Unemployment and New Business Entry

By:

Stephen Johns

Submitted in partial fulfillment of the requirements for
the degree of Bachelor of Arts in Economics
from Washington & Jefferson College
Fall 2021

Abstract

This study investigates the effect of unemployment on the establishment entry rate. The expected relationship between unemployment and establishment entry is a negative quadratic relationship, where rising unemployment rates will contribute to increased establishment entry until the unemployment rate is too high, signaling a poor economy and causing establishment entry to fall. This study samples all counties in the United States from 2005 to 2015. The results show that there is a cubic relationship between the unemployment rate and establishment entry rate rather than a quadratic relationship. The cubic model has two turning points to reflect the relationship between unemployment and establishment entry. When the labor market is tight, there is a negative relationship between unemployment and establishment entry until the unemployment rate reaches 5.88%. Then there is a positive relationship between unemployment and establishment entry until the unemployment rate reaches 16.82%, where the relationship becomes negative again.

Introduction

Entrepreneurs are very important to the success of the economy. They create businesses that employ workers as well as offer a product or service that people can consume. Entrepreneurs are also often responsible huge technology improvements and other important innovations (Cheng & Li, 2011). Entrepreneurship can be measured by the number of new businesses that are formed in a given area. Different measurements that are used to represent new businesses forming include the establishment entry rate (Carree, 2002), and the firm birth rate (Cole, 2018). Given that entrepreneurship is important for the economy, it is all the more important to see how unemployment affects entrepreneurship (Cole, 2018). The goal of this study is to find the relationship between unemployment and entrepreneurship, which is done by sampling all United States Counties from 2005-2015. The primary idea of this study is that low but rising unemployment will actually help entrepreneurial activity until unemployment is too high, as represented by an inverse quadratic relationship between the unemployment rate and the establishment entry rate as used by Cole (2018). In this scenario, low but rising unemployment rates will contribute to raising the establishment entry rate until the unemployment rate is too high, causing the establishment entry rate to fall. However, the regression results using the inverse quadratic relationship showed that the relationship between the unemployment rate and the establishment entry rate was opposite of what was expected. Rather than an inverse quadratic relationship, the relationship was quadratic. This means that as the unemployment rate was low and increasing, the establishment entry rate decreased. To solve this issue, a cubic term was added for the unemployment rate showing when the labor market is tight and unemployment is very low, the establishment entry rate is falling. The establishment entry rate continues to fall until the unemployment rate reaches 5.88%, providing more incentive for the unemployed to start their own businesses. The establishment entry continues to increase as the unemployment rate increases until the unemployment rate reaches 16.82%, signaling a poor economy and causing the establishment entry rate to fall again.

Literature Review

Entrepreneurship is very important for innovation and for boosting economic growth, which is why it is important to understand the relationship between unemployment and entrepreneurship. The relationship between unemployment and entrepreneurship is highly debated, and many studies try to find whether increased unemployment helps entrepreneurship or makes it more difficult. There is a plethora of research on this topic at the state and national level, but this topic is often overlooked at the county level. Overlooking the effect of unemployment and entrepreneurship at the county level can lead to an over-generalization of the relationship that can lead to policy changes that are meant to help with unemployment or job creation but are ultimately misguided (Cole, 2018).

Entrepreneurship is often defined as the act of being an individual who takes the risk of starting their own businesses. Individuals do this due to the belief that there is more money to be made by starting their own business than there is in any existing wage alternative, and Cole (2018) uses the firm birth rate to measure entrepreneurship.

While the relationship between unemployment and firm births is important to understand in order to effectively create policies, this relationship has been shown to have conflicting results. Therefore it is uncertain if low levels of unemployment help to increase or decrease firm births. Many different hypotheses have been tested to figure out the exact nature of the relationship. One of these hypotheses is the Unemployment-Push Hypothesis which states that due to higher unemployment, less job opportunity, and low economic growth, individuals are forced to employ themselves because of the resulting short-supply of paid employment. This relationship would point to a positive effect between unemployment and firm births, where higher unemployment means increased firm births (Carree, 2002).

Another of these hypotheses is the Demand-Pull Hypothesis which states that higher unemployment could mean less income for individuals which will ultimately result in lower product demand. Lower demand and a higher risk of bankruptcy means that a significant amount of new firm births is unlikely (Audretsch, 1995). Another factor of this hypothesis is that while some unemployed individuals may create successful business ventures, most of the unemployed will lack the skills needed to create a new business and keep it running (Rissman, 2006). So in this hypothesis, higher levels of unemployment means a decreased number of firm births.

There is also the Entrepreneurship Hypothesis which suggests that there is a reverse relationship between unemployment and firm births. This hypothesis states that new firms will form which will create new jobs that will contribute to economic growth and ultimately reduce unemployment. Increased firm births will lead to greater competition among businesses and cause production, labor demand, and productivity to increase, reducing unemployment in the process (Picot, Garnett, Manser, and Lin, 1998). This hypothesis is predicting that as more firms are created, unemployment decreases.

Cole (2018) tested a hypothesis where there is a certain threshold of unemployment where if the unemployment rate is below that threshold then the relationship between unemployment and firm births is positive, as predicted in the unemployment-push hypothesis (Caree, 2002). Then if the unemployment rate is above that threshold, then the relationship is negative, as predicted in the demand-pull hypothesis (Audretsch, 1995). This is shown in the form of an inverse quadratic relationship. Levels of unemployment below the threshold are associated with greater market opportunity which attract the unemployed to create their own businesses, knowing that they will face less competition and less barriers to entry given that most of their potential competitors still have jobs. But, as the unemployment rate rises above the threshold, opportunity begins to lessen as competition becomes stiffer, causing new firm formation to decrease. After testing this hypothesis, Cole (2018) found that the firm birth rate did increase under the threshold unemployment level, and that the firm birth rate did decrease above the threshold unemployment level. These findings strengthen the case for policies to be made that try to help entrepreneurs form new businesses, and to try to keep the unemployment rate below the threshold rate.

