mining (MIN)</td>
</tr>
<tr>
<td>15--</td>
<td>Construction (CON)</td>
</tr>
<tr>
<td>20--</td>
<td>Manufacturing (MAN)</td>
</tr>
<tr>
<td>40--</td>
<td>Transportation, Communications, and Utilities (TCU)</td>
</tr>
<tr>
<td>50--</td>
<td>Wholesale Trade (WHO)</td>
</tr>
<tr>
<td>52--</td>
<td>Retail Trade (RET)</td>
</tr>
<tr>
<td>60--</td>
<td>Finance, Insurance, and Real Estate (FIRE)</td>
</tr>
<tr>
<td>70--</td>
<td>Services (SRV)</td>
</tr>
</tbody>
</table>

**Overview of Statistical Analysis**

This report addresses trends in the number of new establishments across nine major U.S. industries from 1977-1997, comparing the data with trends in value added growth as a percentage of U.S. GDP, U.S. unemployment rates, and periods of economic

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4 *http://www.census.gov/apsd/techdoc/cbp/cbp96/sic-code.pdf*
recession from 1977-1997. Through the analysis, I examined paired correlations and multivariable regression analysis for each industry to analyze the number of start-ups that can be predicted by each of the explanatory variables. In order to construct the model, I used paired correlations to determine which explanatory variable accounted for the largest portion of predicted startups within an industry as indicated by the largest adjusted R Squared value. To reduce the potential effects of multicollinearity within my models, I ran the model using the first variable. Then, I calculated the residuals and ran a second paired correlation between the residuals and the remaining two explanatory variables. The variable with the best fit to the residuals, as measured by the highest adjusted R Squared value, was then added into the model. In the case that neither variable explained the residuals to a significant degree, only the initial variable was used in the model. Due to my sample size of 21 data points, each model only contained one or two explanatory variables.

**Part VI. Hypotheses**

I side with Bates (1995) that universal predictions cannot necessarily be made across major U.S industries, and therefore, I believe that:

**H1:** Startup establishments across different industries in the United States will exhibit differing degrees of response to each explanatory variable.

Additionally, I side with McDougall (1994), recognizing the importance of industry size and growth as an integral variable in predicting entrepreneurial activity.
Since I recognize value added as a percentage of U.S GDP as an accurate metric of an industry’s size within the U.S. economy, I hypothesize that:

**H2: Value added as a percent of US GDP (VA%GDP) will have the largest effect on startup creation across major U.S. industries, and I hypothesize that this correlation will be positive.**

When considering the effect of economic recession on entrepreneurship, I side with Kedrosky’s speculation that pessimistic expectations on the part of economic agents will reduce the propensity for entrepreneurs to start new establishments (Kedrosky 2008). Additionally, I believe that overlapping negative effects of recession on access to capital and unemployment will further dampen start-up creation during recessions. As a result, I hypothesize that:

**H3: Periods of economic recession, indicated by a proxy variable (PROX), will have the second largest effect on the number of new establishments in the United States across major industries and that this correlation will be negative.**

Despite claims that high unemployment rates increase human capital available for new establishment creation, I again side with Kedrosky’s assertion that high unemployment rates might make potential entrepreneurs less likely to leave the security of current jobs or take risks to pursue new ventures (Kedrosky 2008). As a result, I hypothesize that:
**H4: National U.S. unemployment rates (UNEMP) will have the third largest effect on startup creation across major U.S. industries, and this correlation will be negative.**

**Part VII. Empirical Findings**

*A Look At New Establishments Across Major Industries in the United States from 1977-1997*

New establishment creation in the United States from 1977-1997 varied dramatically across each of the major U.S industries. While some industries, such as the service industries, encountered millions of new establishments across the twenty-year period, other sectors such as the mining sector exhibited a relatively small number of new establishments. Relative ranges, average annual statistics, and standard deviations provide further evidence illustrating the differences in new establishment creation across major industries from 1977-1997 (Figure 2).

