Cover design by Twisha Patni

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Letter from the Editor

The Economics Review at New York University has seen unprecedented growth over the last year. We have grown our amazing staff of writers, editors, and administrative staff to over 60 members. I am incredibly proud of the hard work and talent that I have seen over the past semester and it is an honour to present to you our 4th printed publication.

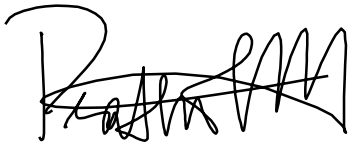
Our growth over the last year in writing and editing staff has been to further the goal of having an outlet for our students, as well as a medium for students at New York University to learn about the various fields we cover at the Review, be it economics, business, public policy, law, or any other field our talented contributors choose to undertake. To provide the window through which students can hone their analytical, research and editorial skills has been one of the founding tenets of the Review and it gives me immense pride to see our members achieve their goals.

This edition of the Economics Review at NYU's printed publication contains five thought-provoking research papers on a variety of topics, from the deep web, to the role of mortgage securitization in the American economy, and from unemployment to income inequality and the prevalence of zombie firms in China. I hope that you find each piece we have selected dynamic and interesting, as well as relevant to our contemporary discourse.

I am eternally grateful for the immense amount of effort that my predecessor, Ewa Staworzynska, put into getting the Economics Review off its feet and I am humbled by the opportunity I have to work with an ever-expanding, ever-passionate, ever-motivated staff and I sincerely hope that you, the reader, enjoy the fruits of all of our efforts.

Happy reading!

Sincerely,



Prabhod Mudlapur

Explaining Unemployment On The State Level

Ava J. Ring & Stephen Tsamblakos

This paper sought to determine the factors that contributed to unemployment on the state level in 2010. The following were examined by state: minimum wage, percentage of the non-white population, manufacturing jobs as a percentage of total jobs, percentage of the population receiving welfare assistance, and female labor force participation rate. The results illustrated the minimum wage and manufacturing percentage were not statistically significant. However, the percentage and rates on the non-white population, population receiving welfare assistance, and female labor force were each statistically significant. There was a positive relationship not only between percentage of the non-white population and state unemployment in 2010, but also between the percentage of the population receiving welfare assistance and state unemployment in 2010. The female labor force participation rate correlated to the lower 2010 state unemployment. As such, policies should be implemented—specifically, those in which non-whites are offered occupational mismatch opportunities, individuals on welfare are incentivized to work, and women are encouraged to join the workforce.

The purpose of this econometrics paper is to determine which factors contributed to state unemployment rates in 2010. Unemployment, a major economic topic in the United States, serves as an indicator of the economy's overall health. This topic is especially important to two students who will enter the labor force very soon. The unemployment rate for the entire country is released by the Bureau of Labor Statistics once a month. However, some states have lower unemployment than other states, and the question here is "*why?*".

One must first understand the distinction between unemployed and employed to comment on unemployment. "Employed" simply means a person is currently working at a job. "Unemployed" describes a person who does not have a job, *and* is actively searching for work. If an individual is jobless yet not looking for employment, they are not in the labor force. As a result, they are also not included in the unemployment rate and are known as discouraged workers. The "labor force" consists of people who are employed and unemployed. The BLS collects unemployment rates each month by sending out the Current Population Survey (CPS) to approximately 60,000 households representative of the entire population. Information is collected about personal characteristics and labor force activities or non-labor force status of each member of the family. This process repeats each month.

After assigning unemployment as the dependent variable of the regression, each regressor was tested to see how it explained unemployment jointly and individually. Unemployment has been a prevalent topic of research, as evidenced in the Literature Review section below. While researchers have focused on explaining unemployment on the national level through GDP, GNP, aggregate demand, inflation, and other economic indicators, there has not been much research examining unemployment on the state level. The variables introduced in this paper are state minimum wages, non-white percentage of state populations, manufacturing jobs as a percentage of total jobs in each state, percentage of population receiving welfare benefits by state, and female labor force participation by state. The array of variables then raised the following question: *Which variables most strongly correlated with state unemployment rates, and were they statistically significant?*

With regards to methodology, an overall regression was run to determine the relationship between the five explanatory variables and unemployment. Individual regressions were also conducted, in which unemployment was regressed on each explanatory variable separately. To measure heteroscedasticity, the Glejser Test and White Test were conducted. Results indicated that heteroscedasticity was not a problem. Auxiliary regressions were run to examine possible problems

with multicollinearity. The F-tests revealed multicollinearity to be an issue with each variable, except for female labor force participation.

To answer this question, previous studies the variables above were consulted. These studies are demonstrated below in the Literature Review. Next, the model for regression is explicitly defined, along with further motivation of the included explanatory variables and their expected signs. Data on the dependent and explanatory variables are discussed. Results and analysis of the final regression follow. The paper concludes with a summary of the findings and possible policy implications.

Brief Literature Review

Before running regressions to determine the effects of the explanatory variables on unemployment, previous literature regarding said variables was examined. This research helped deepen the motivation for including said variables into the regression and also informed the expected signs of the coefficients in the modeled regression.

David Card and Alan Krueger (1994) "Minimum Wage and Employment: A Case Study of the Fast Food Industry in New Jersey and Pennsylvania"

Card and Krueger studied the effects of a higher minimum wage on employment in New Jersey compared to Pennsylvania.[1] A metropolitan area emerged at the border of the two states, which led to similar macroeconomic trends in each state. Therefore, when the minimum wage increased in New Jersey, Pennsylvania was used as a control group subject to the same outside factors as NJ, other than the minimum wage change. Card and Krueger looked at fast food restaurants that usually hired employees who earned the minimum wage. After the wage hike, New Jersey fast food restaurants hired two more people on average. This research illustrates that higher minimum wages in a state indicated less unemployment.

Min Zhou (1993) Underemployment and Economic Disparities Among Minority Groups

In her work, Min Zhou discussed the differences and trends in the labor supply of Puerto Ricans, African-Americans, Mexicans, Cubans, Chinese and Japanese in the 1980s.[2] In these minority groups, 40% of the members were *underemployed.*[3] Zhou focused on the differences between segments of the population within the broad umbrella of "minorities." The groups that had the least unemployment were the Japanese and Cubans because of "occupational mismatch", which refers to greater education, skills, and experience than a job requires. African-Americans and Puerto Ricans were the hardest hit economically and in terms of employment.

[1] Card, D., & Krueger, A. B. (1994). Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania. *The American Economic Review*, (4). 772.
[2] Zhou, Min. (1993) Underemployment and Economic Disparities among Minority Groups. *Population Research and Policy Review,* 12(2) 139-57.
[3] Working, but working less than one wants to.

Justin R Pierce & Peter K Schott (2016). "The Surprisingly Swift Decline of US Manufacturing Employment"

Although manufacturing in the US had been on the decline for decades, Pierce and Schott examined the rapid decline of manufacturing after the year 2000.[4] They determined that the removal of a tariff on Chinese imports contributed to this downward trend in manufacturing. This certainly supports the idea that firms ship their jobs overseas to China, where production is cheaper and labor standards are not enforced. The authors also noted that technological change and automation were possible reasons for the decline in the United States manufacturing sector.

Guido Imbens (2016) "Estimating the Effect of Unearned Income on Labor Earnings, Savings, and Consumption: Evidence from a Survey of Lottery Players"

Imbens surveyed a group of people who won the lottery, an example of unearned income similar to welfare, asking how that affected how much they worked.[5] Results showed the average marginal propensity to earn (MPE) was -11 percent.[6] While this did not differ much between men and women, it was higher for people closer to retirement age. This means for every dollar a person received that he/she did not work for, hours worked decreased by 11%. Therefore, non-labor income negatively affected labor force participation.

Vera Brusentsev (2006) "Evolution of the Female Labor Force Participation in the United States: 1967-2003"

The percentage of women in the workforce has steadily increased in the last sixty years.[7] This upward trend can be attributed to a shift in traditional gender roles, as many women are now not expected to exclusively handle domestic chores, such as managing a household or raising children. In this paper, Brusentsev explored the trends of American women participating in the labor force over time.[8] In addition to examining the distinct and separate effects of race, family size, and education levels on female labor force participation, Brusentsev also examined unemployment and concluded it was inversely related to the female labor force participation rate over time.

Methodology

The model chosen was a linear regression model with quantitative variables using cross sectional data.

$$X_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} - \beta_5 X_{5i} + u_i$$

Y = Unemployment Rate by State (2010)
X1 = Minimum Wage by State (2010)
X2 = Percentage of the Population that is Non-White by State (2010)

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[4] Pierce, J. R., & Schott, P. K. (2016). The Surprisingly Swift Decline of US Manufacturing Employment. *American Economic Review*, *106*(7), 1632-1662.
[5] Imbens, G. W., Rubin, D. B., & Sacerdote, B. I. (2001). Estimating the Effect of Unearned Income on Labor Earnings, Savings, and Consumption: Evidence from a Survey of Lottery Players. *The American Economic Review*, (4). 778.
[6] MPE is the partial derivative of the labor supply curve with respect to hours worked, after receiving non-labor income.
[7] Institute for Women's Policy Research. "Women's Labor Force Participation."
[8] Brusentsev, V. (2006). Evolution of Female Labor Force Participation in the United States: 1967 to 2003. *International Advances In Economic Research*, *12*(3), 358-373.

X3 = Manufacturing Jobs as a Percentage of Total Jobs by State (2010)
X4 = Percentage of the Population Receiving Welfare Benefits by State (2010)
X5 = Female Labor Force Participation Rate by State (2010)
This particular model was chosen because it was believed that a linear relationship would exist between each of the explanatory variables and unemployment. All coefficients were expected to be positive except for β_5, due to the expected negative relationship between female labor participation (X5) and unemployment (Y).

State Minimum Wages by State (2010):

The effect of minimum wages on economic factors such as income inequality, earnings, and supply of jobs has been a hot topic in labor economics. Controversy has surrounded the effects of minimum wage on unemployment due to the contradictory nature of the results.[9] In the classical labor market model, a rising minimum wage has the same effect as simple price increase. The raise leads to a decrease in jobs available in the market, and therefore greater unemployment. Companies shift resources towards capital and away from labor since the relative price of labor inputs into the production function increased. However, empirical evidence has increasingly contradicted this result—the Card and Krueger paper discussed previously was just one example. Many studies have looked at the effects of a changing minimum wage. However, this paper examines cross-sectional data rather than time-series data. It was expected that this relationship would be positive—the higher the minimum wage, the higher the unemployment rate. This is based on the classical labor market with regards to labor supply and demand. A higher wage will cause companies to lay off workers, causing the demand for workers to be less than the supply of workers, also known as a labor surplus.