Cole (2018) looked at another hypothesis that tested whether unemployment was permanently reduced where there were higher levels of firm births, or if unemployment was only temporarily reduced due to new firms causing more competition that later reduced further firm births. The theory tested was that the firm birth rate can increase up to a certain threshold while still decreasing the unemployment rate, but once that threshold is met, the unemployment rate begins to increase again. After testing this hypothesis, it was confirmed that firm births initially create more jobs and reduce unemployment but increasing the number of firms over time creates stiffer competition and reduce further firm births and raise unemployment as a result (Cole 2018). Policies implemented beyond this threshold could be misguided and lead to worsening the unemployment situation.

When studying the relationship between unemployment and firm births, there are other important variables to consider such as industry because the impacts of unemployment on firm creation may vary across different industries (Audretsch and Fritsch, 1999). Industries play an important role in this relationship and neglecting industry data has consequences on any results involving this relationship (Carree, 2002). Cheng and Li (2011) controlled for the NAICS industries, and the study found that unemployment did stimulate firm creation in various parts of the country, with notable positive effects in the manufacturing, information, finance, insurance, real estate, and professional and business services industry groupings. They then concluded that unemployment spurred new firm creation by varying degrees across industries and geographic units, which shows that “one-size fits all” policies on entrepreneurship may not be best suited for all industries. The study also controlled for several other variables that could also have a significant impact on firm creation including establishment size, industry intensity, income growth, population growth, share of proprietors, and various levels of education. One other variable that is very important to control for is education considering that areas with more educated individuals have been shown to have higher rates of firm creation (Acs and Armington, 2004).

Carree (2002) tested the relationship between unemployment and the establishment entry rate which leads to very similar results and conclusions as firm births. The establishment entry rate is measured as the number of new firms in a county in a given year as a percentage of the total firms in the county. The ultimate purpose for the study was to try to verify the Unemployment-Push Hypothesis. This study analyzes how unemployment affects the net entry rate of establishments in industries with low barriers to entry. Audretsch and Fritsch (1999) found that there was only a positive effect of unemployment on firm entry in industries with low entry barriers, which is why this study only focused on these types of industries.

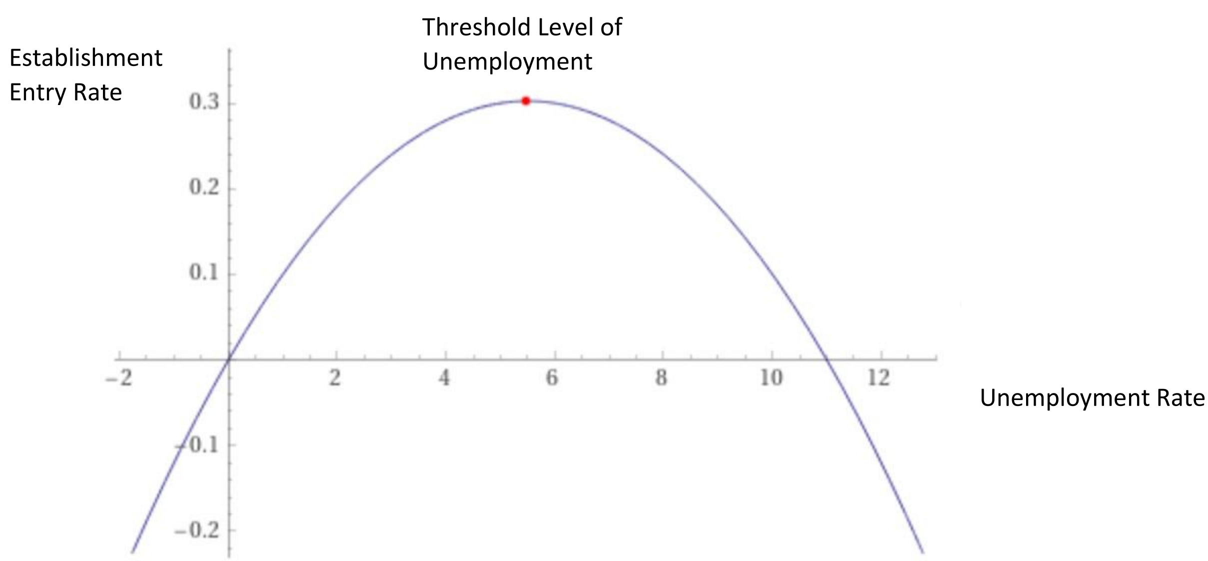
There is also some concern regarding the reverse causality between unemployment and firm births. As mentioned previously, some hypothesize that while moderately high unemployment could cause increased firm births, the increased firm births could ultimately reduce the unemployment (Picot, Garnett, Manser, and Lin, 1998). For example, Acs and Storey (2004) found that certain areas that experience increased firm births experience some degree of an economic boom shortly after. Generally speaking, this is not a bad relationship to have. The issue is that the possibility of this reverse causality makes it more difficult to verify the actual effect that unemployment has on firm births, or vice versa (Santarelli, Carree, and Verheul, 2009).