**Figure 2**


<table>
<thead>
<tr>
<th>Industry</th>
<th>TOTAL</th>
<th>AVG</th>
<th>STDEV</th>
<th>MAX</th>
<th>MIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, Forestry, and Fishing</td>
<td>217101</td>
<td>10338</td>
<td>2452</td>
<td>13900</td>
<td>6958</td>
</tr>
<tr>
<td>Construction (CON)</td>
<td>1644921</td>
<td>78330</td>
<td>10720</td>
<td>93701</td>
<td>54277</td>
</tr>
<tr>
<td>Finance, Insurance, &amp; Real Estate</td>
<td>1309203</td>
<td>62343</td>
<td>10402</td>
<td>84732</td>
<td>47978</td>
</tr>
<tr>
<td>Manufacturing (MAN)</td>
<td>749145</td>
<td>35674</td>
<td>2798</td>
<td>39903</td>
<td>30199</td>
</tr>
<tr>
<td>Mining (MIN)</td>
<td>84404</td>
<td>4019</td>
<td>1418</td>
<td>7998</td>
<td>2277</td>
</tr>
<tr>
<td>Retail Trade (RET)</td>
<td>3825677</td>
<td>182175</td>
<td>17845</td>
<td>231990</td>
<td>157865</td>
</tr>
<tr>
<td>Services (SRV)</td>
<td>4759295</td>
<td>226633</td>
<td>28236</td>
<td>288793</td>
<td>180768</td>
</tr>
</tbody>
</table>
Industry-Specific Trend Analysis

When addressing the changes in new establishments from 1977-1997 using industry-group data, fluctuations indicate general periods of peaks and troughs as well as noticeable similarities between different industries such as services and retail trade. Additionally, different U.S. sectors illustrate different overall levels of entrepreneurial activity.

Figure 3

![Graph showing new establishments by SIC codes from 1977 to 1997](image)

Figure 4
Comparing New Establishments with Changes in VA% GDP Over Time

When comparing the number of new establishments across industries with the subsequent levels of value added as a percent of GDP (VA%GDP), it becomes apparent that levels of entrepreneurial activity within an industry are not necessarily related to the size of the industry within the U.S. economy. For example, even though the service industry is the largest in size and entrepreneurial activity, the retail industry illustrates high levels of entrepreneurial activity despite a moderate overall size. This data indicates that the relative size of an industry is not necessarily an exact predictor of the actual level of entrepreneurial activity in the industry.

Despite the fact that the size of the industry within the U.S. economy doesn’t seem to have a dominating effect on corresponding levels of entrepreneurship, industries
encountering increased growth in VA%GDP over time do appear to exhibit higher levels of entrepreneurship. For example, the service sector illustrated the sharpest increase in VA%GDP from 1977-1997 and exhibits the highest levels of entrepreneurship. Likewise, the manufacturing sector shows the largest decrease in VA%GDP over time, and it has one of the lowest levels of entrepreneurship. Despite these tendencies, we still find that some industries, such as retail, which have shown stagnant VA%GDP growth, continue to encounter higher levels of new establishments.

Figure 5

Comparing New Establishments with Changes U.S. Unemployment Rates Over Time

Figure 6 illustrates the number of startups across major United States industries from 1977-1997, as well as annual average U.S. unemployment rates (in red). By analyzing the graph, we see that low unemployment rates in 1983 and 1993 mirrored low
entrepreneurial activity within the service and retail industries. In 1987, however, low unemployment rates mirrored peaks in entrepreneurial activity within the retail and service sectors. Looking at trends over time, it appears that falling unemployment rates are associated with rising startups in many sectors especially during the mid 1980’s. These trends appear less evident during the early 1990’s, however.

Figure 6

Comparing New Establishments with Periods of Economic Recession

When considering periods of economic recession\(^5\), entrepreneurship across different industries exhibits various responses. Figure 7 shows that during the recession from 1981-1982, manufacturing and construction saw diminished levels of

\(^5\) As defined by the National Bureau of Economic Research (NBER)
entrepreneurial activity while the service sector and the retail sector actually saw dramatic increases in entrepreneurial activity.

Subsequent recessions, such as the one in 1990-1991, included a larger drop in entrepreneurial activity across numerous sectors. In the case of the finance, insurance, and real estate sector (FIRE), however, a large number of new establishments were created. Based on these variations, the data suggests that entrepreneurial activity exhibits varying responses to periods of economic recession.

**Figure 7**

![New Establishments (by SIC Codes) 1977-1997](image)

**Summary of Trend Analysis**

While trend analysis provides an initial platform to analyze the effects of VA%GDP, unemployment rates, and recession upon startups in the United States, attempts to make firm postulates remain confounded. Firstly, almost all of the trends lack universal patterns both within and across industries. Additionally, when we address startup
trends against the three independent variables, we do not address potential problems with multicollinearity. For example, periods of recession are often characterized by high unemployment rates. As a result, it is hard to determine which explanatory variables actually have the greatest effect on U.S. entrepreneurship. In order to reduce confounding factors, I will now examine paired correlations and multivariable regression analysis.

