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A Statistical and Analytical Approach to Analyzing State-Level Job Markets in the United States

Abstract

The decentralized nature of our Federal model allows state governments to be innovative and act as policy laboratories. The policies that have positive implications for the job market on the state level can be implemented by other states or implemented on the national level to help the current economic situation. This was explored in a data driven study incorporating both analytics and statistical analysis. A key result of the statistical analysis is the importance of tax policy. Higher taxes impede establishment entry and led to more job destruction. A key result of the analytical component was that the percentage of people in a union has no direct effect on employment or the job market.

This study used twenty years of state level data, 1990 to 2009, looking at various economic, categorical and demographic factors as independent variables. Dependent variables included the unemployment rate, job creation and other measures of the job market. Each of the dependent variables in the study was modeled through multiple linear regression analysis. The analytics component of the project allowed for a more overall and comprehensive look at the dataset of the project.

The results of the analytics and statistics components of the project show the association between various policies, factors and the job market that could have major policy implications. Overall, state and local governments can be the driving policy makers in the United States. This would allow for greater political innovation and for more political efficiency in the future.

Background

Compared to other post-World War II recessions, the recession of 2007-2009 has been the worst in terms of job creation and job loss in the United States. The unemployment rate has been above eight percent for 42 months as of September 2012. On the national level, the number one issue facing America is the urgency to create more jobs and at a faster pace [1].

However, the national level data does not paint a complete picture of state level job markets. For example in the year 2009, the national unemployment rate was 9.8% in the month of September [2] while the state of North Dakota had a country low unemployment rate of 4.3% and Michigan had a country high unemployment rate of 13.6%. The decentralized nature of our Federal model allows state governments to be innovative and act as policy laboratories. The current economic situation is described by models on the national level which cannot capture important characteristics of state level job markets.

The states are fifty laboratories of innovation, testing various methods of job creation, with various political climates and with various other advantages and disadvantages. The states can be looked at as test subjects to see how various factors relate to the job market and economic climate. The factors that led to job creation or that have other positive implications for the job market on the state level can be implemented by other states or implemented at the national level to help the current economic situation. This was the motivation for me to create a state level study.

Problem Statement

My study used twenty years of state level data, 1990 to 2009, looking at various economic, categorical and demographic factors as independent variables. There are also various dependent variables that were used to give insight into the job market. Metrics that measure job creation, establishment entry, unemployment, job destruction and establishment exit were all necessary to include in order to give a full insight into the job market. Only looking at job creation, for example, can be very misleading. In any given year approximately 10% of the aggregate number of jobs is created and 10% is destroyed [3]. Looking at only job creation is misleading because job creation is a gross number, not a net number.

Many studies have modeled employment on the national and international level [1][4]. These studies show potential independent and dependent variables to explore in my own study. For example, Harold Wilensky of The University of California at Berkeley wanted to show that job creation is a factor

of demographic changes, defined in his study as age structure and net migration rates [4]. Another example is a Kauffman Foundation study: The Importance of Startups in Job Creation and Job Destruction. This paper shows "that without startups, there would be no net job growth in the US economy" [1]. National level studies gave insight into factors that were used in my state level study.

The overarching question of this study is which factors and policies have positive implications for state level job markets. The hypothesis that is being tested is that a state's tax policy has the most impact on a state's job market. I choose a data driven approach to test this, incorporating analytics and statistical analysis. I wanted to model each of the dependent variables that were being tested through linear regression analysis [6]. The analytics portion of the study allowed for a more overall and comprehensive look at the dataset I built for the project. The analytical tools incorporated in the study allowed for the discovery of trends and to zoom in on specific details in the dataset. The goal is to gain insight and make informed decisions.

Literature Review

Author(s): Harold Wilensky of The University of California at Berkeley

Title: The Great American Job Creation Machine in Comparative Perspective

This study attempted to show that job creation is a factor of demographic changes, defined in this study as age structure and net migration rates, the rate of family breakups among various income classes and the history of female labor force participation.

The study is broken into four time periods based on the overall trends in the world economy. The median of job creation for all the time periods and countries was calculated. It was determined which countries consistently were below the median of job creation. It was also determined that across all four of these time periods, job creation rates were not statistically related to unemployment rates. The economies that created the most jobs in the study are often in the upper quartile for unemployment.

In this study, job creation did not correlate with the unemployment rate. This demonstrates the importance of looking at more measurements than just job creation to get a complete picture of the job market. Job Creation does not necessarily translate to low unemployment.

This study also found that poor performing countries in terms of job creation generally had older, richer populations and with higher divorce rates. Divorce forces women into the labor market. The demographic factor of divorce rates had a large impact on job creation. This finding shows the importance

of including demographic data, such as the marriage data, education data, health data, age data, etc. in my own study.

Institution(s): U.S. Chamber of Congress, National Chamber Foundation,

Title: Enterprising States: Polices that Produce

This study looked at which state level public policy initiatives lead to private sector growth. This study highlighted the importance of exploiting natural resources, a pro growth tax policy, removing regulatory barriers, innovation, education, trade and foreign investment along with other factors. This study highlighted that states that have these characteristics defy the "new normal" [5] thesis of America becoming a slow to moderate growth country. This study demonstrated the importance of including tax data, measures of regulation and natural resource data in my own study.

Methodology

Data Collection and Exploratory Data Analysis

There are various measures that give insight to the job market of an economy. These include the unemployment rate, the job creation rate, the job destruction rate and establishment entry. All of these measures were necessary to explore as dependent variables in order to get the full picture of the state level job markets in this study. There are also various noneconomic factors that affect the job market [3]. It was imperative that various demographic and other non economic indicators were included, along with economic factors and categorical variables as independent variables. Harold Wilensky's study demonstrated the importance of including demographic data. In this study both year and the state's census division were treated as categorical variables (In the reference section there is a chart showing the census division for each state). Division was included as a categorical variable to account for regional economic and demographic differences that exist in the various areas of the United States. Year was included as a categorical variable to account for economic differences across the various years of the study. Data was collected from an assortment of sources and was compiled and integrated to fit on one spreadsheet (a complete list of the variables and their sources used for the analysis is in the reference section of this paper). Data was collected for twenty years, 1990-2009 and was collected for each of the fifty states. A few examples of data sources used are the U.S. Census Bureau, the FBI Uniform Crime Results for state level crime data and the U.S. Energy Information Administration for electricity prices. This study started

with over 250,000 points of data and was cut down to fit the needs for the statistics component of the project and analytics component of the project.

There were two copies made of the dataset, one for the statistics component and one for the analytics component. After the collection of the data, exploratory data analysis was completed to refine the datasets. The statistics program R provided the proper platform for the exploratory data analysis. On R, the (plot) function was used to create graphs of independent v. dependent variables. Variables were removed from the two data datasets based on the exploratory analysis. The scatter plots, histograms and other data visualizations were used to determine which variables were useful to include in the study.