Data & Methodology

The goal of this study is to find out how the unemployment rate affects how businesses are able to form across the United States, which is important information to know so that policymakers can find ways to help entrepreneurs and keep the economy stable at various levels of unemployment (Cole, 2018). The assumed hypothesis is that the establishment entry rate will increase up to a certain threshold level of unemployment, then once that unemployment threshold is met, the establishment entry rate will decrease (Cole, 2018). This relationship can be shown in the form of a negative quadratic curve, as shown in Figure 1 below.

This study samples from every county from all 50 states and the District of Columbia, ranging from 2005 to 2015. These all add up to 33,171 observations. This timespan was chosen in order to capture the effects of the recession of 2007-2009 and to gather a wide range of data. Cole (2018) used a similar timespan which ranged from 1999 to 2010.

Figure 1: *Inverse Quadratic Model*



The establishment entry rate was chosen as the dependent variable as used by Carree (2002). Establishment entry rate was chosen over the firm birth rate due to the availability of the data. It was difficult to find sufficient data for the firm birth rate that could be used at the county level and that could be used for the 2005-2015 timespan. This data is taken from the Business Dynamics Statistics dataset using U.S. Census data, which sufficiently covered the selected timespan. The establishment entry rate is measured as the number of new firms in a county as a percentage of the total firms in the county, averaged over the current and previous year.

The main variable of interest is the unemployment rate. The unemployment rate data for each county is measured using the annual average, and this data comes from the Bureau of Labor Statistics. In order see the quadratic effect as use by Cole (2018), the unemployment rate squared term is needed.

One of the main variables this study controls for is industry. The industry data used in this study comes from the 2015 Economic Research Service (ERS) County Typology Codes where six industry categories are measured including farming, mining, manufacturing, government, recreation, and a nonspecialized category. This data covers every county in the United States and the District of Columbia but is taken from 2010-2012 averages rather than having independent values for each year. It was difficult finding other industry data that concisely captured the industry makeup of each county across the necessary timespan, and the industry makeup over this timespan should not have any significant change, so this data is effective. Each industry category is measured by a dummy variable that indicates whether a given county is dependent on each specific industry. Each industry is different when it comes to determining whether a county is dependent upon it. If a county is dependent upon farming, then farming accounted for at least 25% of that county's earnings or at least 16% of the county's employment average.

If a county is dependent upon mining, then mining accounted for at least 13% of the county's earnings or at least 8% of the county's employment average. If a county is dependent upon manufacturing, then manufacturing is responsible for at least 23% of the county's earnings or at least 16% of the county's employment average. If a county is dependent upon government, then federal and state government accounted for at least 14% of the county's earnings or at least 9% of the county's employment average. Recreation counties were computed using the percentage of wage and salary employment in entertainment and recreation, accommodations, eating and drinking places, and real estate as a percentage of all employment reported by the Bureau of Economic Analysis, the percentage of total personal income for the same categories as reported by the Bureau of Economic Analysis, and the percentage of vacant housing units intended for seasonal or occasional use reported in the 2010 Census. These percentages were then converted to z-scores and combined into a weighted-index, where weights of 0.3 were assigned to income and employment and 0.4 to seasonal housing, to reflect any recreational activity. If a county is dependent upon recreation, there had to be an index score of 0.67 or higher. If a county is considered nonspecialized, then the county was not dependent upon farming, mining, manufacturing, government, or recreation. These determinants of county dependeconomic Research Service.

The predicted relationship for farming and/or mining counties is unknown due to the lack of results found in the literature. Manufacturing counties have been shown to have a positive effect on establishment entry rate by Cheng & Li (2011), so the predicted relationship in this study in relation to the nonspecialized category is also positive. Recreational counties are mostly going to consist of places where many people will flock to at various points throughout the year and where businesses would want to go to capitalize on those seasons, so the predicted relationship in relation to the nonspecialized category is positive in these areas.

The predicted relationship between government-dominated counties is also unknown due to a lack of information in other literature.

Another important variable controlled for in this study is level of education taken from ERS county data. This data is collected for all United States Counties and the District of Columbia but is only available by decade spanning from 1970-2000, then 2015-2019. Education level data was also difficult to find for the selected timespan, so this data was used in order to find the approximate educational attainment of each county in given years by assuming constant growth from 2000-2015. The different levels of education available in the data include the percentage of adults aged 25 and older that completed college, the percentage of adults age 25 and older that completed some college, the percentage of adults 25 and older that graduated high school, and the percentage of adults age 25 and older that did not graduate high school. All these percentages add up to 100% so the percentage of adults that did not graduate high school was omitted in the dataset.

Looking at the predicted relationships between the various education levels and establishment entry rate, the expected relationship for the percentage of adults that completed college in relation to high school dropouts is positive. Due to the increased human capital of college graduates, it is likely that they will want to start their own businesses therefore increasing the establishment entry rate. The expected relationship for adults that completed some college and adults that only graduated high school in relation to high school dropouts is also positive, just with a smaller magnitude than adults that completed college.

Various establishment sizes are also considered in this study, coming from the U.S. Census County Business Patterns. The data given for establishment size are given in several categories measured by the number of employees working at an establishment. These categories are broken up into small, medium, and large businesses. The Small Business Association (SBA) defines a small business as a business that employs anywhere from 50-1500 employees, while the Affordable Care Act (ACA) defines a small business as a business that employs less than 50 employees (*What is Considered a Small Business?*). Considering the highest category in the establishment size data for this study is 1000 or more employees, the SBA definition cannot be used here, so a small business in this study will be defined as having anywhere from 1-99 employees. Medium sized businesses will have 100-999 employees. Large businesses will have 1,000 or more employees. The number of firms in each category are then taken as a percentage of the total establishments in the county. The large business category will be the dropped variable.