Multivariable Regression Analysis

In my multivariable regression analysis, value added as percentage of U.S. GDP was the dominant explanatory variable, appearing statistically significant within six of the nine industry models. Unemployment was the second most important explanatory variable, earning statistical significance in three of nine industry models. The proxy variable for recession acted as the weakest explanatory variable, appearing in only one model, and even then wasn’t statistically significant. Figure 7 below summarizes these findings. Numbers listed in bold indicate statistically significant values, and the t-statistics for each value are listed immediately underneath in parenthesis.

The agriculture, forestry, and fishing industry (AGR) as well as the finance, insurance, and real estate industries (FIRE) were the only two industries in which both explanatory variables exhibited statistical significance. Conversely, the wholesale goods industry (WHO) and the transportation, communications, and utilities (TCU) industries were the only industries lacking a single statistically significant explanatory variable.

Figure 8: Summary of Modeling Results

<table>
<thead>
<tr>
<th>Sector</th>
<th>Constant</th>
<th>VA%GDP Coeff.</th>
<th>UNEMP Coef.</th>
<th>Rsquare</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGR</td>
<td>25190.422*</td>
<td>-4614.084*</td>
<td>-886.0918*</td>
<td>0.844791</td>
</tr>
</tbody>
</table>

24
Analysis of Industries Exhibiting Two Explanatory Variables of Statistical Significance:

The agriculture, forestry, and fishing industries as well as the finance, insurance, and real estate industries were the only two industries exhibiting two explanatory variables of statistical significance. In both cases, value added as a percentage of U.S. GDP and national unemployment rates had statistically significant coefficients.

In the agriculture, forestry, and fishing industry the RSquare value of .844 indicated that an expected 84.4% of new establishments can be predicted by both explanatory variables. Within the finance, insurance, and real estate industry, an RSquare value of .702 indicated that VA%GDP and UNEMP predicted approximately 70% of new establishments. Interestingly, the AGR industry was the only industry to exhibit a negative correlation between VA%GDP and new establishments. While many factors could have contributed to these, it is possible that consolidation within the agricultural industries in which larger agribusinesses absorbed smaller farms facilitated growth in
VA%GDP while negating and even reducing the creation of new establishments in the sector.

Analysis of Industries Exhibiting VA%GDP as the Only Statistically Significant Explanatory Variable:

Throughout the analysis, VA%GDP was the only statistically significant explanatory variable within the mining, manufacturing, retail, and service industries. In the manufacturing industry, VA%GDP only predicted a relatively small increase in new establishments, while it predicted a greater degree of change within the mining industry. Analysis of the retail and services industries, two of the largest in terms of average annual number of new establishments, also indicated VA%GDP as a statistically significant predictor of new establishments within each industry. Interestingly, predicted change in the retail sector was almost five times higher than in the service sector, despite the service sector’s larger overall number of average startups each year.

Analysis of Industries Exhibiting U.S. Unemployment Rates as the Only Statistically Significant Explanatory Variable

Unemployment was the only statistically significant explanatory variable of new establishments for the construction industry. The correlation was negative, and small considering the annual average of startups within the sector so we know what….

Analysis of Industries Exhibiting No Statistically Significant Explanatory Variables
None of the three explanatory variables used within the model exhibited statistical significance with the wholesale industry and the transportation, communication, and utilities industries. Looking back at trend data, new establishments across both of these sectors from 1977-1997 exhibit similar peaks and troughs, indicating potential similarities between the sectors. One potential explanation for the lack of significance between new establishments and the explanatory variables could be the possibility that entrepreneurship within both sectors rely more heavily on global, rather than domestic economic factors. As a result, domestic economic shifts might have had less of an effect on these industries.

**Part VIII. Conclusions**

Through the course of this study, trend analysis and multivariable analysis provided new insights concerning the creation of new establishments across major U.S industries from 1977-1997 by yielding data on four original hypotheses.

**H1: Startup establishments across different industries in the United States will exhibit differing degrees of response to each explanatory variable.**

In my analysis, major U.S. industries did illustrate variation in statistically significant explanatory variables, and the extent to which the explanatory variables predicted new establishments differed across each industry. As a result, this analysis helps prove the legitimacy of my first hypothesis and promotes the premise that economic factors have different effects on entrepreneurship across different U.S. industries.
H2: Value added as a percent of US GDP (VA%GDP) will have the largest effect on startup creation across major U.S. industries, and I hypothesize that this correlation will be positive.