Percentage of the Population that is Non-White by State (2010):

American minorities (African-American, Asian, Hispanic, etc.) typically experience a higher rate of unemployment than the white population. They are typically the first to be laid off in economic recessions and the last to be hired in booms.[10] This was especially true following the Great Recession in 2008, when many minorities lost their jobs. The unemployment rate for African Americans was a staggering 15.8% at the beginning of 2010.[11] It was believed that if a greater percentage of a state's overall population was non-white, then unemployment would be higher in that state. Therefore, it was expected that there would be a positive relationship between the non-white percentage of the population and the unemployment rate.
Manufacturing Jobs as a Percentage of Total Jobs by State (2010):
The manufacturing industry has been on a steady decline in America since the 1980s.[12] In 1980, over 19,000,000 jobs were supplied in the manufacturing sector but by 2010, manufacturing jobs fell to 11,000,000.[13] Some states, such as Michigan and Ohio, have economies with more

[9] Neumark, David, and William L. Wascher. "The Effects of Minimum Wages on Employment." In *Minimum Wages*, 37-106. MIT Press, 2008.
[10] Weller, Christian E. (2010) "The State of Minorities in the Economy." Center for American Progress.
[11] Weller, Christian E. (2010) "The State of Minorities in the Economy." Center for American Progress.
[12] McAfee, Andrew. (2013) "Manufacturing Jobs and the Rise of the Machines." Harvard Business Review.
[13] Federal Reserve Bank of St. Louis. "All Employees: Manufacturing."

manufacturing jobs. States such as these should have felt the decline of the manufacturing sector more severely and lay off more workers than those that do not heavily rely on the manufacturing industry as a source of employment. Therefore, it was expected that manufacturing jobs as a percentage of total jobs would be positively related to state unemployment rates.

Percentage of the Population Receiving Welfare Benefits by State (2010):

This variable was included because the more people received welfare payments, the less people were incentivized to go out and search for work. As mentioned in the Brief Literature Review, Imbens explained that non-labor income decreased how much a person would work. If a person's income was sufficiently low already, welfare benefits could push them to stop working completely. When one relies on welfare benefits as one's sole source of income, one is not gaining experience in the work force. As such, if one decides to search for work, one's lack of experience could put one at a disadvantage. This would inflate unemployment. Therefore, it was expected that there would be a positive relationship between the percentage of population receiving welfare benefits and unemployment.

Female Labor Force Participation Rate by State (2010):

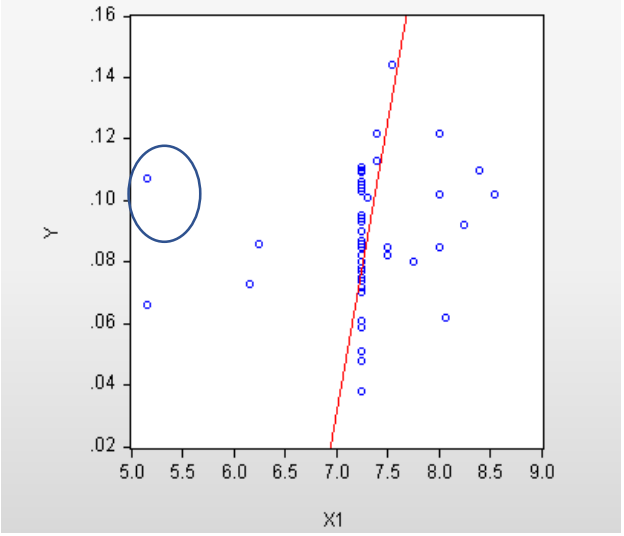
By including female workforce participation, the authors accounted for the contribution of females on the overall health of the state's economy. More females in the workforce of a particular state meant the economy should be stronger (as proved in the Literature Review) and therefore the unemployment should be lower. As such, it was expected that there would be a negative relationship between percentage of women in the labor force and unemployment.

Data

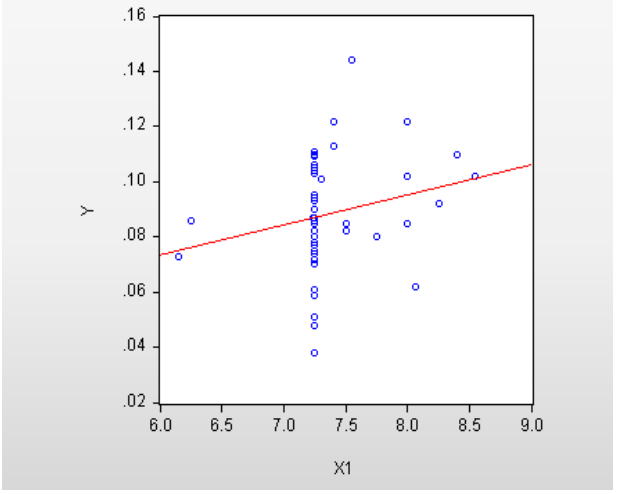
Cross sectional data from each state was gathered from the year 2010. This was the last year the census was conducted, thereby providing reliable population data. The District of Columbia (D.C) was included in this paper, as much of the research consulted regarding analyses of states included D.C. The data for the dependent variable, state unemployment rates in 2010, was collected from the Bureau of Labor Statistics.[14] A possible problem with this was that cross-sectional data generally has a lower R^2. Another data problem was that a survey was used to measure the unemployment rate and those surveyed might not have been completely honest. Furthermore, the unemployment rate does not include discouraged workers, who are not considered part of the labor force. However, this is the most widely used and reliable employment indicator. Data on the minimum wage by state in 2010 was collected from the US Department of Labor.[15] A lack of variation in the data was one possible issue with the minimum wage. The highest minimum wage in a state was Washington at $8.55. The lowest minimum wage *without any conditions* was $5.15 in Wyoming. According to the Department of Labor table, from which this data was gathered, there are certain conditions that might lead to a lower minimum wage. For instance, in Arkansas the minimum wage was $6.25 for employers of four or more people, while the federal minimum wage of $7.25 applies if that condition was not met. This possibility of multiple minimum wages for a state, depending on certain conditions, could make it difficult to determine which minimum wage was affecting unemployment.

[14] Bureau of Labor Statistics. "Employment Status of the Civilian Noninstitutional Population by Sex, Race, Hispanic or Latino Ethnicity, Marital Status, and Detailed Age, 2010 Annual Averages."
[15] Department of Labor. "Changes in Basic Minimum Wages in Non-Farm Employment under State Law: Selected Years 1968 to 2016."

Graph 1 - Effect of State Minimum Wage in 2010 (X1) on Unemployment (Y)



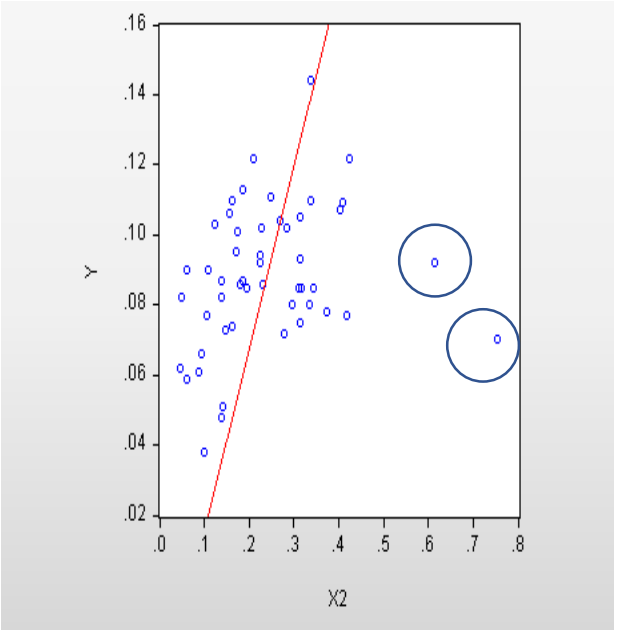
Graph 2 - Effect of State Minimum Wage in 2010 (X1) on Unemployment (Y) (Without Outliers)



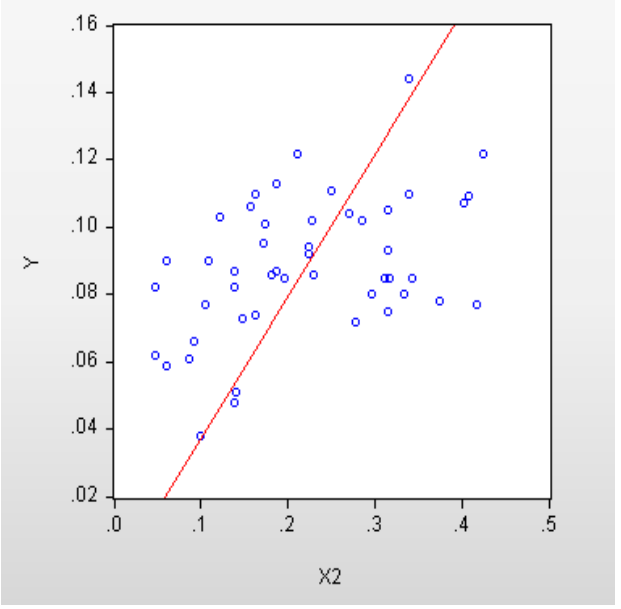
The percentage of the population that was non-white was constructed using data from the 2010 census map.[16] For each state, the white population was divided by the total population. This value was then subtracted from "1" to find the non-white percentage of the population. For example, in New York State in 2010, the white population was 12,740,974 while the total population of the state was 19,378,102. One then divides 12,740,974 by 19,378,102 to get 0.6574933913. This value was then subtracted from "1" to get the non-white percentage of the population, 0.3425066087. A possible problem with this could be that the percentage of the population that was non-white includes people that are not part of the labor force. For example, this number includes people would not be counted in the labor force, such as children under the age of 16, or retirees.

[16] United States Census. "2010 Census Population Map."

Graph 3 - Effect of Percentage of the Population that is Non-White (X2) on Unemployment (Y)



Graph 4 - Effect of Percentage of the Population that is Non-White (X2) on Unemployment (Y) (Without Outliers)

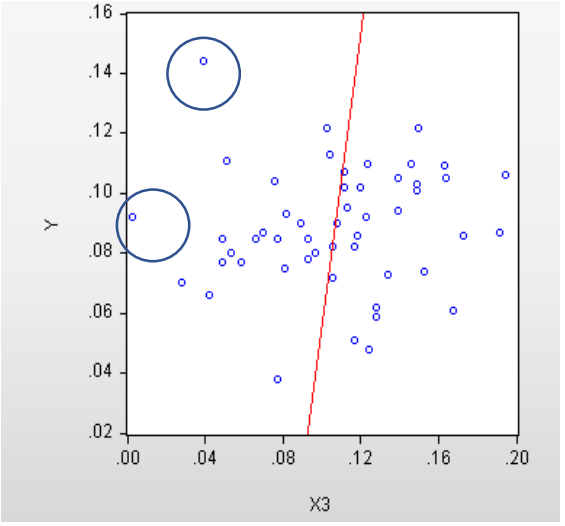


The data on manufacturing was collected from the Bureau of Labor Statistics.[17] In order to find the percentage of manufacturing jobs by state, "Annual Average Employment - Manufacturing" for each state was divided by "Annual Average Employment - Total Private" for

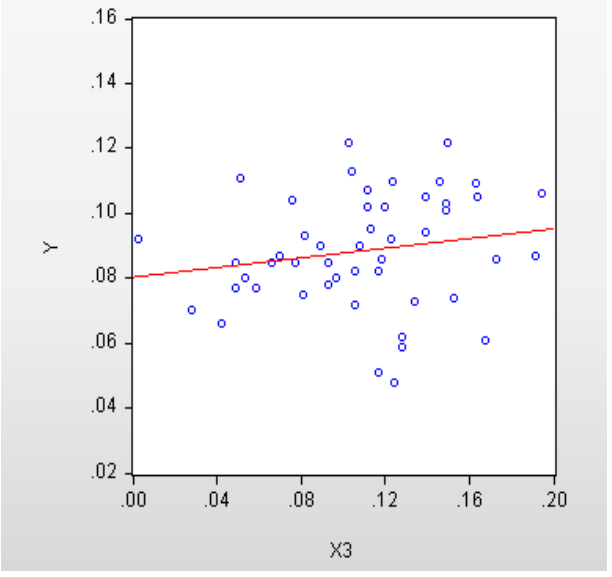
[17] Bureau of Labor Statistics. "Table 10. Private Industry by State and Six-Digit NAICS Industry: Establishments, Employment, and Wages, 2010 Annual Averages."

each state in 2010. A possible problem was that it is virtually impossible to measure the exact number of jobs in each state.