Methodology for Analytics Component

The program that was used for the analytics portion of the project was IBM Cognos version 8. To operate Cognos, the Excel spreadsheet was converted to a database format that was usable by the program. The program used for this conversion was IBM DB2, a database building tool. The data was built into multidimensional cubes.

After building the database, IBM Cognos was used to analyze the database. Cognos incorporates three main classifications of functions, database queries, database reports and Analysis Studio functions.

Database queries were constructed using SQL, structured query language. They are "questions" asked to the database. The result of the query returns data values from the records within the database. Database reports were used to isolate and construct data into meaningful samples and clusters. Also, reports were used to build data visualizations such as charts and graphs. The Analysis Studio was used to target and highlight useful information within the database. The Analysis Studio was useful for looking at and searching for trends in large amounts of aggregate data. The Analysis Studio also allowed for multidimensional analysis and to drill up or down in the database between the Census Division level and State level or based on population, area, or other classifications of data.

Methodology for Statistics Component

For the statistics portion of the project, a linear regression model was constructed for each of the dependent variables: establishment entry rate, establishment exit rate, job creation rate, job destruction rate and unemployment rate using the program R. Linear regression is the process of fitting a straight line model to describe a relationship for a single dependent variable. In the case of multiple linear regression, it is the process of fitting a hyper plane to a dataset [6].

In addition, the Census Bureau Division for each state and year were used as categorical variables. The program, to construct the model, only considers rows of data that have every element with a data value. While data was collected for each year 1990-2009, every element was not entirely complete for every year. So, years that did not have data for every element were not considered when constructing the models.

The data was split into two sets, the training set and the test set. 15% of the data was put into the test set and 85% of the data was put into the training set. The model was build based on the training set.

A Linear Regression model was constructed for each of the dependent variables. The (lm) function on the program was used to construct the model. The (plot) function was then used to look at the Residual and Q-Q plots. The Q-Q showed if the model had normally distributed errors. A pattern in the residual plot or heteroscedasticity in the residual plot meant that the independent variables in the model had to be transformed to correct this. The (summary) function of the program was used to view the t-test results and the R^2 value. T-tests check for statistical significance of partial slopes. Variables were removed based on a $\alpha = .05$ significance level. The (lm) function and (summary) function were rerun after the removal of variables. The (anova) function was used to complete the analysis of variance. Variables were removed if they were not statistically significant at the $\alpha = .05$ significance level.

After this step the variance inflation factor of the model was calculated. If any variable contained a variance inflation factor greater than ten, the variables in the set were adjusted to get the VIF for each of the variables under ten. On the program, this was completed using the (VIF) function. All the previously listed functions were rerun. The RMSE value was calculated for each of the models. The RSME or root mean squared error is a value that estimates the differences between the predicted values of an equation and the actual values. The data was split into training and test sets so the RSME value could be calculated using the models formed from the training set and comparing the predicted values of these models with the values of the test set.
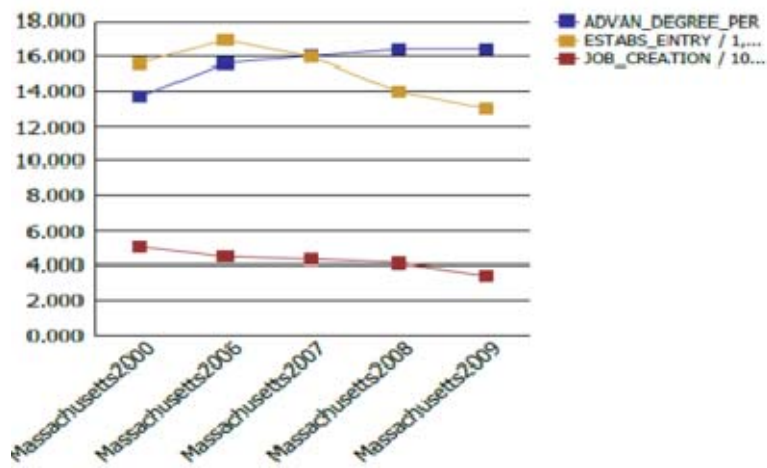
Results

Analytics

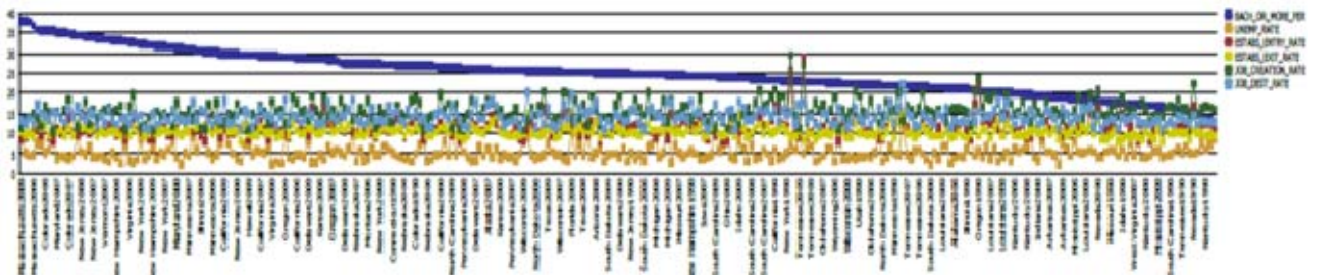1.   Education

     1.1) Advanced Degrees v. Establishment Entry and Unemployment
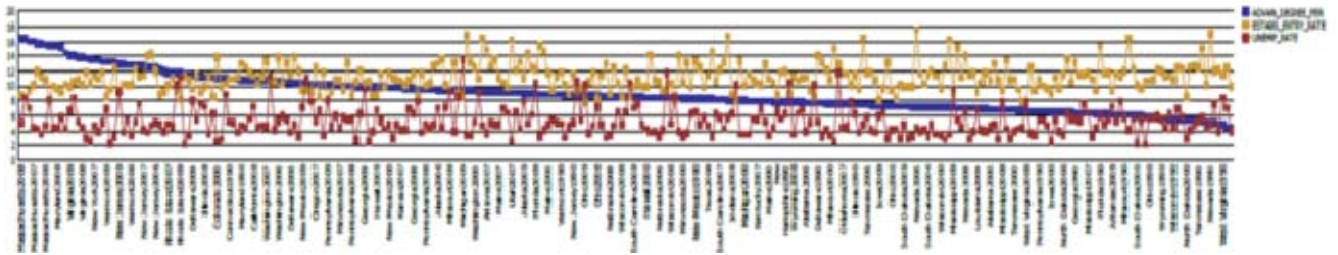

     1.2) Advanced Degrees v. Establishment Entry and Job Creation (MA)

     1.3) Bachelors Degree or More v. Unemployment Rate, Establishment Entry Rate, Establishment Exit Rate, Job Creation Rate, Job Destruction Rate

1.4) High Education v. Low Education States

Section one of the results shows a very weak relationship between educational achievement and the job market. As figure 1.1 shows, the percentage of people with advanced degrees does not have an effect on state level establishment entry or unemployment. This also holds true in the highly educated state of Massachusetts, Shown in figure 1.2. Education achievement's lack of impact on the job market also holds true in figures 1.3 and which compare the percentage of people with bachelor's degrees with job market metrics. Figure 1.4, which compares states with high educational achievement, Massachusetts, Virginia and states with low education achievement Mississippi, Alabama shows that educational attainment does not impact establishment entry or unemployment.