VA%GDP was used in eight of nine industry models, and it was statistically significant in six out of nine industries. It was positive in five of these six cases with the AGR industry being the one exception. In looking at trend data, it also appeared that increases in VA%GDP correlated with higher levels of new establishments over time. Collectively, this data supports my second hypothesis, indicating that the size of an industry has a significant effect on expected number of new establishments.

H3: Periods of economic recession, indicated by a proxy variable (PROX), will have the second largest effect on the number of new establishments in the United States across major industries and that this correlation will be negative.

The proxy variable was only used within the model for the transportation, communication, and utilities industry, and it was not statistically significant. These results indicate that my third hypothesis was incorrect. These findings are surprising considering the prevalence of scholarly speculation regarding the potential effects of recession upon entrepreneurship.

Several potential explanations for these results exist. One explanation for statistical insignificance of the proxy variable for recession could have resulted from the way in which each model was designed. In order to select explanatory variables while avoiding potential confounding effects of multicollinearity, I analyzed initial paired
correlations to determine a primary explanatory variable. I then analyzed paired
correlations between the residual plot of the initial variable and the remaining
explanatory variables in order to determine the second explanatory variable.

It is possible that even though the PROX variable did exhibit a correlation with
new establishments across different U.S. industries (as indicated by a relatively large
RSquare value), other variables such as VA%GDP or UNEMP exhibited higher
correlations. As a result, these variables were placed in the model first. Since variables
such as VA%GDP and UNEMP often correlate with periods of economic recession, it is
possible that the PROX variable was too similar to the initial explanatory variable to
explain a significant portion of the residual plot. As a result, it was not placed into a large
portion of the industry models.

H4: National U.S. unemployment rates (UNEMP) will have the third largest effect on
startup creation across major U.S. industries, and this correlation will be negative.

Unemployment was used in eight of the nine models, and it was statistically
significant in three of them including construction, agriculture, and finance, real estate,
and utilities. Within these three models, it was negative each time. This data supports my
third hypothesis, suggesting that high levels of unemployment hinder the creation of new
startups across several U.S. industries.

Potential Policy Implications
While a large portion of the data remains inconclusive, the variance in findings indicates that sector-specific conditions must be taken into consideration in order to accurately predict the potential effects of economic factors upon entrepreneurship.

As new data continues to highlight the link between entrepreneurship and economic growth, job creation, and policy, scholars must consider each industry independently in order to correctly predict U.S. entrepreneurship. Additionally, strategists must consider industry characteristics to develop targeted and effective programs and policies that improve or enhance entrepreneurship.

*Study Limitations and Potential for Further Research*

Even though this study analyzes data disaggregated by major U.S. industries, greater disaggregation based on different sub-industries would further increase the precisions of empirical analysis on entrepreneurship. Additionally, this study only considers startup creation up until 1997, due to changes in coding and limited access to continuous data sets. By utilizing more recent data sets, scholars can better understand how current economic shocks have affected U.S. entrepreneurship.

While this paper discusses potential predictors of new establishments across major industries within the United States, it does not address which economic variables affect the performance and life span of these new establishments. To truly understand the lasting effects of entrepreneurial activity on the U.S. economy it will be important to further analyze performance metrics.

Finally, this paper addresses industries within the U.S. without providing much analysis on global economic factors. As globalization continues to change the U.S.
economy it will be come more important to address the affects of global shocks on entrepreneurship across different industries in the United States.
Part IX. Appendices

A. Definitions

- **Employment** - Paid employment consists of full and part-time employees, including salaried officers and executives of corporations, who were on the payroll in the pay period including March 12. Included are employees on sick leave, holidays, and vacations; not included are proprietors and partners of unincorporated businesses. (US Census Bureau, Statistics of US Business)

- **Entrepreneur** - a person who establishes a new organization in response to a problem (Shane)

- **Entrepreneurship**: “the scholarly examination of how, by whom, and with what effects opportunities to create future goods and services are discovered, evaluated, and exploited” (Shane)

- **Entrepreneurial Activity**: Creation of a new organization to solve a problem, which can be measured by the number of new organizations created each year.