Graph 5 - Effect of Manufacturing Jobs as a Percentage of Total Jobs by State (X3) on Unemployment (Y)



Graph 6 - Effect of Manufacturing Jobs as a Percentage of Total Jobs by State (X3) on Unemployment (Y) (Without Outliers)

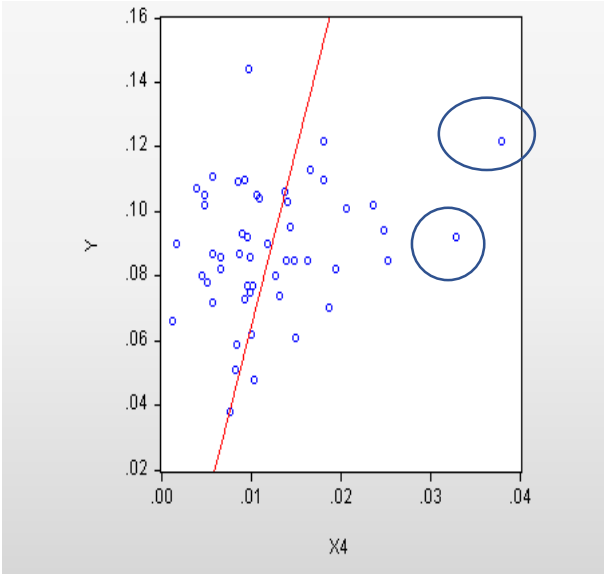


The data for percentage of the population receiving welfare benefits was constructed using other data sets. The average monthly number of recipients of the Temporary Assistance for Needy Families (TANF) Program was gathered for each state in Fiscal Year 2010 from the Office of Family Assistance.[18] This was then divided by each state's population in 2010, according to the US

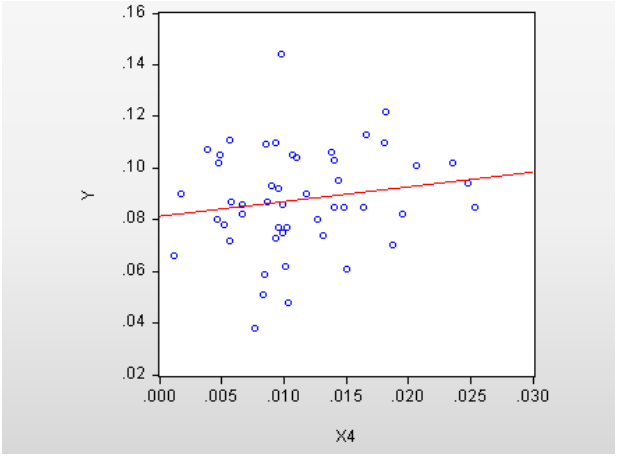
[18] Office of Family Assistance. "Fiscal and Calendar Year 2010 - TANF: Total Number of Recipients."

Census.[19] One issue could be that data was used for the Fiscal Year 2010, as opposed to the Calendar Year 2010. Fiscal Year 2010 began in October of 2009 and ended in September 2010, meaning that October, November, and December of 2010 were not included in the percentage of the population receiving welfare benefits in 2010. However, the dependent variable, unemployment rate in 2010, did include those months. As such, reconciling the fiscal and calendar years could be an issue.

Graph 7 - Effect of Percentage of the Population Receiving Welfare Benefits (X4) on Unemployment (Y)



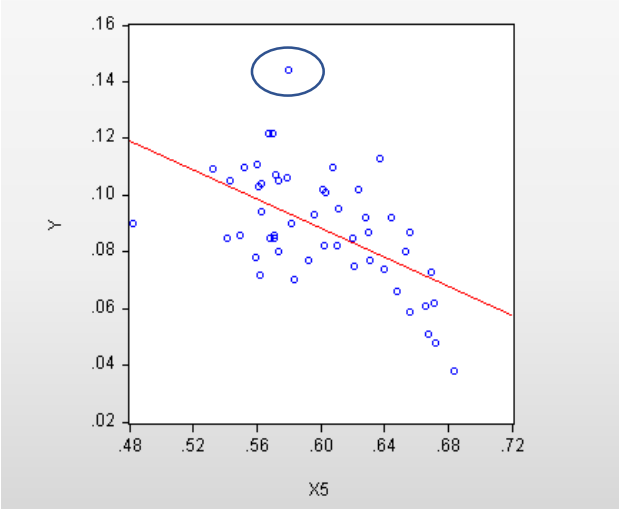
Graph 8 - Effect of Percentage of the Population Receiving Welfare Benefits (X4) on Unemployment (Y) (Without Outliers)



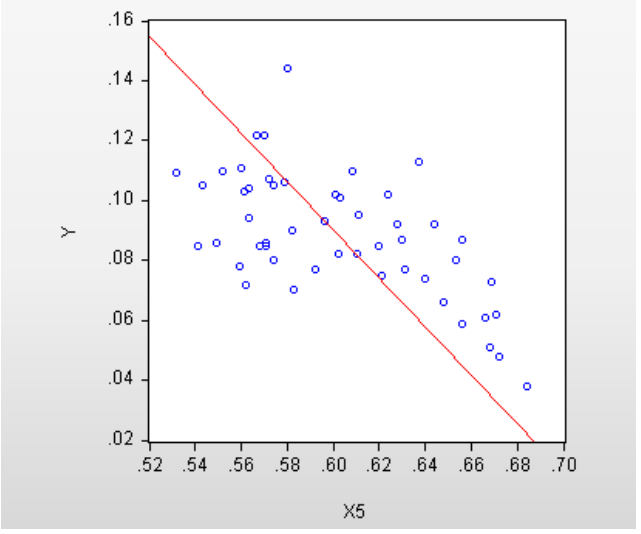
[19] United States Census. "Resident Population Data."

The Female Labor Force Participation Rate (FLPR) by State in 2010 was collected from the Bureau of Labor Statistics.[20] Labor Force is measured by the number of people employed and unemployed in the economy. A possible problem with this data is that this could be collinear with the dependent variable, unemployment.

Graph 9 - Effect of Female Labor Force Participation (X5) on Unemployment (Y)



Graph 10 - Effects of Female Labor Force Participation (X5) on Unemployment (Y) (Without Outliers)



[20] Bureau of Labor Statistics. "Employment Status of the Civilian Noninstitutional Population by Sex, Race, Hispanic or Latino Ethnicity, Marital Status, and Detailed Age, 2010 Annual Averages."

Table 1 (below) shows the mean and standard deviation calculated from the data sources above.

Table 1

Variable	Mean	Standard Deviation
State Unemployment Rate (2010)	0.0885	0.0200
Minimum Wage ($) by State (2010)	7.3059	0.6061
Non-White % by State (2010)	0.2401	0.1375
% of People Receiving Welfare Benefits by State (2010)	0.0122	0.0073
Female Labor Participation Rate by State (2010)	0.6000	0.0441
Manufacturing Jobs by State (2010)	0.1067	0.0424

Regression Results

Overall Regression

After running the regression, the following Population Regression Function was obtained:

$$Y = 0.1782 + 0.0048 * X_1 + 0.0209 * X_2 + 0.0775 * X_3 + 0.3770 * X_4 - 0.2375 * X_5$$

The Overall Regression Results can be seen in Table 2 of The Appendix. Each variable had the expected sign. Given the F-statistic was 6.2948, the overall regression was statistically significant. As expected, there was a low R^2 of 0.4116 which could be attributed to the use of cross-sectional data.

The only variable that was individually statistically significant at the 10% level was the Female Labor Force Participation Rate by State (2010). In the overall regression, this variable had a coefficient value of -0.2375, a standard error of 0.0555, and a p-value of 0.0001. The remaining explanatory variables were not individually significant at the 10% level. Minimum Wage by State (2010) had a coefficient value of 0.0048, a standard error of 0.0044, and a p-value of 0.2778. The Percentage of the Population Non-White by State (2010) had a coefficient value of 0.0209, a standard error of 0.0203, and a p-value of 0.3074. The Percentage of Manufacturing Jobs by State (2010) had a coefficient value of 0.0775, a standard error of 0.0605, and a p-value of 0.2070. The Percentage of the Population Receiving Welfare Assistance by State (2010) had a coefficient value of 0.377, a standard error of 0.3748, and a p-value of 0.3199.

This regression was not meant to be used as a forecast since it was not time series data. Referencing the F-statistic, the overall fit of the data to the model is satisfactory. However, four of the five partial coefficients were not significant. Each variable was then regressed on unemployment individually and the results are as followed.

Minimum Wage by State (2010):

It was expected that the higher the minimum wage, the higher the unemployment rate would be. This hypothesis was supported when unemployment (Y) was regressed on minimum wage (X1). The slope coefficient β_1 was positive, but close to zero, with a value of 0.0575. The R^2 had a low value of 0.0303. The standard error of the coefficient was 0.0046. This was seen in Table 3. However, the coefficient β_1 was not statistically significant with a p-value of 0.2218, which was not sufficiently low. Based on Graph 1, Georgia and Wyoming were considered to be outliers with a minimum wage of $5.15 in both states. The unemployment rates in Georgia and Wyoming were 10.7% and 6.6%, respectively. These outliers are highlighted in Graph 1. After these points were removed, the coefficient value increased to 0.0109 and the p-value decreased to 0.1049. This is seen in in Table 4. Graph 2 illustrates the data with the outliers removed. After running a test on the studentized residuals, it was determined that Nebraska, Nevada, and North Dakota were considered to be extreme observations. However, they were not considered to be outliers based on their position in Graph 1. The studentized residuals are highlighted in red and seen in Table 15.

After running the Glejser and White tests, it was determined that heteroscedasticity was not a factor. The t-statistic from the Glejser test was -0.35, meaning the coefficient was not significant and there was no heteroscedasticity. The value from the White Test was equal to 19.3013. At twenty degrees of freedom, the p-value following the Chi-Square distribution was equal to 0.5023. As such, the value was not statistically significant, meaning there was no heteroscedasticity. The White test is seen in Table 13.