2. Crime

2.1) Violent Crime Rate v. Establishment Entry Rate and Job Creation Rate

2.2) Violent Crime Rate v. Establishment Entry Rate and Establishments (NY)
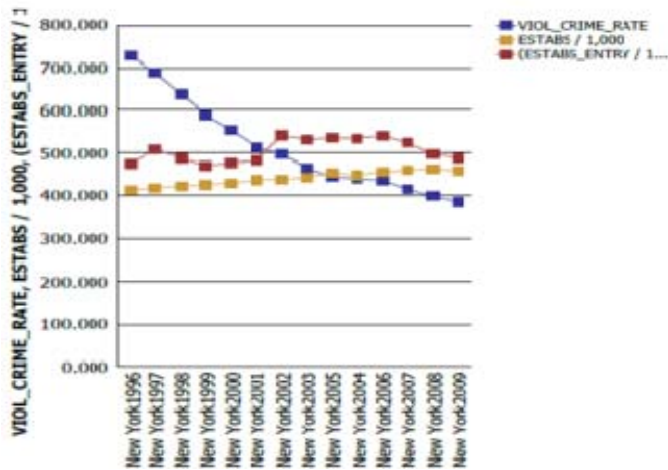
Violent crime rate has very little impact on the state level job market as shown in figure 2.1. This is further exemplified in figure 2.2 by highlighting New York State. New York State had a large reduction in Crime from 1996 to 2003, shown in figure 2.2. This had relatively no impact on the number of establishments per person and the establishment entry rate.

3.   2009 – (Spike in Unemployment)

3.1) Only States with Net Job Creation in 2009
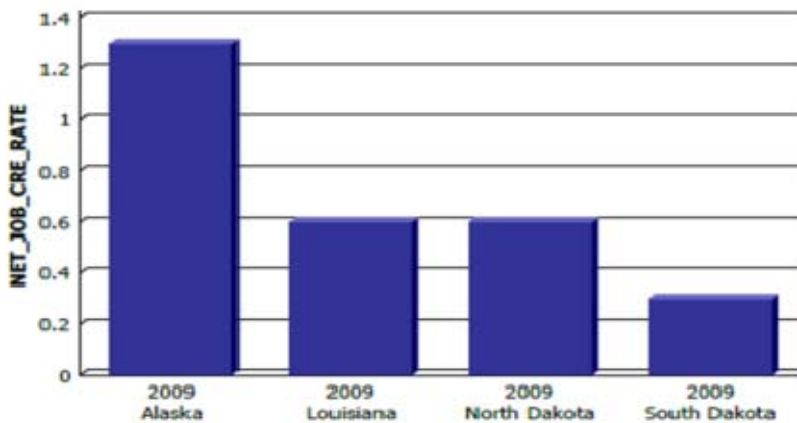
In 2009 there was a major spike in the unemployment rate and job destruction across the country. The only four states with net job growth in 2009 were South Dakota, Alaska, North Dakota and Louisiana, shown in figure 3.1. These four states are all high energy production states rich in natural resources [7].

4.   Innovation

4.1) Patents per 100k v. Job Creation Rate and Establishment Entry Rate
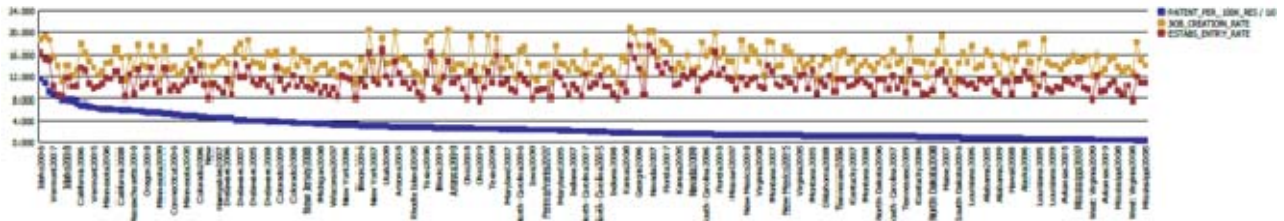
4.2) Patents per 100k vs. Job Creation and Establishment Entry (Indiana and Michigan)
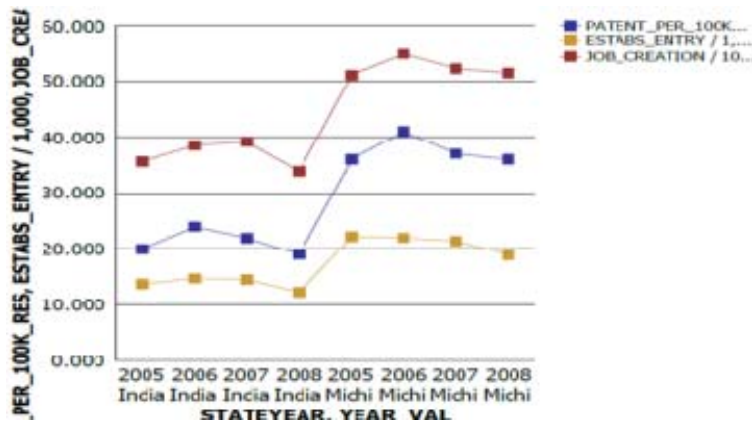
4.3) Patents per 100k v. Manufacturing GDP (Indiana and Michigan)
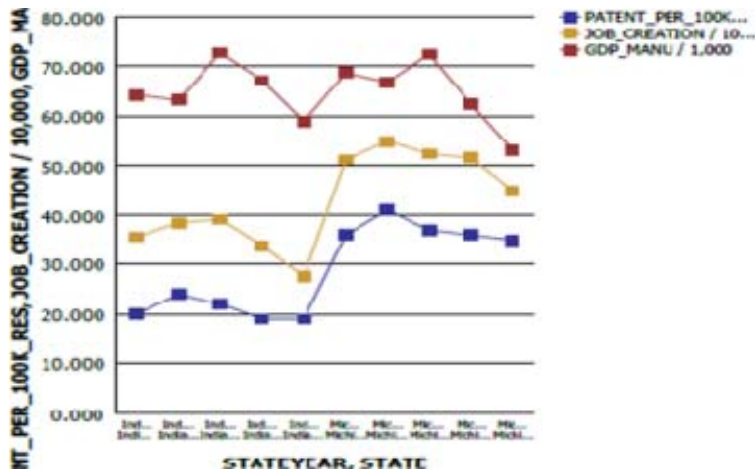
A statistic that measures innovation is patents per 100k people. There is relatively no relationship between patents per 100k people and the job market when looking at all fifty states at once. However, when filtering for the manufacturing based economy states of Michigan and Indiana, there is a clear

relationship between innovation and job creation, establishment entry and manufacturing GDP in figures 4.2 and 4.3. This shows a clear and vital relationship between patents and the job market in manufacturing states.