The relationship for small and medium businesses in relation to large businesses is unknown due to a lack of results from other studies. Cheng & Li (2011), controlled for establishment size to see the effect on firm births, but the study was broken up by industry and therefore had varying effects on firm births depending on the industry.

The per capita personal income data used is measured in dollars and comes from the Bureau of Economic Analysis, computed using Census Bureau midyear population estimates. This is not adjusted for inflation, and in this study the natural log of per capita personal income will be used. Income growth is measured in thousands of dollars and comes from the Bureau of Economic Analysis and is computed by taking the percent change in income from the previous midyear estimates. Population growth is measured in persons and also comes from the Bureau of Economic Analysis and is computed by taking the percent change of population from the previous midyear population estimates. Reynolds, Miller, & Maki (1995), found a positive relationship between income and firm births as well as for population growth and firm births, so that relationship should be consistent for the relationship between per capita personal income and establishment entry rate as well as for the population growth rate. Following the trend of the per capita personal income relationship, there should also be a positive relationship between income growth and the establishment entry rate.

The 9 census regions are used as dummy variables where each county will reflect which census region it falls into, and the South Atlantic region will be omitted. Predicting the relationship between the census regions and the establishment entry rate, the amount of information from the literature on this relationship is very limited since there have only been a limited number of studies done in the United States and the studies that do exist were done so in specific regions of the country, not the entire country. However, Cheng & Li (2011), did find a positive relationship between the establishment entry rate and most southern states, the New England area, and the Rocky Mountain region. Those findings would indicate that most of the census regions will most likely have a negative relationship with the establishment entry rate relative to the South Atlantic region. The only regions that would still be in question are the New England and Mountain regions.

Metro and nonmetro variables are also used in this study using the 2013 rural urban continuum codes (RUCC). The 2013 RUCC come from the ERS and categorize counties as metropolitan based on the population of the metro area the county is in, and nonmetropolitan based on their urban population and adjacency to a metropolitan area. This is measured on a scale of 1-9 for each county, where 1 is a county in a metro area of at least 1,000,000 people, 2 is a county in a metro area of 250,000-1,000,000 people, 3 is a county in a metro area of less than 250,000 people, 4 is the first nonmetro category and is a county with an urban population of at least 20,000 and adjacent to a metro area, 5 is a county with an urban population of at least 20,000 and not adjacent to a metro area, 6 is a county with an urban population of 2,500-19,999 and adjacent to a metro area, 7 is a county with an urban population of 2,500-19,999 and not adjacent to a metro area, 8 is a county that is completely rural or has an urban population less than 2,500 and is adjacent to a metro area, and 9 is a county that is completely rural or has an urban population less than 2,500 and is not adjacent to a metro area. To make this data more usable, it will be broken up into 3 categories including metro, nonmetro and adjacent to a metro county, and nonmetro and not adjacent to a metro county. The metro category will consist of counties that have a RUCC of 1, 2, or 3. Nonmetro counties adjacent to metro counties will have a RUCC of 4, 6, or 8. Nonmetro counties that are not adjacent to metro counties will have a RUCC of 5, 7, or 9. The nonmetro and not adjacent to a metro county variable will be the dropped term. Cheng & Li (2011), controlled for the RUCC but again, since the study was broken up by industry and there were varying results, the expected relationship is unknown.

Dummy variables for the years in this study will also be used in the regression, and 2005 will be the omitted variable. Due to the recession, the expected relationship between most of the years and the establishment entry rate relative to 2005 will be negative. The years 2006 and possibly 2007 may have positive relationships the establishment entry rate relative to 2005, simply because these are the only two years other than 2005 that do not take place either during the bulk of the recession or the recovery period that takes place after.

Results

The hypothesized result of this study was that the establishment entry rate would rise as the unemployment rate was low but also rising until the unemployment rate was too high for new businesses to form, causing the establishment entry rate to start falling. This relationship was represented as a negative quadratic relationship. Several regressions were run to see the negative quadratic relationship but the effects from these regressions showed that the effect was the opposite of the hypothesis, due to the coefficients of the unemployment rate and unemployment rate squared term having opposite signs than what was expected. So rather than there being an inverse quadratic relationship between the unemployment rate and the establishment entry rate, there was just a quadratic relationship. This means that as the unemployment rate rose, the establishment entry rate decreased. This result is most likely due to the inverse quadratic equation not being the best fit for this model. Another reason these regressions could have had these results is due to some of the outlier counties such as very wealthy counties that had very low and relatively constant unemployment during this time period, and other counties that had excessively high unemployment for the duration of this time period. However, after using a cubic model, the effect between unemployment and the establishment entry rate better matched the existing literature. The regressions using the cubic term for unemployment can be seen in Table 1 below.

Using the cubic model helps to control for those residential and very wealthy counties where unemployment stayed low throughout the recession and recovery. It also helps to control for mostly residential areas that are not fertile locations for new business. This can be seen on the left side of Figures 1 and 2 below, where the unemployment is low and rising and the establishment entry rate is decreasing. While the cubic model helps to control for those factors, it also picks up the intended relationship where the establishment entry rate will rise as the unemployment rises until the unemployment rate gets too high for new businesses to enter the market. Two regressions were used to capture the effects of the cubic relationship between the unemployment rate and the establishment entry rate, and a correlation matrix was used to test for multicollinearity and there was none to be concerned with.