The F-test was conducted for multicollinearity. The computed F-value was determined after running an auxiliary regression of minimum wage on each of the other explanatory variables. The computed F-value was 3.78, which was greater than the critical F-value of 2.07 at the 10% level of significance (4 degrees of freedom, 46 degrees of freedom). However, the R^2 from this auxiliary regression was 0.2472, which was lower than the overall R^2 value, 0.4116. According to Klein's Rule of Thumb, "multicollinearity may be a troublesome problem only if the R^2 obtained from an auxiliary regression is greater than the overall R^2 that is obtained from the regression of Y on all the regressors."[21] However, since Klein's Rule of Thumb is not a formal test like the F-test, it was determined that there was multicollinearity. As seen below, the same issue arose for X2, X3, and X4.

Percentage of the Population Non-White by State (2010):

It was expected that a higher rate of non-white population by state (2010) would lead to higher rates of unemployment. This proved true because when unemployment (Y) was regressed on non-white population (X2) alone, the coefficient was positive but close to zero, with a value of 0.0406. The R^2 had a low value of 0.0777. The standard error of the coefficient was 0.02. This is seen in Table 5. However, this coefficient was statistically significant at the 10% level with a p-value of 0.0476. Based on Graph 3, Hawaii and Washington D.C. were considered to be outliers with non-white population rates of 62% and 75%, respectively. The unemployment rates in Hawaii and Washington D.C. were 7% and 9.2%, respectively. Such outliers are highlighted in Graph 3. After removing these points, the coefficient value increased to 0.0873 and the p-value decreased to 0.0010, which was very significant. This is seen in in Table 6. Graph 4 illustrates the data with the outliers removed. After running a test on the studentized residuals, it was determined that Hawaii,

[21]Retrieved from https://newclasses.nyu.edu/access/content/group/dc0c7874-22da-487e-ac84-8e938f12ab1e/Documents/Summer%202012%20Lecture%20Handouts%20-%20PDF%20Format/J-GP%20CHAPTER%2010%20HANDOUT-PDF_1.pdf - Slide 70

Nevada, and North Dakota were considered to be extreme observations. However, they were not considered to be outliers based on their position in Graph 3. The studentized residuals are highlighted in red and seen in Table 16.

After running the Glejser test it was determined that heteroscedasticity was not a factor. The t-statistic from the Glejser test was 1.0040, meaning the coefficient was not significant and heteroscedasticity was not present.

After running an auxiliary regression of non-white population on each of the other explanatory variables, evidence of multicollinearity was found. The computed F-value was 5.56, which was greater than the critical F-value of 2.07 at the 10% level of significance (4 degrees of freedom, 46 degrees of freedom). However, the R^2 from this auxiliary regression was 0.3260, which was lower than the overall R^2 value, 0.4116. As mentioned previously, Klein's Rule of Thumb is not a formal test like the F-test. Therefore, based on the results of the F-test, it was determined that there was multicollinearity.

Manufacturing Jobs as a Percentage of Total Jobs by State (2010):

It was expected that a higher percentage of manufacturing jobs by state (2010) would lead to higher unemployment. This proved true when unemployment (Y) was regressed on manufacturing jobs (X3). The coefficient was positive, but close to zero, with a value of 0.0454. The R^2 had a low value of 0.0093. The standard error of the coefficient was 0.0454. This is seen in Table 7. However, this coefficient was not statistically significant with a p-value of 0.5017. Based on Graph 5, Nevada and North Dakota were considered to be outliers. The percentage of manufacturing jobs out of total jobs in Nevada and North Dakota were 4% and 7%, respectively. Nevada had an unemployment rate of 14.4% and North Dakota had an unemployment rate of 3.8%. These outliers are highlighted in Graph 5. After these outliers were removed, the coefficient value increased to 0.0745 and the p-value decreased to 0.2158. This is seen in in Table 8. Graph 6 illustrates the data with the outliers removed. After running a test on the studentized residuals, it was determined that Nebraska, Nevada, and North Dakota were considered to be extreme observations. However, Nebraska was not considered an outlier based on its position in Graph 5. The studentized residuals are highlighted in red and seen in Table 17.

After running the Glejser test, it was determined that heteroscedasticity was not a factor. The t-statistic from the Glejser test was 0.1785, meaning the coefficient was not significant and there was no heteroscedasticity.

After running an auxiliary regression of manufacturing jobs on each of the other explanatory variables, it was determined that there was evidence of multicollinearity. The computed F-value was 3.00, which was greater than the critical F-value of 2.07 at the 10% level of significance (4 degrees of freedom, 46 degrees of freedom). However, the R^2 from this auxiliary regression was 0.2068, which was lower than the overall R^2 value, 0.4116. As mentioned previously, Klein's Rule of Thumb is not a formal test like the F-test. Therefore, based on the results of the F-test, it was determined that there was multicollinearity.

Percentage of the Population Receiving Welfare Assistance by State (2010):

It was expected that the more people receiving welfare assistance, the higher unemployment would be. This proved true because when unemployment (Y) was regressed on population on welfare (X4), the coefficient was positive, with a value of 0.6897. The R^2 had a low value of 0.0631. The standard error of the coefficient was 0.3798. This is seen in Table 9. This coefficient was statistically significant at the 10% level with a p-value of 0.0755. Based on Graph 7, California and Washington D.C. were considered to be outliers with 3.8% and 3.29% of the population having received welfare assistance, respectively. California had an unemployment rate of

12.2% and Washington D.C. had an unemployment rate of 9.2%. These outliers are highlighted in Graph 7. After these outliers were removed, the coefficient value decreased to 0.5699 and the p-value increased to 0.2636. This was noteworthy because the removal of outliers caused the slope coefficient to be *less* significant. This is seen in in Table 10. Graph 8 illustrates the data with the outliers removed. After running a test on the studentized residuals, it was determined that Nebraska, Nevada, and North Dakota were considered to be extreme observations. However, they were not considered to be outliers based on their position in Graph 7. The studentized residuals are highlighted in red and seen in Table 18.

After running the Glejser test, it was determined that heteroscedasticity was not present. The t-statistic from the Glejser test was -0.6698, meaning there was no heteroscedasticity.

After running an auxiliary regression of welfare assistance on each of the other explanatory variables, evidence of multicollinearity was found. The computed F-value was 4.8800, which was greater than the critical F-value of 2.07 at the 10% level of significance (4 degrees of freedom, 46 degrees of freedom). However, the R^2 from this auxiliary regression was 0.2978, which was lower than the overall R^2 value, 0.4116. As mentioned previously, Klein's Rule of Thumb is not a formal test like the F-test. Therefore, based on the results of the F-test, it was determined that there was multicollinearity.

Female Labor Force Participation Rate by State (2010):

It was expected that the higher the female labor force participation rate the lower unemployment would be. This proved true because when unemployment (Y) was regressed on female labor participation (X5) the coefficient had a value of -0.2564. The R^2 had a value of 0.3196. The standard error of the coefficient was 0.0535. This is seen in Table 11. This coefficient was statistically significant at the 10% level with a p-value of 0.0000. West Virginia was an outlier with female labor participation at 48.2% and unemployment at 9%. This outlier was highlighted in Graph 9. After the outlier was removed, the coefficient value decreased to -0.2971 and the p-value was 0.0000. This is seen in in Table 12. Graph 10 illustrates the data after removing the outliers. After running a test on the studentized residuals, it was determined that Hawaii and Nevada were considered to be extreme observations. However, they were not considered to be outliers based on their position in Graph 9. The studentized residuals are highlighted in red and seen in Table 19.

After running the Glejser Test to test heteroscedasticity, it was determined that heteroscedasticity was not present. The t-statistic from the Glejser Test was -0.4580, meaning the coefficient was not significant and there was no heteroscedasticity.

After running auxiliary regressions of female labor participation on each of the other explanatory variables, it was determined that there was no multicollinearity. The computed F-value 1.65, seen in Table 12, was less than the critical F-value of 2.07 at the 10% level of significance (4 degrees of freedom, 46 degrees of freedom). Furthermore, the R^2 from this auxiliary regression was 0.1251, which was lower than the overall R^2 value, 0.4116.

Further Tests

Modified R^2 was calculated by hand for the overall regression, and for each of the five individual explanatory variables. The Modified R^2 value was 0.3712 as compared to the original R^2 value, 0.4116. Like the original R^2, the low Modified R^2 can also be attributed to cross-sectional data. The calculations for the Modified R^2 can be seen in Table 14. For the overall regression, there were 51 observations (n) and 5 explanatory variables (k). For each individual regression, there were 51 observations (n) and 1 explanatory variable (k). The formula for the Modified R^2 is as follows: Modified $R^2 = (1-k/n) * R^2$.

Autocorrelation was not tested for because there was a very small possibility that autocorrelation would be present in cross-sectional data.

Summary and Conclusion

In summary, this paper examined the unemployment rate in each state in 2010 and sought to determine which explanatory variables had the largest effect. The independent variables used were State Minimum Wages, Percentage of the Population Non-White, Percentage of Manufacturing Jobs, Percentage of the Population Receiving Welfare Assistance, and the Female Labor Force Participation Rate. The variables that were not statistically significant follow. Despite previous research showing that minimum wages had a large impact (in both the positive and negative direction) on unemployment, the coefficient in the individual regression was not significant. This information could be due to the fact that there was not enough variation in the variable, a possible data problem discussed previously. The percentage of manufacturing jobs was also not statistically significant. Such a percentage could be due to the fact that the manufacturing sector had already experienced a sharp decline before 2010.

The individual effect of percentage of the population non-white on state unemployment was statistically significant, as expected, with a positive slope coefficient of 0.0406. This result meant a greater non-white population correlated to larger unemployment rates. With regards to policy implications, in "Underemployment and Economic Disparities between Minorities", Min Zhou pointed to "occupational mismatch" as a short-term fix that positively impacted unemployed or underemployed minorities. By working jobs in which one's education or skill level was higher than the level required for the job, minorities learned new skills, were exposed to new industries, and earned an income. Japanese and Cubans took advantage of this and therefore were the most employed of the minorities Zhou researched.

However, the incentives to work decreased when welfare was introduced. X_4, percentage of the population receiving welfare assistance, was statistically significant, with a slope coefficient of approximately 0.6897. This coefficient was the largest in absolute terms out of all of the independent variables introduced. As seen in Imbens' paper, this could be attributed to unearned income, which severely decreased one's incentive to work. Changes in the welfare system need to be considered in order to incentivize people to work, even as they receive welfare benefits. Lastly, female labor force participation was also individually statistically significant with a slope coefficient of approximately -0.2656. This finding should lead to greater efforts in encouraging women to join the workforce.

After conducting the White Tests and Glejser Tests, none of the variables were heteroscedastic. In regards to multicollinearity, the F test was conducted based on auxiliary regressions for each of the variables. It was determined that there was multicollinearity for Minimum Wage by State (X1), Percentage of the Population Non-White by State (X2), Manufacturing Jobs as a Percentage of Total Jobs by State (X3), and Percentage of the Population Receiving Welfare Assistance by State (X4). A test for studentized residuals was also run to determine what could be considered extreme observations. However, rarely did the results of the studentized residuals match up with what was considered an outlier based on the graphs.

In conclusion, the variables that affected unemployment the most were percentage of the population non-white, percentage of the population on welfare, and female labor force participation. The problem with unemployment, therefore, has to do with the inability of *underrepresented* (non-white, poor, and women) people in America to find work. It is not the types of jobs in different states, or how much employees earn, but rather the employment opportunities available to these underrepresented citizens.