5. Technology Sector

5.1) High Tech Employment/ Total Employment v. Unemployment (WA,VA, MD, MA)
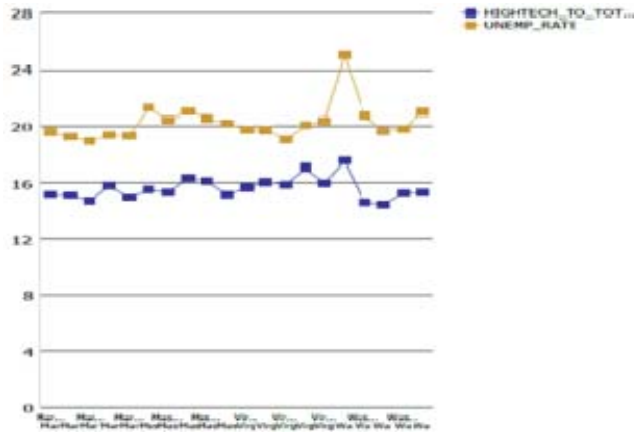
In the high tech states of Washington, Maryland, Virginia and Massachusetts, the trend lines of the unemployment rate and High Tech Employment/ Total Employment follow the same pattern of movement, shown in figure 5.1.

6. Tourism

6.1) Tourism / population v. Establishment Entry Rate
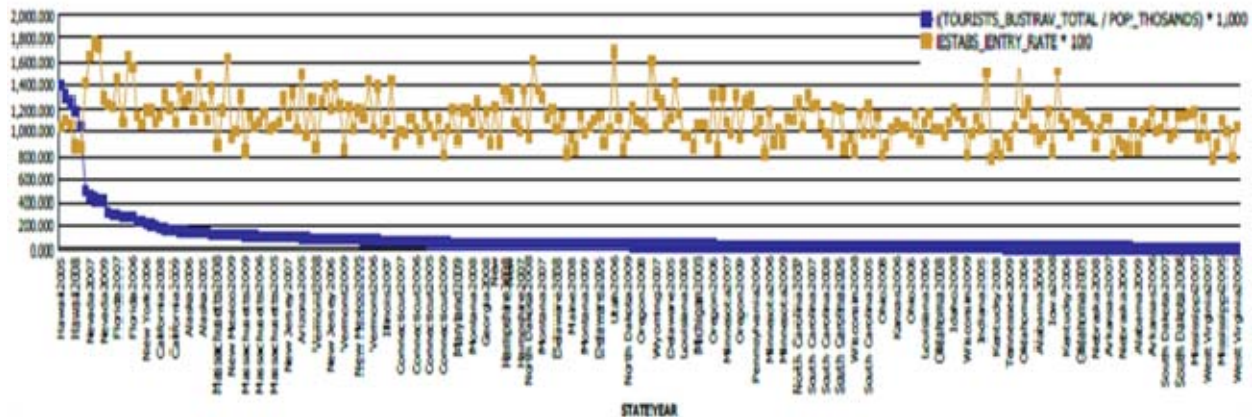
Section six shows the how tourism impacts the job market. As figures 6.1 shows, there is no relationship between tourism and establishment entry.

7.   Unions

7.1) Manufacturing Unions v. Job Destruction Rate and Job Creation Rate

7.2) Private Sector Unions v. Job Creation Rate and Establishment Exit Rate

7.3) Public Sector Unions v. Job Creation Rate, Establishment Exit Rate and Establishment Entry Rate

Section seven shows the relationship between public, private, manufacturing union membership and the job market. Figure 7.3 shows a direct comparison of states with a high percentage of people in a public sector union and states with a low percentage.

There is little to no relationship between the percent people in a public sector or manufacturing union and the job market. This is particularly interesting when looking at establishment entry. Studies have shown that unions deter job creation and establishment entry [8] [9]. However the findings in this study go against that. This factor could have major policy implications. Union policy is a topic heavily discussed in the political arena, especially on the state level.

Statistics

Notes for statistics results:

- A variable list is available in the reference section of this paper.

- All the models fulfill the regression assumptions of a linear relationship between independent and dependent variables, independence of errors, being homoscedastic and having normally distributed errors.

- "I" Refers to an indicator function, for example:

$(-2.531e-01)I_{Division\ Middle\ Atlantic} = -2.531e-01((x\ 1)$ if Division Middle Atlantic, $(x\ 0)$ if other Division)

Estabs Entry Rate

Estabs Entry Rate = 4.199 + (4.277e-08)population in 1000s + (-8.439e+00)Tax Rate for Corporate Income > 0 + (-2.447e-02)VC Deals per Million Residents 1995-2011 + (-2.615) Tourists and business travelers/ Total population in 1000s + (3.026e+02)PERSONS OBTAINING LEGAL RESIDENT STATUS BY STATE/population in 1000s + (8.108e+02)Real GDP Construction/population in 1000s + (8.838e-01)$I_{Division\ East\ South\ Central}$ + (-2.531e-01)$I_{Division\ Middle\ Atlantic}$ + (3.179)$I_{Division\ Mountain}$ + (1.980e-01)$I_{Division\ New\ England}$ + (1.651)$I_{Division\ Pacific}$ + (1.155)$I_{Division\ South\ Atlantic}$ + (5.135e-01)$I_{Division\ West\ North\ Central}$ + (1.068)$I_{Division\ West\ South\ Central}$ + (2.426e-01)$I_{year2006}$ + (1.265e-01)$I_{year2007}$ + (-1.488)$I_{year2008}$ + (-1.996)$I_{year2009}$

Variable	Std. Error
(Intercept)	1.446e+00
population.in.1000s	1.187e-08
Tax.Rate.for.Coporate.Income....0	2.256e+00
VC.Deals.per.Million.Residents..1995.2011	6.520e-03
INSTRUCT..PCT.CURR.EXP..STATE.FIN.	2.461e-02
Tourists.and.business.travelers/population.in.1000s	3.821e-01
PERSONS.OBTAINING.RESIDENCE/population.in.1000s	5.445e+01
Real.GDP.Construction.population.in.1000s	1.648e+02
Division East South Central	2.406e-01
Division Middle Atlantic	2.983e-01
Division Mountain	2.522e-01
Division New England	2.818e-01
Division Pacific	2.569e-01
Division South Atlantic	2.172e-01
Division West North Central	2.256e-01
Division West South Central	2.388e-01
year2006	1.542e-01
year2007	1.556e-01
year2008	1.594e-01
year2009	1.769e-01