- **Establishment** - A single physical location where business is conducted or where services or industrial operations are performed. (US Census Bureau, Statistics of US Business)

- **Firm** - A firm is a business organization consisting of one or more domestic establishments in the same state and industry that were specified under common ownership or control. The firm and the establishment are the same for single-establishment firms. For each multi-establishment firm, establishments in the same industry within a state will be counted as one firm- the firm employment
and annual payroll are summed from the associated establishments. (US Census Bureau, Statistics of US Business)

- **Recession** - A recession is a significant decline in economic activity, measured by the job market, inflation-adjusted income, the total amount of goods and services produced by a country and other indicators. It begins when a country reaches a peak of economic activity and ends when the country reaches its trough. The period on the way up from the trough to the peak is known as an expansion. (National Bureau of Economic Analysis).

- **Unemployment** - People who are jobless, looking for jobs, and available for work are unemployed (Bureau of Labor Statistics)

- **Value added** – “This usually refers to firms where it is defined as the value of the firm’s output minus the value of all its inputs purchased from other firms. It is therefore a measure of the profit earned by a particular firm plus the wages it has paid. As a rule, the more value a firm can add to a product, the more successful it will be” (“A-Z Economics”).

- **RSquare Adj** – adjustment of the traditional RSquare value – which measure the proportion of the variation around the mean where a value of 1 indicates a perfectly fitted model and a value of 0 indicates a model which does not improve on the simple mean model – to make it more reliable for models with varying numbers of parameters by including degrees of freedom through the taking the ratio of mean squares (“JMP 8 Statistics and Graphics Guide”).

- **p-value** (also denoted as Prob > F) – “the probability, calculated assuming the null hypothesis is true, of obtaining a test statistic value at least as contradictory to the
null hypothesis as the value that actually resulted. The smaller the p-value, the more contradictory is the data to the null hypothesis” (*Probability and Statistics, Jay L. Devore*).

B. Data Sources

*Business Dynamic Statistics*

According to their website, the new Business Dynamics Statistics (BDS) are a product of the Center for Economic Studies of the U.S. Census Bureau. The annual series describes establishment-level business dynamics along dimensions such as age and firm size. The BDS series provides annual statistics for startups in different industries 1976-2005. Using the BDS, I will be able to determine the number of new establishments as well as job creation and job destruction across different industries prior to 2005.

*Statistics of United States Businesses*

According to their website, the Statistics of U.S. Businesses (SUSB) is an “annual series that provides national and subnational data on the distribution of economic data by enterprise size and industry… The series excludes data on nonemployer businesses, private households, railroads, agricultural production, and most government entities.”

The records of the SUSB data on employment go back as far as 1989. From 1989-1997 the SUSB utilized the SIC system, and in 1998 the SUSB began classifying organization based on the NAICS. This will provide me with sector-specific information on the number of startups and employment across industries after 1989.
Annual Survey of Manufactures (ASM)

According to their website, “the ASM provides sample estimates of statistics for all manufacturing establishments with one or more paid employee. It also provides data on employment, payroll, supplemental labor costs, cost of materials consumed, operating expenses, value of shipments, value added as a percent of U.S. GDP by manufacturing, detailed capital expenditures, fuels and electric energy used, and inventories.”

The United States Small Business Administration

The US Small Business Administration provides information on businesses in the U.S dating back to 1977 across different industries. Their data includes the number of firms created and annual employment across different sectors.

Bureau of Economic Analysis

The BEA provides relevant data on the annual industry accounts. Within the data, the BEA provides information on the value added as a percent of U.S. GDP across different industries over time during the years of 1947-1997 under the SIC and from 1998-Present under the NAICS.

According to their website, "The GDP-by-industry accounts include estimates of value added as a percent of U.S. GDP by industry. Value added as a percent of U.S. GDP is a measure of the contribution of each private industry and of government to the Nation's GDP. It is defined as an industry's gross output (sales or receipts and other operating income, commodity taxes, and inventory change) minus its intermediate inputs (energy, raw materials, semi-finished goods, and purchased services). BEA publishes
current-dollar estimates of an industry’s gross output and intermediate inputs, as well as the composition of its value added as a percent of U.S. GDP, which consists of compensation of employees, gross operating surplus, and taxes on production and imports, less subsidies. Chain-type price and quantity indexes of gross output, intermediate inputs, and value added as a percent of U.S. GDP are published by industry. Contributions to the percent change in real GDP are also published by industry group.” (“Industry Accounts Information Guide”).
Part X. Bibliography


United States Small Business Administration. www.sba.gov. 5/3/20