Table 1: *Regression Results*

	Establishment Entry Rate	
Independent Variable	Regression 1	Regression 2
Unemployment Rate	-0.98*** (0.06)	-0.47*** (0.07)
Unemployment Rate^2	0.07*** (0.006)	0.05*** (0.007)
Unemployment Rate^3	-0.002*** (0.0002)	-0.002*** (0.0002)
Small Business	68.09*** (17.09)	62.39*** (16.48)
Medium Business	41.25** (17.64)	31.36* (17.08)
High School Only	-0.05*** (0.005)	-0.02*** (0.006)
Some College	-0.05*** (0.005)	-0.03*** (0.006)
College	0.01*** (0.005)	0.03*** (0.005)
ln(Per Capita Personal Income)	-2.32*** (0.11)	-0.46*** (0.13)
Income Growth	0.04*** (0.004)	0.20*** (0.004)
Population Growth	0.57*** (0.02)	0.59*** (0.02)
Metro	0.84*** (0.05)	0.72*** (0.04)
Adjacent to Metro	0.15*** (0.04)	0.12*** (0.04)
Farming	0.10	0.26***

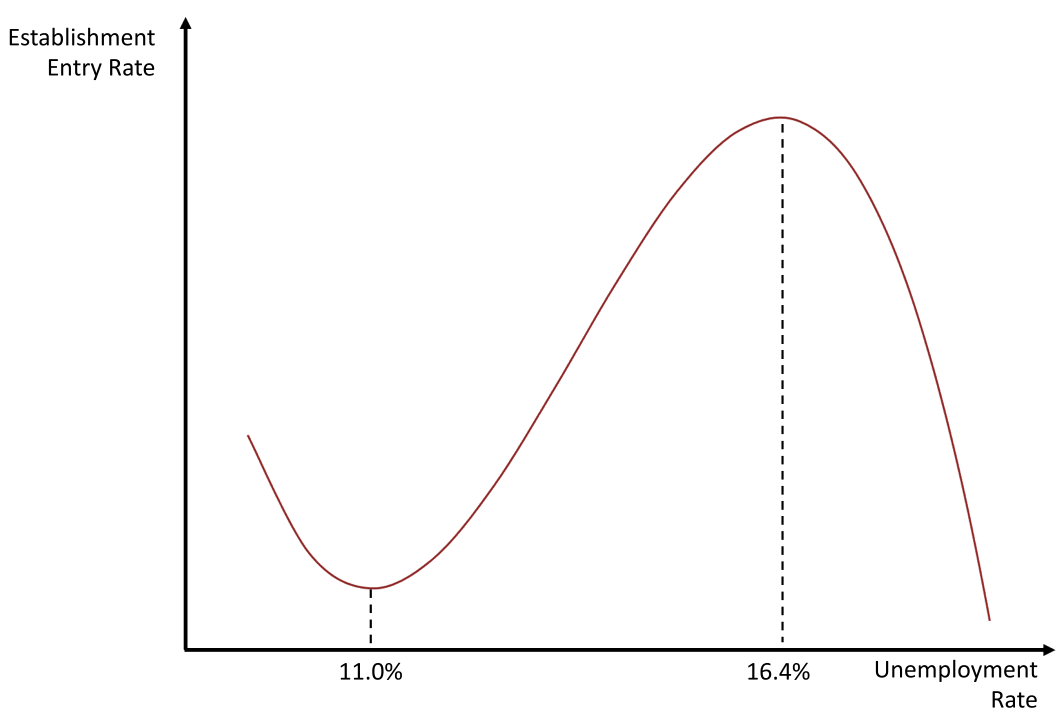
	(0.07)	(0.07)
Mining	0.55*** (0.08)	0.61*** (0.08)
Manufacturing	-0.28*** (0.04)	-0.24*** (0.04)
Government	-0.32*** (0.05)	-0.16*** (0.04)
Recreation	1.12*** (0.05)	0.95*** (0.05)
Pacific	1.25*** (0.08)	0.66*** (0.08)
Mountain	0.98*** (0.08)	1.11*** (0.08)
West North Central	-0.52*** (0.06)	-0.36*** (0.07)
West South Central	-0.26*** (0.05)	0.02 (0.05)
East North Central	-0.54*** (0.05)	-0.84*** (0.05)
East South Central	-0.23*** (0.05)	-0.28*** (0.05)
New England	-0.63*** (0.07)	-0.81*** (0.07)
Mid Atlantic	-0.49*** (0.06)	-0.68*** (0.06)
2006		0.81*** (0.07)
2007		0.12* (0.07)
2008		-1.14*** (0.07)
2009		-2.19*** (0.09)
2010		-2.14*** (0.08)
2011		-1.71*** (0.09)
2012		-1.33*** (0.08)
2013		-1.56*** (0.08)
2014		-1.40*** (0.08)
2015		-1.35*** (0.08)
Constant	-28.59* (17.08)	-45.26*** (16.46)
Number of Observations	33,171	33,171
F-Stat	420.12***	426.28***

R^2	0.2707	0.3134

Note: Robust standard errors for independent variables are shown in parentheses. The symbols *,**,*** correspond to a 10% , 5%, and 1% level of significance.