Standard error: 0.7639   Adjusted R-squared: 0.842   RMSE= 5.255

Estabs Exit Rate

Estabs Exit Rate = 4.199 + (19.30514)Average Combined State and Local Tax Rate for State + (-0.01160)VC Deals per Million Residents 1995 2011 + (309.49093) PERSONS OBTAINING LEGAL RESIDENT STATUS BY STATE/population in 1000s + (-300.59382)Real GDP Government/ population in 1000s + (0.59931)$I_{\text{Division East South Central}}$ + (0.05528)$I_{\text{Division Middle Atlantic}}$ + (2.02422)$I_{\text{Division Mountain}}$ + (0.25494)$I_{\text{Division New England}}$ + (1.32591)$I_{\text{Division Pacific}}$ + (1.04339)$I_{\text{Division South Atlantic}}$ + (0.24030)$I_{\text{Division West North Central}}$ + (0.58235)$I_{\text{Division West South Central}}$ + (0.11117)I_{year2001} + (0.90426)I_{year2002} + (-1.19674)I_{year2003} + (-1.32918)I_{year2004} + (-1.62684)I_{year2005} + (-0.74419)I_{year2006} + (-0.42870)I_{year2007} + (-0.12565)I_{year2008} + (0.68416)I_{year2009}

Variable	Std. Error
(Intercept)	3.670e-01
Average.Combined.State.and.Local.Tax.Rate.for.State	3.126e+00
VC.Deals.per.Million.Residents	3.282e-03
PERSONS.OBTAINING.PERMANENT.RESIDENCE	2.601e+01
Real.GDP.Government/population.in.1000s	3.139e+01
DivisionEast South Central	1.580e-01
DivisionMiddle Atlantic	1.854e-01
DivisionMountain	1.397e-01
DivisionNew England	1.505e-01
DivisionPacific	1.892e-01
DivisionSouth Atlantic	1.429e-01
DivisionWest North Central	1.375e-01
DivisionWest South Central	1.570e-01
year2001	1.468e-01
year2002	1.483e-01
year2003	1.473e-01
year2004	1.482e-01
year2005	1.497e-01
year2006	1.504e-01
year2007	1.479e-01
year2008	1.483e-01
year2009	1.512e-01

Standard error: 0.7192   Adjusted R-squared: 0.7182   RMSE= 3.1319

Job Creation Rate

Job Creation Rate = 8.952 + (3.248e-04)Property crime rate + (3.008e-05)Real GDP Per Capita + (1.795e-02)Housing Ownership Rates + (9.626e-03)Quality of Life Rank Out of 50 + (6.800e+02)Real GDP Construction population in 1000s + (1.144)$I_{\text{Division East South Central}}$ + (5.690e-01)$I_{\text{Division Middle Atlantic}}$ + (2.915)$I_{\text{Division Mountain}}$ + (8.499e-02)$I_{\text{Division New England}}$ + 1.195$I_{\text{Division Pacific}}$ + (1.190)$I_{\text{Division South Atlantic}}$ + (4.906e-01)$I_{\text{Division West North Central}}$ + (1.966)$I_{\text{Division West South Central}}$ + (8.225e-01)I_{year2006} + (1.125)I_{year2007} + (-4.741e-01)I_{year2008} + (-2.358)I_{year2009}

Variables	Std. Error
(Intercept)	1.710e+00
Property.crime.rate	1.374e-04
Real.Per.Capita.GDP	1.277e-05
Housing.Ownership.Rates	1.961e-02
Quality.of.Life.Rank.out.of.50	7.396e-03

Real.GDP.Construction/population.in.1000s	2.256e+02
Division East South Central	3.526e-01
Division Middle Atlantic	3.966e-01
Division Mountain	3.404e-01
Division New England	3.109e-01
Division Pacific	3.643e-01
Division South Atlantic	2.944e-01
Division West North Central	2.851e-01
Division West South Central	3.592e-01
year2006	2.146e-01
year2007	2.199e-01
year2008	2.256e-01
year2009	2.502e-01

Standard error: 1.068   Adjusted R-squared: 0.7667   RSME=3.465

Job Destruction Rate

Job Destruction Rate = 1.435e+01 + (-8.702e-02)Industrial Price Cents per kilowatthour + (2.031e-03)Violent Crime Rate + (8.675)Tax Rate for Corporate Income>0 + (3.908e-05)Real per Capita GDP + (5.029e-02)Housing Ownership Rate + (-3.807e+02)PERSONS OBTAINING LEGAL RESIDENT STATUS BY STATE/population in 1000s + (-5.914e+02) Real GDP Construction population in 1000s + (-2.826e+02)Real GDP Government population in 1000s + (1.942e+05)Gross Public Debt state billion population in 1000s + (7.183e+05) Pensions state billion population in 1000s + (5.346e-01)$I_{\text{Division East South Central}}$ + (-3.233e-01) $I_{\text{Division Middle Atlantic}}$ + (2.075)$I_{\text{Division Mountain}}$ + (2.462e-01)$I_{\text{Division New England}}$ + (1.201)$I_{\text{Division Pacific}}$ + (9.505e-01)$I_{\text{Division South Atlantic}}$ + (-5.003e-01)$I_{\text{Division West North Central}}$ + (3.953e-01)$I_{\text{Division West South Central}}$ + (-3.686)I_{year2003} + (-4.794)I_{year2004} + (-4.898)I_{year2005} + (-5.516)I_{year2006} + (-3.173)I_{year2007} + (-4.402)I_{year2008} + (-2.183)I_{year2009}

Variables	Std. Error
(Intercept)	1.423e+00
Industrial.Price.Cents.per.kilowatthour.	2.657e-02
Violent.Crime.rate	4.129e-04
Tax.Rate.for.Coporate.Income > 0	2.466e+00
Real.Per.Capita.GDP	1.130e-05
Housing.Ownership.Rates	1.784e-02
PERSONS.OBTAINING.LEGAL.RESIDENCE	5.428e+01
Real.GDP.Construction.population.in.1000s	1.862e+02
Real.GDP.Government.population.in.1000s	6.444e+01
Gross.Public.Debt.state...billion.population.in.1000s	5.426e+04
Pensions.state...billion.population.in.1000s	2.364e+05
Division East South Central	2.711e-01
Division Middle Atlantic	3.126e-01
Division Mountain	2.609e-01
Division New England	3.041e-01
Division Pacific	3.094e-01
Division South Atlantic	2.648e-01
Division West North Central	2.313e-01
Division West South Central	2.912e-01
year2003	2.106e-01
year2004	2.094e-01
year2005	2.117e-01
year2006	2.159e-01
year2007	2.195e-01
year2008	2.302e-01
year2009	2.455e-01