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A full reference of all data sets used can be found at our website,
http://theeconreview.com/appendix

The Role Of Mortgage Securitization In The U.S. Economy From 1970 To Present

Herbert Gates

From 1986 to 2007, average American household debt increased from under 80% of disposable income to over 140% by 2007. People are living above their means, and the economy is enabling them. Much of this rise in debt was attributed to increasing mortgage debt. Nevertheless, the rise in household debt is not just about deregulation but also monetary policy. Throughout the 90s, after the 2001 stock market crash, and after the Recession, the Federal Reserve maintained very low interest rates which eased credit liquidity, and thus helping to keep markets flush with cash. Because banks were so willing to lend, consumers were able to take on loans to finance their lifestyles for cheap. A perfect example is US mortgage markets. Interest rates on traditional mortgages were very low in 2007-08, plus, markets witnessed the addition of unconventional mortgage schemes, such as high-risk home loans called subprime mortgages.[22] According to Campbell (2010), gaps in regulation enabled investment banks to "create and sell" exotic and risky investment securities at their own discretion; conflicted and "lackadaisical" oversight within credit rating agencies resulted in falsely high ratings of these exotic securities, which convinced bank clients that these products were much safer than they actually were. The lack of adequate regulation encouraged an extremely liberal supply of credit to enter the market and banks, and thus the mortgage lenders were able to lend at will and to nearly anyone.

Further, this deregulation eased credit and allowed for more Americans to purchase homes by taking on more debt, but it was a short-term gain for the economy. The 1986 Tax Reform Act is an example of the deregulation that took place. Since World War 2, the US tax code had allowed Americans to deduct interest paid on their mortgage from their federal income taxes, a clear incentive for home ownership. However, the 1986 reform law allowed for an unlimited deduction from mortgages on both first and second homes. This encouraged American consumers to take on second mortgages and own multiple homes, benefiting from the interest deductions while financing their lifestyle. Simultaneously, regulations around mortgage quality oversight were either watered-down or rid of entirely. For example, the 1982 Alternative Mortgage Transactions Parity Act granted non-Federally chartered mortgage lenders the ability to write adjustable mortgages, which are mortgages with interest rate "teaser periods" that adjust higher after a certain time frame, typically one year. Next, in 2004, the Office of the Comptroller of Currency granted federally regulated lenders exception from state regulations, which were typically more stringent. This allowed for many lenders to employ prepayment penalties and balloon payment schemes, both of which tend to increase risk of default (Campbell). Lastly, the lending capacity of government-sponsored enterprises (GSE)—such as Fannie Mae, Freddie Mac, and others—were capped by the Bush administration in order to reduce the role of GSEs in the mortgage market and foster more competition between private companies and lenders. Though this is similar to the neoliberal prescription put forward by Brenner and Peck, the government still played an active, yet reduced role in the mortgage markets (Hall). Moreover, this placed pressure on the *secondary market* for mortgages because these GSEs supported them with a large amount of liquidity. Fannie and Freddie's main role was to support the secondary market because it inherently eases credit and

enables mortgage originators to continually invest their assets in new mortgage origination. The secondary market for mortgages, for reasons to be explained later, was unfortunately critical to maintaining stability within mortgage markets, and thus the U.S. economy. Regardless, private companies, including investment banks that had acquired mortgage lenders, were further incentivized to enter the mortgage space. Their entrance in the market increased competition and decreased profits for other market players, which encouraged lenders to took on more risk and give out more mortgages to compensate for the declining profits. On top of inadequate regulation, advances in technology and innovation around securities trading and risk hedging enabled extremely advanced financial securitization of these loans, which resulted in an unsustainable amount of subprime mortgage debt on lenders' and banks' balance sheets. This alone played a large part in sowing the seeds of the financial meltdown, but the crash was not inevitable. The catalyst of the financial crisis was the bursting of the bubble in the U.S. housing market and the rapid depreciation of home values starting in early 2007. But, what drove the growth of the bubble was access to very cheap mortgage credit and a large appetite on the lender and consumer side for subprime rated mortgages. Banks had a large appetite for subprime mortgage debt because, to put it bluntly, it made them large amounts of money. Securitizing mortgage debt into tradable securities was the most profitable business around; rating agencies generally rated them very high, which enabled the securities to carry a top-dollar value due to its perceived high upside and low downside. Profits on securitized mortgages naturally made banks hungry for more, and thus enabled for profits to trickle down the supply chain of mortgage debt securitization; they flowed all the way from the mortgage originator down to the broker-dealer who was *making* mortgage-backed securities trading markets. Investment banks and GSEs would buy mortgages and package them in the form of different securities such as mortgage-backed securities (MBS) and collateralized debt & mortgage obligations (CDO, CMO). These banks and enterprises would then turn around and sell these packaged securities in tranches, a term for certain slices of the security, all with different coupon rates and payment structures. In 2006, 07, and 08, rising delinquencies within subprime mortgages first led to the failing, including Fannie Mae and Freddie Mac, Countrywide, and New Century Financial. These originators had taken on billions of dollars in mortgage debt, having lent subprime mortgages to tens of millions of Americans. For example, after Countrywide failed in 2008, Bank of America purchased the firm for $2.5 billion; by June 2012, Bank of America had lost more than $40 billion in real estate investments, repayments to investors, as well as legal fees and settlements with federal and state agencies associated with Countrywide (Fitzpatrick). Next, banks began to fail. In March of 2008, though the Federal Reserve Bank of New York provided an emergency loan to prevent its impending failure, Bear Stearns, the 7th-largest global investment bank by assets, failed. Down from its 52-week high of $133.20 per share, the bank sold itself to J.P. Morgan for $10 per share. The collapse of Bear Stearns precluded a total global financial meltdown that put several institutions on the brink of collapse including Bear Stearn's rival, Lehman Brothers (acquired by J.P. Morgan), Merrill Lynch (acquired by Bank of America), Washington Mutual (lost its banking subsidiary after overseeing the largest financial failure—with respect to assets under management—in US history, but its remaining assets were sold to J.P. Morgan), Wachovia (acquired by Wells Fargo), Citigroup (received $45 billion in bailout funds), AIG (largest recipient of bailout funds at $180 billion), and the GSEs Fannie Mae and Freddie Mac.

The financial meltdown of 2008 stemmed in part from a series of neoliberal regulatory policies that stretch back to the 1970s. The associations of neoliberal ideology within the regulations also suggest loosely conservative ideas of lower taxes and less government oversight. Free market ideologists, like Milton Friedman and Friedrich Hayek who "argued for free markets and against any form of state planning or state intervention into the economy other than for purposes of rectifying the most serious market failures or negative externalities," saw forms of their doctrine increase in popularity and practice in the 1970s (Krippner, Markets on Trial). The neoliberal belief that less

government regulation is better for the economy manifested itself wholly in the 70s, reaching its political pinnacles with the elections of Ronald Reagan, George H.W. Bush, Bill Clinton, and George W. Bush. At the same time, many economists and economic sociologists disagree with this viewpoint. Wendy Brown argues in *Undoing the Demos* that neoliberalism is silently undoing the basic elements of democracy. It does so not by the means of instituting a plutocracy, handing the keys of the economy from manufacturing and industrials to financial services, or the shift to a market-based economy, but rather "neoliberal reason, ubiquitous today in statecraft and workplace, in jurisprudence, education, culture, and a vast range of quotidian activity, is converting the distinctly political character, meaning, and operation of democracy's constituent elements into economic ones" (Brown, p. 17-22). Pre-2008 viewpoints coming from Campbell & Lindberg (1990) and Polanyi (1944) argue that markets have always been regulated by political and economic institutions by policies such as property rights and insider trading laws. These institutions, they argue, compose the central "fabric" of the economy, bearing the standard for stability and continuity. Economists such as Paul Krugman, on the other hand, point to the lack of an effective regulatory environment in the years leading up to and including 2008, as evidence of the need for stringent regulations to financial markets in particular (Krugman). Hyman Minsky, a post-Keynesian era economist, believes that, on top of stringent regulation on the financial sector, the Federal Reserve shall serve as the ultimate last resort lender to the U.S. economy in order to contain extending damage from a crisis rooted in speculation. "In the end there is no such thing as a truly free market" (Campbell, p. 66).

The financial crisis of 2008 was partly a result of not too much financial regulation, but in reality, too little regulation. This inadequate regulation was one capitalistic response to the traditional "Keynesian welfarism" that characterized the 1970s. "As Theodore, Peck, and Brenner summarize, 'Open, competitive and unregulated markets, liberated from state intervention and the actions of social collectivities, represent the optimal mechanism to socioeconomic development" (Hall). Varying ideologies around the issue of free markets, regulation, and government intervention have been extensively developed. From the 1970s to the turn of the century the U.S. financial sector experienced a period of deregulation which arguably climaxed with the repeal of the Glass-Steagall Act under President Bill Clinton in 1998. Less than ten years later, global financial markets had been turned upside down and the U.S. had been thrown into a deep recession. Economists such as Krugman, Minsky, and Campbell are supporters of regulated markets, yet some aspects of their ideologies were undermined in the latest of crises. Campbell et. al. cited property rights as one essential fabric to stability, yet this very notion is what allowed the housing bubble to grow so large. A plurality of the world was convinced that U.S. housing markets could never fail, nor fly under the radar while on the brink of collapse. It did just that in the years leading up to its collapse. Minsky believed that the Federal Reserve should be the ultimate bearer of risk in troubled times, but that markets should be well regulated. The U.S. government acted on the first half of Minsky's ideology through the bank bailout and the economy dove further into recession in the months and years following. While Paul Krugman argues for more robust regulation and points to a lack of it as a principle causation, there was some oversight in place leading up to the crisis. Even the most basic of audits would have shown the astronomical leverage ratios the big banks carried during the rise of the bubble. On the other hand, Brenner, Peck, and Theodore hailed free, competitive, unregulated markets "liberated from state intervention" as the gold standard for sustainable economic growth and productivity. Yet, what would have happened if the U.S. government had let the banks fail? Fannie Mae and Freddie Mac, two government-sponsored mortgage loan originators, received over $185 billion alone in TARP funds. AIG, Bank of America, Citigroup, JPMorgan Chase, Wells Fargo, Ally Financial, Goldman Sachs, Morgan Stanley, and PNC collectively received over $250 billion in bailouts. From a theoretical perspective, the government failed to abide by any of the prescriptions laid out so far. While the government employed Brenner et. al.'s low-regulation

ideology into practice, they violated that same ideology with government intervention in the bailout. Minsky's prescription was only half-taken: U.S. markets lacked "stringent regulation" by any means but still had federal monetary support in the end.