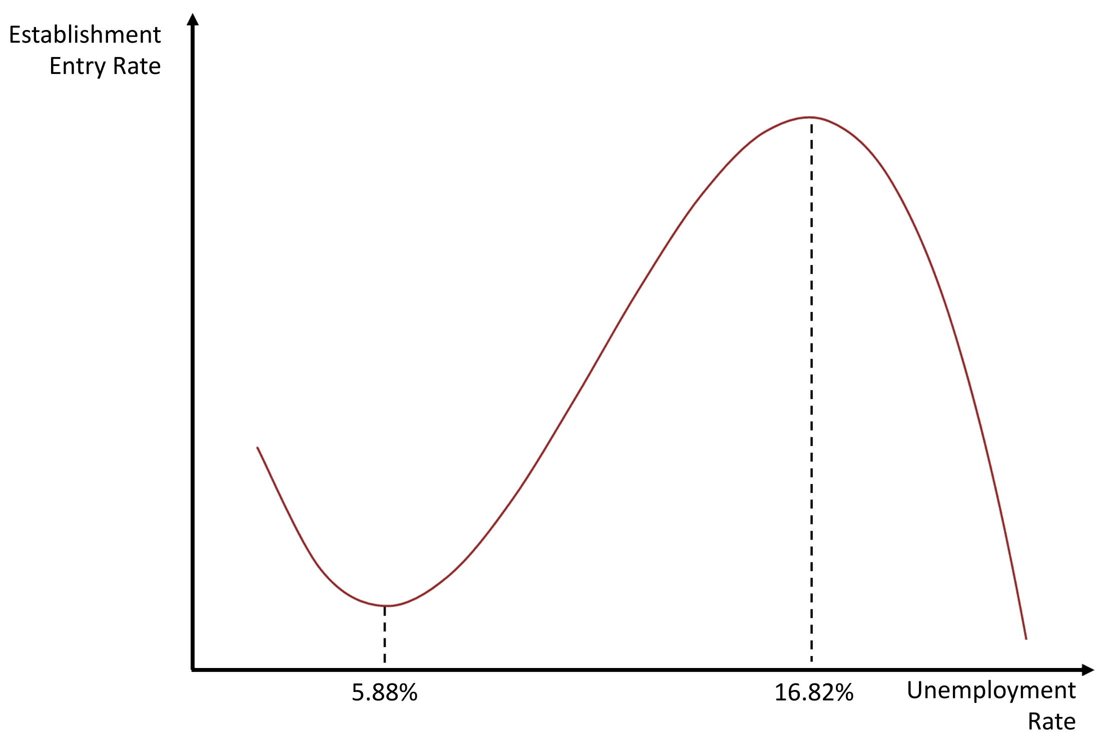
Regression 1 explains 27.07% of the variation in the establishment entry rate and does not control for the years. Regression 1 shows that the turning point for when the rising unemployment rate starts to contribute to increasing the establishment entry rate is when the unemployment rate is 11.0%, which is shown in Figure 2. This is obviously a very high and unrealistic level of unemployment for people to decide to start new businesses. The unemployment rate was very high in certain counties for a large portion of this timespan which biased these turning points upward. The model then shows that the establishment entry will continue to increase as the unemployment increases until the unemployment rate reaches 16.4%, then the establishment entry rate will decrease again.

Figure 2: *Regression 1*



Regression 2 controls for the years and explains more of the variation in the establishment entry rate than regression 1, with an R^2 value of 31.34%. Controlling for the years makes the turning point for the unemployment rate, where the establishment entry rate begins to increase as the unemployment rate increases, much more realistic. The first turning point in Regression 2 is when employment is 5.88%, then the establishment entry rate will increase until the unemployment rate reaches 16.82%, then the establishment entry rate will fall again as shown in Figure 3. Some of the bias of the high unemployment rates in particular counties is removed as a result of controlling for the years.

Figure 3: *Regression 2*



Looking now at the results of the controls, regression 2 will be used to interpret the relationships between the control variables and the establishment entry rate. The changes in the coefficients show the omitted variable bias for when years are not controlled for in the regression. If the percentage of small businesses as a percentage of total establishments increased by one percentage point, then the establishment entry rate increased by 62.39 percentage points relative to large businesses. If the percentage of medium sized businesses as a percentage of total establishments increased by one percentage point, then the establishment entry rate increased by 31.36 percentage points relative to large businesses.

One interesting result of the model is the relationship between the percentage of people only graduating high school and the establishment entry rate as well as between the percentage of people that completed some college and the establishment entry rate. If the percentage of people that only completed high school increases by one percentage point, then the establishment entry rate decreases by 0.02 percentage points relative to the percentage of high school dropouts. If the percentage of people that completed some college increases by one percentage point, then the establishment entry rate decreases by 0.03 percentage points relative to the percentage of high school dropouts. It seems counterintuitive that an increase in the percentage of high school dropouts would have a more positive effect on the establishment entry rate than the percentage of people that only completed high school and the percentage of people that completed some college. The reason for this is unknown. However, the relationship between the percentage of people that completed college and the establishment entry rate makes more sense. If the percentage of people that graduated college increases by one percentage point, then the establishment entry rate increases by 0.03% relative to the percentage of high school dropouts.

Another interesting relationship in the results is between the per capita personal income and the establishment entry rate. If the per capita personal income increases, then the establishment entry rate decreases. This also seems counterintuitive, but it can be rationalized. Wealthy counties could already have well-established places of business as well as expensive real estate that makes it difficult to move and start a business in those kinds of places. For income growth, if income growth increases by one percentage point, then the establishment entry rate increases by 0.20 percentage points. If population growth increases by one percentage point, then the establishment entry rate increases by 0.59 percentage points.