Standard error: 1.035   Adjusted R-squared: 0.7835   RSME= 4.832

Unemployment rate

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Unemployment Rate = 5.308 + (1.702e-01)Sales Tax Percent + (-1.296e-02)PERSONS
OBTAINING LEGAL RESIDENT STATUS BY STATE/population in 1000s + (-3.356e+02) Real GDP
Government/population in 1000s + (2.089e+05)Gross Public Debt state billion/
population in 1000s + (6.136e+05)Pensions state billion/ population in 1000s +
(1.349e+06) Welfare state billion/population in 1000s + (2.722e-01)I
```
$(1.702\text{e-}01)$ ... $+ (2.722\text{e-}01)I_{\text{Division East South Central}}$
$+ (-3.401\text{e-}01)I_{\text{Division Middle Atlantic}} + (-3.728\text{e-}01)I_{\text{Division Mountain}} + (-9.706\text{e-}01)I_{\text{Division New England}} + (1.865)I_{\text{Division Pacific}} + (4.083\text{e-}02)I_{\text{Division South Atlantic}} + (-1.182)I_{\text{Division West North Central}} + (-5.156\text{e-}01)I_{\text{Division West South Central}} + (5.835\text{e-}01)I_{\text{year2001}} + (1.470)I_{\text{year2002}} + (1.627)I_{\text{year2003}} + (1.089)I_{\text{year2004}} + (7.677\text{e-}01)I_{\text{year2005}} + (4.906\text{e-}01)I_{\text{year2006}} + (6.618\text{e-}02)I_{\text{year2007}} + (1.114)I_{\text{year2008}} + (4.257)I_{\text{year2009}}$

Variables	Std. Error
(Intercept)	3.060e-01
Sales.Tax..Percent	3.058e-02
VC.Deals.per.Million.Residents..1995.2011	4.397e-03
PERSONS.OBTAINING.RESIDENCE/ population.in.1000s	3.823e+01
Real.GDP.Government.population.in.1000s	4.744e+01
Gross.Public.Debt.state...billion.population.in.1000s	4.670e+04
Pensions.state...billion.population.in.1000s	2.371e+05
Welfare.state...billion.population.in.1000s	3.297e+05
DivisionEast South Central	2.146e-01
DivisionMiddle Atlantic	2.443e-01
DivisionMountain	1.958e-01
DivisionNew England	2.340e-01
DivisionPacific	2.813e-01
DivisionSouth Atlantic	2.033e-01
DivisionWest North Central	1.894e-01
DivisionWest South Central	2.179e-01
year2001	1.932e-01
year2002	1.973e-01
year2003	1.963e-01
year2004	1.979e-01
year2005	1.997e-01
year2006	2.019e-01
year2007	2.014e-01
year2008	2.031e-01
year2009	2.097e-01

Standard error: 0.9452   Adjusted R-squared: 0.679   RMSE: .824

Overview of Statistical Models

The model of establishment entry rate shows the importance of corporate income tax. The higher the corporate income tax, the lower the establishment entry rate. This model also demonstrates the importance of immigration policy; the greater the number of people who attain legal residence in a state, the greater the establishment entry rate. Two surprising results are that both the number of tourist per 1000 people and the number of venture capital deals per million residents negatively affect establishment entry.

The model of establishment exit rate shows importance of state income tax. A higher state income tax leads to greater establishment exit. Greater government GDP per 1000 people leads to less establishment exit.

The job creation rate model shows that the construction sector of the economy is a driver of job creation. This model also shows that as property crime increases and the Forbes quality of life rank decreases, job creation increases. This is counterintuitive. One would expect property crime and poor quality of life to be negatives for job creation, not positives.

The job destruction rate model once again highlights the importance of tax policy and the construction sector of the economy. A higher tax on corporate income leads to greater job destruction. Greater construction GDP per 1000 people leads to a lower job destruction rate. This model also demonstrates the importance of a state's fiscal policy. Both greater state pension costs and greater public debt lead to more job destruction.

The unemployment rate model again highlights the importance of tax policy, immigration policy and a state's fiscal policy. A greater sales tax leads to a greater unemployment rate. The more people attaining permanent legal residence in a state, the lower the unemployment rate. Also, the more a state spends on welfare, public sector pensions or the greater the state's debt, the greater the unemployment rate.

Discussion

Scope and Limitations

This study was an overarching look at the relationship between certain factors and metrics that measure the job market. This study does not take a look at the quality of jobs created or lost. Other studies have shown that, for example, well educated states have created higher paying, higher quality jobs [16]. This study did not look at quality, just an overall view of employment on the state level.

Another limitation was incompleteness in the dataset. The study incorporated data from the years of 1990 to 2009. The data from the sources I used were very limited past 2009. This is why the final year being in the study is 2009. Also, the dataset I used was not fully complete. Some sources, for example, only had data for ten of the years being explored in this study. This could have affected the output of the regression models or could have affected the analytic section's results.

Policy Implications

One of key results of the statistical analysis is the importance of tax policy. Higher taxes impede establishment entry and led to more job destruction. This is a common theme demonstrated in various studies. Lower taxes help economic growth and lead to job creation [10]. Another key factor is a state's finances. Having a manageable and sustainable spending policy is vital; this leads to more certainty in the business environment and thus more hiring. Generally, states with low taxes and pro growth agendas keep debts manageable and promote a positive business environment [11] [12].

According to the Kauffman Foundation, the share of entrepreneurs who start a business and are recent immigrants to the United States is currently close to 30%. This number was around 13% in 1996 and has been steadily climbing [13]. These immigrant entrepreneurs start business across various sectors of the economy [14]. It is a great advantage for a state to attract new immigrants to their state. It has positive benefits for a state's job market and on the country as a whole [15].

What is especially important is the tax on startup companies. This is because startup companies are the drivers of job creation in this country. Without startup companies there would be no net job creation in the United States [1]. This fact also demonstrates the importance of immigration policy. Many immigrants come to this country to start businesses. According to the Kaufman Foundation 30% of startups are founded by recent immigrants. There has to be more done on the Federal and State level to encourage highly skilled and educated immigrants to come to this country.

In the current economic situation there should be less of an emphasis placed on issues that do not have a direct positive effect on employment. These issues include education policy, union policy, tourism and crime. These factors, while important in society do not have direct, positive or negative impacts on the job market.