The period of low regulation is defined by a systematic, 30-year legislative effort to break apart financial regulations and government oversight around financial services. This effort was guised in neoliberal rhetoric, consisting of global competitiveness and free market capitalism. As President Bill Clinton put it, it was deemed necessary to decrease financial regulation to give banks more power and ability to diversify their financial opportunities in order to "better equip [financial institutions] to compete in global financial markets" of the corporate economy that would soon outpace the big banks if they did not keep up, a clear nod to neoliberalism's globalized doctrine (Bartlett). Though deregulation is not the sole arbiter of the blame for the crisis, the prominent role of neoliberalism in influencing this period is clear. According to Greta Krippner, the rise of neoliberalism in Washington legislation is due to the cozy relationship between Wall Street lobbyists and Washington's power brokers (Krippner). Alan Greenspan, who identifies with the Austrian school of neoliberal economic thought, had been chairman of the Federal Reserve from 1987 to 2006. While the neoliberal free market ideology that embraces deregulation and free market economics is a classic trait of Chicago school-era economists such as Friedman, Brenner, and Peck, the increasing financialization of the U.S. economy has been associated with the Austrian school of thought. The Austrian school of economics focuses on the neoliberal ideal of the subjective theory of value, which surmises that the value of a good is not based on the amount of labor required to produce it, nor by any inherent property of the good, but rather by the level of importance individuals place on it. In other words, the value of a good is based on the amount that a person is willing to pay for it, regardless of whether anything about the good is modified during the transfer of ownership. Economic theorists such as Carl Menger adhere to this neoliberal 'value in exchange' belief. In free market economies, the freedom of an individual to set his own price for a good, which creates competition among other buyers to bid the highest price, results in a market equilibrium for prices. This exchange based theory of value, Menger argues, is bolstered by the theory of marginal utility. Goods that consumers value higher than others will be a higher priority for purchase because the consumer perceives that he/she will receive more utility from one more unit of said good. The employment of the exchange based theory of value in financial markets contributed to the financialization of the U.S. economy in conjunction with Keynesian monetary policy backed by a sustained neoliberal legislative movement around deregulation of the securities and financial services industries. Still, many economic sociologists and historians have agreed throughout and before this period that substantial oversight of the markets is imperative for economic stability. For example, Hyman Minsky "theorized that financial markets are subject to slow movements from stability to crisis as speculative bubbles form and then burst, causing banks and other lenders to tighten credit even to the most creditworthy companies and individuals" (Campbell, p. 94). Further, in defense of his belief in central bank interventions in times of crisis, Minsky supported financial regulation and oversight as a way to free the central bank from being tethered to severe business cycles. Additionally, theorists endorsed the idea that at the root of financial crises is an overestimation: exuberance and optimism in market cycles enticed banks and lenders to lever up to levels that are unsustainable if susceptible to a market correction (Kindleberger). In other words, if the market expectations around a certain highly promoted asset are not met, the value of the asset will collapse, insolvency could follow, and credit could dry up, sending the economy into recession or worse.

The financialization of the American economy, defining it by the rise in exotic trading instruments as a principal source of income for the financial services industry and a principal source of U.S. GDP growth, on a macro level, is fundamentally tied to the securitization of American consumer financial products. While Krippner defines financialization as a pattern of accumulation

in which profit making occurs increasingly through financial channels rather than through trade and commodity production, she also acknowledged that some define the term as characterizing the rise of financial instruments and exotic trading structures as a substantial source of income and supposed productivity within the financial services sector (Krippner). The financialization that occurred from the 1970s to the 2000s has been characterized by the opening of markets, the removal of exchange controls, an increase in the volatility of interest rates, and the rising economic importance of large financial institutions around the world. Simultaneously, this period marked a departure from Keynesian economics for a neoliberal growth model that, while showing relative success before 2000, had enabled increases in volatility around interest and exchange rates. In order to account for the increasing rate volatility, banks created products that allowed them to hedge their exposure and offset risk (Tickell, p. 248-77). These products, called derivatives, have been part of the financial sector's securities trading business for over 10 years. In 1865, the Chicago Board of Trade instituted the first formal rules of which the derivatives would be governed. In the early days, grain derivatives were bought and sold so that farmers and traders could hedge risk against price variations. Grain producers would sell their grain to traders at an agreed upon price, and deliver it a later date; thus, this was the first "futures" contract of its kind. It wasn't until the late 60s and early 70s that derivatives markets really began to take shape when currency futures contracts started being traded in 1972. In addition to futures, swaps and options also became popular. Swaps are instruments that allow two parties to exchange cash flow liabilities, typically interest rate liabilities on certain loans. Whether rates go up or down determines the winners and losers on a swap trade. Lastly, there are options which allow a buyer or seller to buy (this is a "call" option) or sell (this is a "put" option) an asset at a predetermined price. Financial firms have gone on to create more complex instruments such as "swaptions" and "differential swaps" (Tickell, p. 248). Tickell states that these derivatives do not derive their value from physical products, but rather the value of the derivative is derived from the value of the underlying assets. In other words, instead of buying a derivative and owning a physical product, such as a bushel of grain, when someone buys a derivative, they own a bet on the future value of the product. This is the shift that Krippner and others touch upon in their discussions of the financialization of the economy. It was now profitable to place risky derivatives bets on certain products in the markets, but this capital expenditure does not lead to increased production of goods, but rather leads to bigger trades, more commission fees, and more liquidity risk in the market. Financialization can be marked as a shift in banking when it became profitable to not only lend to companies and invest in products but also to buy risky financial instruments that could net large monetary gains, yet add little to no value in terms of productive spending. The risk of derivatives is exacerbated and more widespread because the value of these instruments is based upon the moving value of the assets the instrument is derived from. In other words, if interest rates on ten year U.S. Treasury bonds rise, huge swaths of derivatives have their value changed since most are, at least partly, based upon the change in interest rates. While some argue that the inherent complexity of derivatives trades can lead to "market risk" and should be regulated, some maintain otherwise (Duffee, p. 805-833). *The Economist* magazine had this to say about derivatives: "derivatives are simply another financial and managerial tool which financiers and managers need to use properly. True, some of those instruments are too powerful for inexperienced or unsupervised hands. The same could be said for motor cars, and few people would use that as an argument for more traffic lights" (Tickell, p. 254). The juxtaposition of risk, free markets, and regulation have been hotly debated around the derivatives market specifically, but the prescriptions laid out by economists ranging from Minsky to Polanyi, to Friedman and Hayek have not been put in to practice in full. Minsky and Polanyi would call for robust regulation and backing from the Fed during crises; the derivatives market lacks meaningful oversight. Friedman and Hayek would have called for free markets and little regulation, but also very little federal government intervention. What we saw, in reality, was Keynesian government intervention in interest rate manipulation and

liquidity market activity, coupled with Friedman-style deregulation and Minskian government bailouts. As famed economist Nouriel Roubini said in the wake of the government response to the bailout, "An unprecedented government response has showered liquidity on markets in the form of tax cuts, bail-ins, bailouts, interest rates cuts [of ten to zero], credit extensions, guarantees, and other measures, all of which have been packing in a panoply of acronyms dreamed up in the halls of Washington, Beijing, and Brussels" (Roubini).

Though derivatives had been used in the late 19th century by agriculture traders to hedge against price changes, the Chicago Mercantile Exchange (CME) permitted currency futures trading through its creation of the International Monetary Market in 1973, which marked the introduction of the first modern derivatives instruments into financial markets. The basis of futures trading in currency is to allow investors to hedge their risk against volatility in capital markets and to enable investors to profit off of the derived value of an asset at a future date. Though this is considered the most vanilla of derivatives instruments, its manifestation ushered a new era of financial trading in which instruments are valued based on the derivation of the underlying assets it is tied to. With futures came swaps, agreements between two parties to exchange of future cash flows, which can move in value by fluctuating interest rates. The last popular derivative is the option, which allows buyers to have the right either to buy (call option) or sell (put option) an asset at a predetermined price. Buyers make money if interest rates move in their favor, while sellers charge a premium price to be able to cover losses. The period from 1970 to 2005 was marked by financial innovation around securitizing asset-backed securities that tied everyday consumer financial products to a large market of complex financial instruments, which were fundamentally based off of these three basic derivatives: futures, swaps, and options. Despite having their roots in risk hedging and management, the derivatives industry is notorious for high profile losses partly due to their growing complexity throughout the decades. Due to such high complexity, since the value of a derivative depends on a number of underlying variables (such as exchange rates and interest rates), it is difficult to predict the future value of these instruments without having an intimate knowledge of the asset structure (Tickell, 253). And thus, derivatives markets are characterized by traders who vary in mastery and expertise of the products, which creates inefficiencies and turns some trades into heavy losses. Derivatives also carry an extra risk burden due to their propensity to dry up liquidity in markets and cause credit crises in a more accelerated and widespread manner than traditional equities and other financial products. Due to the nonlinear risk structure of many derivative products, such as products that derive their value from floating interest rates, credit crises are a particular problem for the industry. If a derivative instrument is based upon thousands of debtors staying afloat on payments for an adjustable-rate loan, the creditors on that product will lose money if a majority of those rates adjust within a similar time frame and cause a tightening of credit and a higher rate of delinquency on payments (United States Senate). The elephant in the room of examples of heavy losses in derivatives markets is the 2007-08 losses incurred by mortgage-backed securities and assets tied in value to the U.S. housing market. Three products, in particular, were eternalized with the history of mortgage markets: the mortgage-backed security, the collateralized debt obligation, and the credit default swap (CDS).

Originally dreamed up by Wall Street all-star Lewis Ranieri of Salomon Brothers, the mortgage-backed security is a financial instrument that pools together thousands of cash flows from mortgage loans as one entity that can be split into pieces and purchased as an investment. This pooling and splitting process is called securitization, and it was a revolutionary technique that dramatically increased liquidity and excitement around loans. The purchaser of a piece or a whole MBS can profit off of interest rate changes that would increase the value of the cash flows of those baseline mortgages. But, the buyer is also susceptible to losses if interest rates fall shorter or credit tightens and causes defaults. By 2007, more than half of all home mortgages were packaged into