Looking at the dummy control variables, if a county is considered a metro county, then the establishment entry rate increases by 0.72 percentage points relative to rural counties that are not adjacent to a metro county. If a county is considered a rural county that is adjacent to a metro county, then the establishment entry rate increases by 0.12 percentage points relative to rural counties that are not adjacent to a metro county. These results make sense considering businesses have more motivation to open in a city or near a city due to higher populations and therefore more customers.

For the industry variables, determinants of dependency for industries in a county are given in the previous section. If a county is dependent on farming, then the establishment entry rate increases by 0.26 percentage points relative to nonspecialized counties. The farming variable in regression 1 is not significant so there is no comparison between coefficients. If a county is dependent on mining, then the establishment entry rate increases by 0.61 percentage points relative to nonspecialized counties. If a county is dependent on manufacturing, then the establishment entry rate decreases by -0.24 percentage points relative to nonspecialized counties. If a county is dependent on government, then the establishment entry rate decreases by -0.16 percentage points relative to nonspecialized counties. If a county is dependent on recreation, then the establishment entry rate increases by 0.95 percentage points relative to nonspecialized counties. The result that makes the most sense out of these variables is the result for the counties dependent on recreation. Counties that rely on tourism and things of that nature are likely to be a common spot for businesses to want to enter the market. Given the results for metro counties, it seems surprising that farming and mining counties have a positive relationship with establishment entry rate. The coefficient changes between regression 1 and regression 2 for these industry variables are relatively small.

For the region dummy variables, the Pacific and Mountain regions had positive relationships with the establishment entry rate relative to the South Atlantic region, but the rest of the regions had negative relationships with the establishment entry rate relative to the South Atlantic region. The West South Central region was not significant in regression 2 but the relationship was negative in regression 1. It was expected that the Pacific, Mountain, and South Atlantic Regions would have positive relationships with the establishment entry rate based on the findings of Cheng & Li (2011), but it was also expected that the New England region would have a positive relationship and it does not.

Moving on to the year variables, 2006 and 2007 were the only two years to have a positive relationship with the establishment entry rate relative to 2005. The rest of the years have a negative relationship with the establishment entry rate relative to 2005, with the largest change happening from 2007 to 2008 and the worst of the effects happening in 2009 and 2010. These negative effects likely come from the effects of the recession, mainly happening in 2008 and 2009. Even though the recession technically ended in June of 2009, the effects of it lagged in to 2010 which is why the negative relationship between 2010 and the establishment entry rate is still so strong. In the years following 2010, the negative effects lessen throughout the recovery years but still have a negative relationship with the establishment entry rate relative to 2005, due to the recovery being slow.

Conclusions

Much of the literature has a difficult time finding a consistent relationship between unemployment and entrepreneurship. Cole (2018) found that there was an inverse quadratic relationship in the Mid Atlantic region of the United States, which is the hypothesized relationship that was used in this study. However, given that the unemployment rate was high for an extended period of this study, the results may show some gaps in the findings of Cole (2018). The results of this regression gave opposite signs for the unemployment rate and unemployment rate squared term, so rather than the unemployment rate and establishment entry rate having an inverse quadratic relationship, the results were simply showing a quadratic, u-shaped relationship. A cubic term for unemployment was then added, which controlled for the wealthy and residential areas where unemployment remained very low and relatively constant throughout the recession and recovery years. In places like this, where unemployment was low, the establishment entry rate decreased. But in other places, where the unemployment was slightly higher than that of those wealthy and residential areas, the establishment entry rate increased as the unemployment rate increased until unemployment became too high for a suitable economy to start a business in. Regression 1 showed the cubic relationship between the unemployment rate and establishment but the turning points shown in Figure 2 are biased upward as a result of high unemployment over the majority of the time span. Regression 2 controls for the years and the turning points are a little more realistic, as shown in Figure 3.

Entrepreneurship is vital to the success of the economy. Entrepreneurs help to employ many workers so understanding how unemployment affects entrepreneurship is very important. Understanding this relationship could help to better control unemployment by helping entrepreneurs and easing the process of starting a new business. Knowing the range for when unemployment has a positive impact on new business formation could be helpful for creating policy that helps unemployed individuals, which could help to prevent unemployment from getting out of control.

Overall, the hypothesis of this study was mostly correct, low but rising unemployment rates increase the establishment entry rate up to a certain threshold of unemployment. The cubic term for unemployment just needed to be added to the regression in order to get the hypothesized result, which shows that Cole (2018) may have missed some aspects of the relationship between unemployment and entrepreneurship.

References

Acs Z. J. and Armington C. (2004) The impact of geographic differences in human capital on service firm formation rates, *Journal of Urban Economics* 56, 244–278.

Acs Z. J. and Storey D. J. (2004) Introduction: Entrepreneurship and economic development, *Regional Studies* 38, 871–877.

Audretsch D. B. and Fritsch M. (1999) The industry component of regional new firm formation processes, Rev. Ind. Organiz. 15, 239–52.

Audretsch, David B. (1995) Innovation and Industry Innovation. *MIT Press*: Cambridge, MA.

Bureau, U. S. C. (2021, October 8). *CBP datasets*. Census.gov. Retrieved November 4, 2021, from https://www.census.gov/programs-surveys/cbp/data/datasets.html.

Carree, M. A. (2002). Does Unemployment Affect the Number of Establishments? A Regional Analysis for US States. *Regional Studies*, 36(4), 389-398. https://doi.org/http://www.tandfonline.com/loi/cres20

Cheng, S., & Li, H. (2011). Spatially Varying Relationships of New Firm Formation in the United States. *Regional Studies*, 45(6), 773-789. https://doi.org/http://www.tandfonline.com/loi/cres20

Cole, I. M. (2018). Unemployment and Entrepreneurship in the Mid-Atlantic Region of the United States: A Spatial Panel Data Analysis. *Review of Regional Studies*, 48(3), 347-375.