While a well educated citizenry may command higher wages and have better quality of jobs than a poorly educated citizenry [17], education attainment does not drive the unemployment rate down or increase establishment entry. Nor does it lead to net job creation or decrease job destruction or establishment exit. This is also true with the percentage of people in private or public sector Unions. Union policy is a big political issue in the United States. Studies have shown that unions deter job creation and establishment entry [8] [9]. However the findings in this study go against that. This study shows the percentage of people in both private and public sector unions has virtually no effect on job creation, establishment exit or establishment entry. This also holds true with tourism and crime on the

state level. Less of a policy emphasis should be placed on these issues when employment and job creation are the biggest political and economic issues in the country.

The only states that had net job growth in 2009 were South Dakota, Alaska, North Dakota and Louisiana. These states along with other energy producing states have seen great GDP and Income growth in recent years [10]. While the exploitation of natural resources has great benefits for a state's economy and job market, not all states have the natural resources of these states. Greater exploitation of natural resources would have beneficial implications for employment in states that have the resources to do so.

Further Research

There are important idiosyncratic distinctions that exist within each state and affect their job markets. Examples are the relationship between patents and the job market in manufacturing states, the impact of the tech industry on the job market in high tech states and energy production's impact on employment. The further research lies within looking for the individual characteristics that drive the job markets of individual states. This is vital because each state's economy is different. Each state has its own governing policies, natural resources, workforces, establishments and economic conditions. It is necessary to highlight the driving forces and characteristics of each state's job market. The step after that is to go smaller than the state level and look what drives the job market on the city level. The state and local governments can be the driving policy makers in the United States. This would allow for greater political innovation and for more political and economic efficiency in the future as well as optimal allocation of resources and targeted policymaking.

References

[1] Kane, T. (2010). *The importance of startups in job creation and job destruction*. (Kauffman Foundation).

[2] Bureau of Labor Statistics, "Monthly Labor Review: September 2009"

[3] Wilensky, H. (2008). *The great american job creation machine in comparative perspective*. (University of California at Berkley), Available from Wiley.

[4] Davis, S. and Haltiwanger J. (1992). *Gross Job Creation, Gross Job Destruction and Employment Reallocation.*

[5] Bill Gross, Investment Outlook, Pimco, January 2012

[6] MH Kutner, CJ Nachtsheim, J Neter, W Li - IRWIN, Chicago, 2004 - lavoisier.fr

[7] *Annual Energy Outlook 2012*, U.S. Energy Information Administration

[8] David G. Blanchflower, Neil Millward, and Andrew J. Oswald, "Unionization and Employment Behavior," *Economic Journal*, Vol. 101, No. 407 (July 1991), pp. 815–834; Jonathan S. Leonard, "Unions and Employment Growth," *Industrial Relations*, Vol. 31, No. 1 (Winter 1992), pp. 80–94; and Richard J. Long, "The Effect of Unionization on Employment Growth of Canadian Companies," *Industrial and Labor Relations Review*, Vol. 46, No. 4 (July 1993), pp. 691–703.

[9] Robert J. Lalonde, Gerard Marschke, and Kenneth Troske, "Using Longitudinal Data on Establishments to Analyze the Effects of Union Organizing Campaigns in the United States," *Annales d' Economie et de Statistique*, Vols. 41–42 (January–June 1996), pp. 155–185, and Richard B. Freeman and Morris M. Kleiner, "The Impact of New Unionization on Wages and Working Conditions," *Journal of Labor Economics*, Vol. 8, No. 1 (January 1990), pp. S8–S25.

[10] *Enterprising States Polices that Produce.* US Camber of Congress, June 2012

[11] Bret Swanson, "The Growth Imperative," National Chamber Foundation, May 24, 2011

[12] 5 Robert Atkinson, Scott Andes, Stephen Ezell, Daniel Castro, Darlene Hackler, and Richard Bennett, "Innovation Policy on a Budget: Driving Innovation in a Time of Fiscal Constraint," Information Technology and Innovation Foundation, 2010,

[13] E.J. Reedy, Kauffman Index Holds Steady – Increasing Evidence of Smaller Starts, Ewing Marion Kauffman Foundation, March 7, 2011

[14] Robert W. Fairlie, and Bruce D. Meyer, "Ethnic and Racial Self-Employment: Differences and Possible Explanations," *Journal of Human Resources* (September 1996); Bowles, Jonathan, and Colton, Tara, "A World of Opportunity," *Center for an Urban Future,* February 2007.

[15] Paula E. Stephan and Sharon G. Levin, "Exceptional Contributions to U.S. Science by Foreign-Born and Foreign-Educated," *Population Research and Policy Review* 20:59–79 (2000).

[16] "Workers (and business) unite!: Can training programmes reshape America's workforce?," *The Economist,* August 27, 2011

[17] McKinsey Global Institute, *"An economy that works: Job creation and America's future,"* McKinsey and Company June 2011.

Data Used in Study

Data Name	What it Measures	Source of Data	Years Used
unemployment rate	The percentage of the work force that is unemployed (seasonally adjusted)	Census Bureau Longitudinal Business Database	1990-2009
Estabs	Number of Establishments	Census Bureau Longitudinal Business Database	1990-2009
Emp	Number of People Employed	Census Bureau Longitudinal Business Database	1990-2009
Estabs_Entry	Number of New Establishments in a given year	Census Bureau Longitudinal Business Database	1990-2009
Estabs_Entry_Rate	Number of New Establishments in a given year per 1000 people	Census Bureau Longitudinal Business Database	1990-2009
Estabs_Exit	Number of Establishments Exiting in a given year	Census Bureau Longitudinal Business Database	1990-2009
Estabs_Exit_Rate	Number of Establishments Exiting in a given year per 1000 people	Census Bureau Longitudinal Business Database	1990-2009
Job_Creation	Number of Jobs Created in a given year	Census Bureau Longitudinal Business Database	1990-2009
Job_Creation_Rate	Number of Jobs Created in a given year per 1000 people	Census Bureau Longitudinal Business Database	1990-2009
Job_Destruction	Number of Jobs Destroyed in a given year	Census Bureau Longitudinal Business Database	1990-2009
Job_Destruction_Rate	Number of Jobs Destroyed in a given year per 1000 people	Census Bureau Longitudinal Business Database	1990-2009
Net_Job_Creation	Jobs Creation - Job Destruction	Census Bureau Longitudinal Business Database	1990-2009
Net_Job_Creation_Rate	Jobs Creation Rate - Job Destruction Rate	Census Bureau Longitudinal Business Database	1990-2009
Residential Price	Residential Electricity Price (Cents per kilowatthour)	U.S. Energy Information Administration	1990-2009

Commercial Price	Commercial Electricity Price (Cents per kilowatthour)	U.S. Energy Information Administration	1990-2009
Industrial Price	Industrial Electricity Price (Cents per kilowatthour)	U.S. Energy Information Administration	1990-2009
Violent Crime rate	Violent Crimes per 1000 people	FBI Crime States	1990-2009
Murder and nonnegligent manslaughter rate	Murder and nonnegligent manslaughter rate per1000 people	FBI Crime States	1990-2009