mortgage-backed securities. The MBS and its underlying assets can be purchased by investors in a manner known as a "pass-through" structure, where the buyer bears both the credit and interest rate risk and the lender *wipes his hands clean* of risk, or investors could purchase bonds issued by the entity of packaged mortgages based on its cash flows from repayments. The MBS got more complex as well and soon became synonymous with the collateralized debt obligation, or CDO. The CDO is a type of MBS that pools together home mortgages and slices them into tranches to be purchased. Unlike the original MBS, CDOs are not purchased in a pass-through structure, but are rather sliced into tranches and sold as bonds that are rated based on risk of default, with the highest-rated tranches receiving repayment first (with the lowest coupon), and the lowest-rated tranches receiving payment last, but with a much higher coupon rate. In other words, the CDO allowed a more formal structure to place bets on repayments of mortgages which varied in risk and thus reward. The highest rating a CDO can receive is Senior AAA—the last to suffer losses in times of default—while the lowest ratings are BBB and Residual, which suffer losses first. It is important to note that the underlying asset of the CDO is a mortgage, in this case, meaning that the mortgage serves as collateral in times of default. When derivatives called "synthetic CDOs" or "CDOs squared" were introduced to the market, this fundamental was challenged. In the 2000s, CDO traders developed a securitization process that repackaged specific tranches of already-existing CDOs into new CDOs. This was an extremely common practice within the lower-rated tranches of true CDOs. A banker would sell all the tranches of a CDO that it could but would inevitably run into the common occurrence of not being able to sell some of the riskiest tranches of a CDO. The solution was to repackage the CDO with other, similarly rated CDOs, and call it a synthetic CDO. Think of the CDO issuer like a restaurant: they sell all the fresh food they can, but rather than throw out the leftovers (which are still edible at least for a bit), they put it in a stew or meatloaf and sell it for the next few days. One would think that repackaging pools of low rated tranches of CDOs would result in just one big, low rated CDO. But in the last few years leading up to the financial crisis, this was not the case. Repackaged CDOs, or CDOs squared, commonly received high ratings, such as AAA and AA-, from credit rating agencies. The moral and ethical question deserves to be examined, but for my paper, I'd like to stress the importance of this notion from a liquidity standpoint while looking at the lifecycle of securitized assets. Because rating agencies typically granted synthetic CDOs, as well as traditional CDOs, as mostly safe, stable investments, they were exposed to a vast, liquid market of institutional investors, including mutual funds, pension funds, and other sources of incredible amounts of what was perceived as safe, money-making investments. This type of exposure made bankers and traders rich but it hinged the entire economy on what were actually extremely risky and complex investments. Further, and most importantly, synthetic CDOs were not collateralized by mortgages like traditional CDOs were. The collateral on a synthetic CDO is, you guessed it, bottom-tier tranches of traditional CDOs. In other words, when things came crashing down, synthetic CDOs were worth nothing, absolutely nothing when homeowners stopped paying their mortgages because cash flows had stopped and the lowest tranches lose first. With traditional CDOs, someone along the mortgage supply chain—typically owners of the credit risk on the home and owners of senior tranches of the CDOs—will receive proceeds from a foreclosed home or other liquidated assets, which is better than nothing. In 2006, 07, and 08, synthetic CDOs had flooded the MBS market and made up a significant portion of outstanding CDOs on the market. Lastly, the credit default swap is a type of swap agreement that primarily insures the buyer of a CDS against some reference loan defaulting. To cut to the chase, what became popular, in conjunction with the rise of this revolutionary mortgage finance industry, were credit default swaps that referenced CDOs and synthetic CDOs as their risk asset, as the loan the instrument would insure against default. Having existed since just 1994, the CDS market was worth more than $62.2 *trillion* in outstanding commitments (ISDA). What is most interesting about a CDS is a *naked CDS*. This type of CDS enables investors to purchase a CDS that references underlying

debt which the buyers have no stake in. So, even if you don't own any tranches of a specific CDO, you can still buy a CDS on it to profit in the case of default. Imagine a world where other people could have insurance on your car, so when you crash, multiple people could receive a compensation for the damages. Just like a synthetic CDO, the limits for purchasing a naked CDS has no end, and that increases the risk-nature of the CDS market as a whole. A CDS allows investors to create value from a product that does not support it with real cash flows, except in guarantees from the CDS issuer. It makes sense that AIG, the largest issuer of naked and traditional credit default swaps before the collapse would require the largest bailout from the US government.

It is evident that securitization has changed the way banks provide liquidity, how markets perceive default risk, and the structure of global credit markets as a whole. Loans have become increasingly liquid because banks typically securitize them and then sell them off as bonds, therefore, turning deposits into a source of financing for other activities (Loutskina, Strahan). This allowed for the easing of capital to flow into the market and a larger propensity to take on more debt on the lending side. Although growth was most significant in mortgage markets, securitization expanded dramatically across the board since the early 1970s. In the mid-1970s, the total amount of securitized home mortgages was valued at $28 billion; by 2003, the number of securitized residential mortgages had grown to $4.2 trillion (Loutskina, Strahan). Securitization of commercial and consumer loans had grown from zero in the 1970s to the multi-hundreds of billions of dollars, as well. The creation of GSEs such as Fannie Mae and Freddie Mac served as the boon to the craze of mortgage securitization, while a prolonged period of deregulation coupled with financial innovation around asset securitization led to a dramatic increase in the size and risk profile of global structured credit markets, where securitized assets are traded. Fannie Mae and Freddie Mac were created as part of the New Deal in response to the Recession; their principal purpose was to ease liquidity in government-sponsored mortgages. In 1970, they were chartered by Congress to provide general stability and liquidity to U.S. mortgage markets, creating what would be known as the secondary market for mortgages within just a decade. The two GSEs became the principal buyers of mortgages from all lenders in the 90s, securitizing them and selling most of them off as mortgage-backed securities while holding few. The market share of U.S. outstanding mortgages that had been securitized by Fannie Mae and Freddie Mac grew from 25% in 1990, to 47% in 2003. The GSE enhanced liquidity by purchasing mortgages from lenders, securitizing them and issuing MBS, thus freeing themselves and the lender from credit and interest rate risks on the pool of assets. This fundamentally changed the way liquidity was perceived in reality, and this new methodology behind mortgage lending and risk bearing naturally warped the cost and risk structures around the industry. Lenders were increasingly able to sell off loans into markets, releasing themselves from risk profiles they once more heavily depended on the soundness of. To underscore the principal mission of these GSEs, they were mandated to operate under certain limitations pertaining to the size of the mortgage they could securitize; they were to regulate "non-jumbo" mortgages, which were defined in 2006 as loans below $417,000. The loan limit forced the GSEs to securitize low and middle-income homes, which incentivized liquidity in those markets, therefore, making home ownership a possible reality for lower classes. This created a moral hazard within banking, as the U.S. government essentially ended up guaranteeing that mortgage lenders could sell off risky mortgages to securities originators like Fannie Mae and Freddie Mac, who took up a majority of secondary mortgage market share. As this moral hazard was created, so too did the rapid development of asset securitization in the form of complex derivatives—specifically mortgage-backed securities, collateralized debt obligations, and credit default swaps—which were invented and implemented beginning in the 1970s. It was also in this period that marked the beginning of a 30-year-long deregulatory movement of U.S. financial markets and its banking sector. Some key pieces of legislation include the watering down of capital reserve requirements throughout the 1980s and 90s; the repeal of the Glass-Steagall Act in 1998, which enabled risky consolidation in the banking and

insurance industry; and the Commodity Futures Modernization Act of 2000, which barred state and federal regulation of the derivatives industry. As the Congressional report on the causes of the Financial Crisis of 2007-08 notes, "We conclude over-the-counter derivatives contributed significantly to this crisis. The enactment of legislation in 2000 to ban the regulation by both the federal and state governments of over-the-counter derivatives was a key turning point in the march toward the financial crisis" (The Financial Crisis Inquiry Commission). As I covered earlier, none of the leading economic thinkers around neoliberalism prescribed an economic policy that was marked by low interest rates, high government intervention in monetary policy, a complete lack of regulatory structure of derivatives markets, and government bail-outs when the economy overheated. The pick-and-choose economic policy that characterized the period from the 1970s to the present enabled the rise and eventual domination of finance capitalism in the global economy; the policy founded its roots in securitizing traditional retail banking products—like mortgages, personal loans, and credit cards—in a regulation-less environment that incentivized extremely profitable innovation within the sector. This process of securitizing everyday products is a large part of the fabric of the financialization of the U.S. and global economy throughout a period defined by a neoliberal wave of economic thought and leadership around the world.

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THE FORMATION AND IMPACT OF CHINA'S ZOMBIE COMPANIES

Zongzhi Guo

This paper defines the concept of "zombie companies" and explores the impact of zombie companies on the Chinese Economy and on local economies using regression analysis and a matrix-based mathematical model.

In accordance with China's supply-side structural reform, the Chinese government is trying different tactics to eliminate as many zombie companies as it can. The term "zombie company" was first cited by a Japanese scholar during 1990s and was used to describe companies that were financially distressed and extremely close to bankruptcy, yet still survived in the market. Today, not many researchers are experts in this field, and therefore, a universal definition of zombie company does not exist. According to Peter Coy, U.S. economic commentator, zombie companies are "organizations that have no way to continue their operations but have not gone through bankruptcy with the support of bank loans or government funding"[5].

In China, however, scholars believe zombie companies are produced under the conditions of increasing labor costs, lack of creativity and higher taxes. Under those circumstances, companies suffer from overcapacity and have to rely on constant loans and funds to keep themselves in the market[1]. Though there is ambiguity in the definition of zombie companies, their impact is obvious. The zombies are distorting the market by deliberately lowering market prices for their products, raising market wages and consuming the resources which should have belonged to other healthy enterprises. Their enormous impact leads to the following question: since they create so many problems, why are zombie companies still surviving in the market? What causes this "zombification," and who is behind it all? By applying an analytical hierarchy process and calculations with matrices, this paper intends to explore the factors that potentially contribute to the formation of zombie companies and evaluate their impact on numerous aspects of China's economic development in the early 21st century.

Identifying Zombies

The formation of zombie companies is a long process, which involves a lot of factors. Hence, a qualitative method seems implausible to be used in our analysis. On the other hand, if we use a quantitative method, we need to research high amounts of data and use them to build a mathematical model. However, nowadays, there is not a large body of research on zombie companies, from which it is hard to obtain financial figures. Therefore, the analytical hierarchy process seems to be the best method that can be used here.

Determining the structure

We determine our structure from the top with the goal of discovering the factors that can potentially transform a corporation into a zombie company. Next, comes our pairwise comparisons. Our structure consists of broad analyses which we manipulate through intermediary channels, finally coming to more specific conclusions.

Constructing matrices

Each element in the upper level is used to compare the elements in the level immediately below it. Suppose we have *m* elements in total, and we arrange them according to their importance to get matrix A.

$$A = \begin{bmatrix} a_{11} & a_{12} & L & a_{1m} \\ a_{21} & a_{22} & L & a_{2m} \\ L & L & L & L \end{bmatrix} = A(a_{ij}), \qquad (i,j) = (1,2)$$

Number	Importance	Value
1	x_i and x_j are equally important	1
2	x_i is slightly more important than x_j	3
3	x_i is more important than x_j	5
4	x_i is a lot more important than x_j	7
5	x_i is extremely more important than x_j	9
6	x_i is slightly less important than x_j	1/3
7	x_i is less important than x_j	1/5
8	x_i is a lot less important than x_j	1/7
9	x_i is extremely less important than x_j	1/9

Test Consistency

According to the definition, if [$\lambda_1, \lambda_2, L, \lambda_n$] are the solutions to Ax = λx, then the matrix A has at least one eigenvector, which to all $A_{ii} = 1$, $\sum \lambda_i = n$. That is, when the matrix is absolutely consistent, $\lambda_1 = \lambda_{max} = n$, the principal eigenvalue is equal to n and all other eigenvectors are equal to 0; when the matrix is not absolutely consistent, we have $\lambda_1 = \lambda_{max} > n$, and all other eigenvectors [$\lambda_1, \lambda_2, L, \lambda_n$] satisfy: $\sum \lambda_i = n - \lambda_{max}$.

- If a square pairwise comparison matrix is not absolutely consistent, two different situations may be considered. In this case, we cite the consistency index: $CI = \frac{\lambda_{max} - n}{n-1}$.

The smaller the CI for a comparison matrix, the more consistent the comparison is, with a CI of 0 indicating perfect consistency.

- But for different matrices, people have different judgments and requirements for CI. Thus, we invite the RI (Retention Index) to determine whether matrices all have absolute consistency.