County by Firm Size Coarse. Business Dynamics Statistics. (2019). Retrieved November 3, 2021, from https://www.census.gov/data/datasets/time-series/econ/bds/bds-datasets.html.

County typology codes. USDA ERS - County Typology Codes. (2015). Retrieved November 4, 2021, from https://www.ers.usda.gov/data-products/county-typology-codes/.

Education. USDA ERS - Data Products. (n.d.). Retrieved November 4, 2021, from https://data.ers.usda.gov/reports.aspx?ID=17829.

Picot, Garnett, Marilyn E. Manser, and Zhengxi Lin. (1998) The Role of Self-Employment in Job Creation in Canada and the United States, OECD-CERF-CILN International Conference on Self-Employment, Burlington, Ontario, Canada.

Personal income by county, Metro, and other areas. Personal Income by County, Metro, and Other Areas | U.S. Bureau of Economic Analysis (BEA). (n.d.). Retrieved November 4, 2021, from https://www.bea.gov/data/income-saving/personal-income-county-metro-and-other-areas.

Reynolds, P. D., Miller, B., & Maki, W. R. (1995). Explaining Regional Variation in Business Births and Deaths: U.S. 1976-88. *Small Business Economics*, *7*(5), 389–407. http://www.jstor.org/stable/40228793

Rissman, Ellen R. (2006) The Self-employment Duration of Younger Men Over the Business Cycle, *Economic Perspectives*, 3Q, 14–26.

Rural-urban continuum codes. USDA ERS - Rural-Urban Continuum Codes. (2013). Retrieved November 4, 2021, from https://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx.

Santarelli, E., Carree, M., & Verheul, I. (2009). Unemployment and Firm Entry and Exit: An Update on a Controversial Relationship. *Regional Studies*, 43(8), 1061-1073. https://doi.org/10.1080/00343400801968361

What is considered a small business?: Classification by Federal Agency. Patriot Software for Small Business. (2021, April 12). Retrieved November 4, 2021, from https://smallbusiness.patriotsoftware.com/what-is-considered-small-business-classification-size/.

Appendix

Table 2: *Descriptions and Sources of Variables*

Variable	Description	Mean	Standard Dev.	Minimum	Maximum
Establishment Entry Rate(1)	Number of new firms as a percentage of total firms	9.18	3.10	0	80
Unemployment Rate(2)	Number of unemployed as a percentage of the labor force	6.83	2.93	1.10	29.40
ln(Per Capita Personal Income)(5)	A county's income in dollars divided by the total population	10.43	0.26	9.36	12.21
Income Growth(5)	Percent change in income from previous midyear income estimates, measured in thousands of dollars	3.75	6.29	-57.60	146.40
Population Growth(5)	Percent change in population from previous midyear estimates, measured in persons	0.28	1.53	-76.80	42.6
Small Business(4)	Number of firms with less than 100 employees as a percentage of total firms	0.98	0.01	0.87	1
Medium Business(4)	Number of firms with 100-999 employees as a percentage of total firms	0.02	0.01	0	0.13
High School Only(3)	Percentage of people that only graduated high school	34.42	6.78	0	57.43
Some College(3)	Percentage of people that finished some college	29.28	5.23	0	48.11
College(3)	Percentage of people that graduated college	19.73	8.86	0	75.30

Farming[3]	County is dependent on farming for earnings and employment	0.16	0.37	0	1
Mining[3]	County is dependent on mining for earnings and employment	0.08	0.27	0	1
Manufacturing[3]	County is dependent on manufacturing for earnings and employment	0.17	0.37	0	1
Government[3]	County is dependent on state and local government for earnings and employment	0.14	0.35	0	1
Recreation[3]	County is dependent on recreation for earnings and employment	0.13	0.34	0	1
Metro[3]	County is in a metropolitan area and has an urban population of 250,000 or more	0.37	0.48	0	1
Adjacent to Metro[3]	County is adjacent to a metropolitan area and has an urban population less than 250,000	0.33	0.47	0	1
Pacific[6]	County is located in Pacific US Census region	0.05	0.21	0	1
Mountain[6]	County is located in Mountain US Census region	0.09	0.29	0	1
West North Central[6]	County is located in West North Central US Census region	0.20	0.40	0	1
West South Central[6]	County is located in West South Central US Census region	0.15	0.36	0	1
East North Central[6]	County is located in East North Central US Census region	0.14	0.35	0	1
East South Central[6]	County is located in East South Central US Census region	0.12	0.32	0	1

New England[6]	County is located in New England US Census region	0.02	0.15	0	1
Mid Atlantic[6]	County is located in Mid Atlantic US Census region	0.05	0.22	0	1
2006		0.09	0.29	0	1
2007		0.09	0.29	0	1
2008		0.09	0.29	0	1
2009		0.09	0.29	0	1
2010		0.09	0.29	0	1
2011		0.09	0.29	0	1
2012		0.09	0.29	0	1
2013		0.09	0.29	0	1
2014		0.09	0.29	0	1
2015		0.09	0.29	0	1

Sources: (1) Business Dynamics Statistics, (2) Bureau of Labor Statistics (BLS), (3) USDA Economic Research Service (ERS), (4) County Business Patterns, (5) Bureau of Economic Analysis (BEA), (6) US Census Bureau