Robbery rate	Robberies per 1000 people	FBI Crime States	1990-2009
Aggravated assault rate	Aggravated assaults per 1000 people	FBI Crime States	1990-2009
Property crime rate	Property Crimes per 1000 people	FBI Crime States	1990-2009
Average Combined State and Local Tax Rate for State	Average Combined State and Local Income Tax Rate for State	Tax Foundation	1990-2009
per capita earnings	Earnings per person	Bureau of Economic Analysis	1997-2009
population in 1000s	Number of people in thousands in each state	Census	1990-2009
Gross Public Debt-state $ billion	Debt in billions of dollars	www.usgovernmentspending.com	1990-2009
Pensions-state $ billion	Pension spending in billions of dollars	www.usgovernmentspending.com	1990-2009
Welfare-state $ billion	Welfare spending in billions of dollars	www.usgovernmentspending.com	1990-2009
Transportation-state $ billion	Transportation spending in billions of dollars	www.usgovernmentspending.com	1990-2009
Priv. Construction % Members	Percentage of construction workers that are members of a union	www.unionstats.com	1990-2009
Priv. Construction % Represented	Percentage of construction workers that are represented by union	www.unionstats.com	1990-2009
Priv. Manufacturing % Members	Percentage of manufacturing sector workers that are members of a union	www.unionstats.com	1990-2009

Priv. Manufacturing % Represented	Percentage of manufacturing sector workers that are represented by a union	www.unionstats.com	1990-2009
Private % Members	Percentage of private sector workers that are members of a union	www.unionstats.com	1990-2009
Private % Represented	Percentage of private sector workers that are represented by a union	www.unionstats.com	1990-2009
Public % Members	Percentage of public sector workers that are members of a union	www.unionstats.com	1990-2009
Public % Reprsented	Percentage of public sector workers that are represented by a union	www.unionstats.com	1990-2009
High school graduate or more	High School Diplomas per 1000 people	Census Bureau American Community Survey	1990, 2000, 2006-2009
Bachelor's degree or more	Bachelor's degrees per 1000 people	Census Bureau American Community Survey	1990, 2000, 2006-2009
Advanced degree or more	Advanced degrees per 1000 people	Census Bureau American Community Survey	1990, 2000, 2006-2009
Housing Ownership Rates	Percent of homes in a given area that have an owner	Census Data	1990-2009
Housing Vacancy Rates	Percent of homes in a given area that have are vacant	Census Data	1990-2009
Real Per Capita GDP	State GDP per person	Bureau of Economic Analysis	1997-2009
Real GDP Construction	GDP of construction sector in a state	Bureau of Economic Analysis	1997-2009
Real GDP Government	GDP of government sector in a state	Bureau of Economic Analysis	1997-2009
Real GDP Manufacturing	GDP of Manufacturing sector in a state	Bureau of Economic Analysis	1997-2009
Marital Rate per Thousand	Marriages per 1000 people	Census Data	1990, 2000, 2006-2009
Sales Tax, Percent	State sales tax, percentage	Tax Foundation	2000-2009

Tax Rate for Corporate Income > $0	Corporate Income tax rate (percentage) for corporate income > $0	Tax Foundation	2000-2009
Tax Rate for Corporate Income > 50K	Corporate Income tax rate (percentage) for corporate income > $50k	Tax Foundation	2000-2009
Tax Rate for Corporate Income > 100K	Corporate Income tax rate (percentage) for corporate income > $100k	Tax Foundation	2000-2009
PERSONS OBTAINING RESIDENT STATUS BY STATE	Number of legal immigrants to a state in a given year	Department of Homeland Security	2000-2009
Tourists and business travelers Total	Number of tourists and business traveler to a state in a given year	Department of Homeland Security	2000-2009
Bussiness Costs Rank out of 50	Rank 1- 50, (1 is the best, 50 is the worst) Cost of employment, material, labor, etc.	Forbes, The Best States for Business	2005-2009
Labor Rank out of 50	Rank 1- 50, (1 is the best, 50 is the worst) Laborforce quality, productivity, etc.	Forbes, The Best States for Business	2005-2009
Regulatory Environment	Rank 1- 50, (1 is the best, 50 is the worst) Burden of Regulation in the state	Forbes, The Best States for Business	2005-2009
Growth Prospects Rank out of 50	Rank 1- 50, (1 is the best, 50 is the worst) Potential for economic growth	Forbes, The Best States for Business	2005-2009
Quality of Life Rank out of 50	Rank 1- 50, (1 is the best, 50 is the worst) best quality of life, taking into account crime, education, cost of living, etc.	Forbes, The Best States for Business	2005-2009
R&D performed ($millions)	Research and Development in millions of dollars	National Science Foundation	2003-2008
State Agency R&D Expenditures	State Government spending on research and development	National Science Foundation	2003-2008
High-technology formations/business establishments (%)	New high tech firms/ total establishments in a given year	State Science & Technology Institute	2003-2004, 2006-2008

High-technology establishments	Total number of high tech firms	State Science & Technology Institute	2003-2004, 2006-2008
High-technology establishments/business establishments (%)	Total high tech firms/ total establishments in a given year	State Science & Technology Institute	2003-2004, 2006-2008
Patents (All Types)	Number of patents in a state in a given year	State Science & Technology Institute	2005-2009
Patents Per 100k Residents	Number of patents per 100k people in a state in a given year	State Science & Technology Institute	2005-2009
VC Deals per Million Residents	Number of Venture Capital Deals per Million People	State Science & Technology Institute	1995-2009

Regions and Divisions for Census Bureau
Source: Census Bureau

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REGION I: NORTHEAST

Division I: New England
Connecticut    (09)
Maine          (23)
Massachusetts  (25)
New Hampshire  (33)
Rhode Island   (44)
Vermont        (50)

Division 2: Middle Atlantic
New Jersey     (34)
New York       (36)
Pennsylvania   (42)


REGION 2: MIDWEST*

Division 3:  East North Central
Illinois       (17)
Indiana        (18)
Michigan       (26)
Ohio           (39)
Wisconsin      (55)


Division 4:  West North Central
Iowa           (19)
Kansas         (20)
Minnesota      (27)
Missouri       (29)
Nebraska       (31)
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North Dakota   (38)
South Dakota   (46)


REGION 3: SOUTH

Division 5: South Atlantic
Delaware       (10)

District of Columbia (11)
Florida        (12)
Georgia        (13)
Maryland       (24)
North Carolina (37)
South Carolina (45)
Virginia       (51)
West Virginia  (54)

Division 6: East South Central
Alabama        (01)
Kentucky       (21)
Mississippi    (28)
Tennessee      (47)

Division 7:  West South Central
Arkansas       (05)
Louisiana      (22)
Oklahoma       (40)
Texas          (48)


REGION 4: WEST
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                                         Wyoming          (56)
Division 8:  Mountain
Arizona          (04)
Colorado         (08)              Division 9: Pacific
Idaho            (16)              Alaska           (02)
Montana          (30)              California       (06)
Nevada           (32)              Hawaii           (15)
New Mexico       (35)              Oregon           (41)
Utah             (49)              Washington       (53)
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