Matrix Order	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
RI	0	0	0.52	0.89	1.12	1.26	1.36	1.41	1.46

To the matrices whose orders are 1 or 2, RI is always 0 because they are always absolutely consistent. When the matrix order is bigger than 1 and 2, we use the CR (Consistency Ratio) to test each matrix's consistency. Specifically, when CR= CI/RI < 0.10, we say the decision-maker makes the perfect judgment to have an absolutely consistent matrix. If CR ≥ 0.1 , then we need to make adjustments to the matrix.

Single Hierarchal Arrangement

The Single Hierarchal Arrangement prompts us to calculate the relative importance of an element to the one immediately above it:

- First, calculate all the products of elements on each row: $M_i = \prod_{j=1}^{n} a_{ij}$ (i=1, 2, …,n)
- Second, calculate the nth root of M_i and we get $\overline{W_i} = \sqrt[n]{M_i}$
- Then, we normalize the vector: $W_i = \frac{\overline{W_j}}{\sum_{j=1}^{n} \overline{W_j}}$
- After that, we find the maximum principal eigenvalue $\lambda_{max} = \sum_{i=1}^{n} \frac{(AW)_i}{nW_i}$
- Finally, we follow the steps above to calculate every eigenvalue and find the relative importance of every factors in different levels.

Data Analysis

Potential Factors

There is a growing mass of literature examining the potential influences of the Chinese government and banking system on zombie companies. Specifically, Caballero explored the role of misdirected banks, which constantly restructure loans and lend money to insolvent firms just to maintain required credit rates[2]. Moreover, Fukao and Bishop have each tried to pinpoint the role of the government in companies' "zombification," and have argued over the effects of the government's misleading policies.

Inspired by the studies, we decided to identify zombies not only by their own management and profitability, but also by the subsidies they received from government and banks. Within this assessment, we can identify three primary influences on firms: government, the banking system and the market itself, with three to four secondary factors in each of these.

The Chinese government is very active in influencing the nation's market economy. Unfortunately, the state's system of central macroeconomic controls incorporates many misled policies and flawed assumptions. The government assesses the performance of the economy using GDP-based models, and often determines which officials are promoted based on interpretations of these models. This unsteady system of metrics, combined with a questionable enterprise bankruptcy law, can lead to problems for Chinese firms.

The Chinese banking system is also plagued by imperfect performance assessment systems, mostly based off of rates of debt. Banks are loosely regulated in China, and have incentives to open as many accounts as possible, regardless of the actual credit and investment activities occurring in them.

Finally, the market structure in China is conducive to many management errors within firms. Business strategies are often lax and firms do not deal well with liquidity in their own sector.

	Primary Factor	Secondary Factor	Notes
Factors	Government	State Macro Control System	Misleading Policies
		Government Performance Assessment	GDP-based Model
		Government Officials Promotion	Employment, GDP, social stability as important factors
		Legal System	Enterprise Bankruptcy Law
	Banking System	Performance Evaluation System	Bad debt rate based Model
		Destructive Competition	Banks try to get many accounts as possible
		Credit Rate and Trust Evaluation	Loose financial regulation
	Enterprise	Enterprise Profitability	Profitability ratio= Gross Profit/ Net sales
		Enterprise Operation Strategy	Multi-Business Diversification
		Enterprise Management	Internal Management, Risk Management
		Liquidity	Current assets/ current liability

Questionnaire

After determining our potential factors, we created a questionnaire to solicit additional information about these 3 influences on Chinese companies. It included 15 questions, containing the comparisons between different primary and secondary sectors. In June 2016, we distributed the questionnaire to 25 scholars, professionals working in universities, government, banks, enterprise and so on; all 25 individuals eventually responded.
Before establishing the AHP matrix, we needed to verify the absolute consistency of our data and remove all the responses that did not satisfy our conditions. We were left with 21

valid responses, for which we used AHP software to perform our matrix calculations. The results are shown on Tables 5,6,7 and 8. As you can see, the CR in every matrix is less than 0.1, which indicates the absolute consistency and validity of our results.

Table 5

Factors	Government	Banking System	Enterprise
Government	1	5	9
Banking System	1/5	1	2
Enterprise	1/9	1/2	1
Total Weights	0.7608	0.1576	0.0816

Note: CI= 0.0006 ; RI= 0.58 ; CR= 0.0011

Table 6

Factors	State Macro Control System	Government Performance Assessment	Government Officials Promotion	Legal System
State Macro Control System	1	1/5	1	5
Government Performance Assessment	5	1	3	7
Government Officials Promotion	1	1/3	1	3
Legal System	1/5	1/7	1/3	1
Total Weights	0.1814	0.5806	0.1814	0.0567

Note: CI= 0.0466 ; RI= 0.9 ; CR= 0.0518

Table 7

Factors	Performance Evaluation System	Destructive Competition	Credit Rate and Trust Evaluation
Performance Evaluation System	1	3	5
Destructive Competition	1/3	1	3
Credit Rate and Trust Evaluation	1/5	1/3	1
Total Weights	0.6370	0.2583	0.1047

Note: CI= 0.0193 ; RI= 0.58 ; CR= 0.0332

Table 8

Factors	Enterprise Profitability	Enterprise Operation Strategy	Enterprise Management	Liquidity
Enterprise Profitability	1	3	5	1/3
Enterprise Operation Strategy	1/3	1	3	1/6
Enterprise Management	1/5	1/3	1	1/8
Liquidity	3	6	8	1
Total Weights	0.2534	0.1083	0.0512	0.5871

Table 9

	Primary Factor		Secondary Factor		
Factors	Government	0.76	State Macro Control System	0.18	0.1368
			Government Performance Assessment	0.58	0.4408
			Government Officials Promotion	0.18	0.1368
			Legal System	0.06	0.0456
	Banking System	0.16	Performance Evaluation System	0.64	0.1024
			Destructive Competition	0.26	0.0416
			Credit Rate and Trust Evaluation	0.1	0.016
	Enterprise	0.08	Enterprise Probability	0.25	0.02
			Enterprise Operation Strategy	0.11	0.0088
			Enterprise Management	0.05	0.004
			Liquidity	0.59	0.0472

Further Analysis

We used the outcome obtained from the calculations to weigh the priorities in the level immediately below and kept doing this for every element. Then, for each element in the level below, we added its weighed values and obtained its overall priority. The outcome is shown on Table 9. Our AHP analysis indicates that among all of the primary factors, government policy is the most likely cause of a typical company's "zombification," with 76% of the total weight. The second is the banking system. As for secondary factors, local governments' performance assessment systems, clumsy regulations, banks' performance

appraisal systems and the liquidity associated with the Chinese enterprise system are all particularly influential according to our analysis. But we now ask if these results make sense in a purely rational context?

Local Governments Prop up Zombie Companies

It is no secret that the Chinese central government assesses the performances of local governments based on GDP and employment rate in their respective regions. Recently, the central government announced a policy that requires local governments to meet annual GDP growth targets of approximately 6.57%. In order to meet this target, local governments have to protect zombie companies, which are mostly large state-owned enterprises, because the bankruptcy of those companies will lead to decreases in GDP and complications in settling such companies' employees. On the one hand, local governments offer land and mineral resources to banks, enticing them to provide increased loans and financial leniency to zombie companies. On the other hand, local governments also use themselves as "vouchers," allowing zombie companies to extend their loan period. When significant companies have trouble paying back their loans, local government officials will negotiate with banks on their behalf.

Banks Prop up Zombie Companies with Continuous Loans

Zombie companies also rely on extra support from banks to stay alive in the market. Banks are willing to grant more loans to zombie companies because they want to avoid too many non-performing loans on their balance sheet. When banks lend money to zombie companies to pay back old debts, the worst debts on the balance sheet are reduced, while the banks accounts' payables increase substantially. This little trick helps zombie companies survive and also makes banks look good on paper. In fact, bad debt rates are very important in helping the central bank evaluate local banks' performances. In other words, banks' performance appraisal systems create an incentive for banks to hide their debts by constantly lending money to zombie companies. Since so much money flows towards zombie companies, some smaller firms are unable to take advantage of loans that they could otherwise get. In the long run, this phenomenon distorts competition in many markets, stunting growth by preventing natural and healthy capital flows.

Corporations Can't Adapt to Changing International Markets

The global economy is still recovering from the 2008 global financial crisis, with a huge decrease in aggregate demand over the past decade. The impact has expanded to China, where the most obvious effects have been the observed stagnation in GDP growth, and that of the development of fixed-asset investments. The market situation creates problems for China's manufacturing companies, which rely on exports and cheap labor. Since it is hard for companies to export their goods, they face unwanted overages in production, testing their inventories' capacity. In fact, firms in 19 out of the 24 most important industries in China are suffering from overcapacity. These include traditional industries such as steel, cement, and aluminum, as well as emerging industries such as LED and solar energy. Specifically, since 2002, Chinese steel production has accounted for half of the world's overall production. However, because of the decreasing revenues caused by

overcapacity, steel companies have recently found it much harder to make any profits, and many steel companies have gone into debt.

In order to keep some firms alive, the government has provided massive subsidies, but to little avail. In 2012, with a government subsidy of 48.87 billion RMB, steel corporations still made 60.82 billion losses in total. After experiencing the effects of the government's "Reform" and "Opening-up" policies, these companies suddenly did not know what to do. They were plagued by huge debts and dependence on loans. Unable to adapt independently, companies have had to constantly borrow loans and try to create new business. These loans eventually became accumulated debts, which caused businesses to become zombie companies.

It seems like the decline in market demand is the main factor that makes companies "zombified." However, many companies are poorly managed, and do not take advantage of opportunities provided by investments; this is also a key source of error. For example, in the copper and cable industries, the technical content of the products is low, and brand value has little influence. Thus, these industries operate on a smaller scale, with less experienced workers. In these industries, managers have notoriously squandered company money on bad investments. These errors of management have made many companies less competitive and exacerbated their struggles with debt.

Unveiling the Impact

In this section, we want to pay attention to the impact of zombie companies on the economy, focusing on the congestive effects of the zombies on non-zombie firms' behavior. We want to determine whether or not there exists a gap in productivity between zombie companies and non-zombies when the number of zombies increase. In addition to this, we also want to see if the presence of the zombies depresses the development of healthy firms and thus hinders their growth. Inspired by Caballero, we are using firm-level data to determine how the behavior of non-zombie companies has been changed by the impact of zombie companies[2].

To do our analysis, we look at the firm-level data obtained from the Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZSE), the two largest stock exchanges in China. We chose a sample of 40 companies (20 in each Stock Exchange) in steel, copper, LED, cement and solar industries, which are all heavily affected by "zombification." There are two variables that we focus on most: employment growth and investment rate. We picked a time range from 2007 to 2015, because firms were highly affected by the global financial crisis and had serious problems with overcapacity.

Theoretically, the presence of zombie companies should have a negative impact on the performance of non-zombie companies, since the zombies distort the distribution of loans and waste resources that should be coming to the non-zombies. Without the sufficient funds, non-zombies have little room to make more investment and create opportunities to profit.

Table 10

Year/ Variable	# of zombie companies in the industry	ΔlnI (net growth of investment)	lnE (net growth of employment)
2007	315	7.03%	0.62%
2008	303	6.54%	0.31%
2009	352	19%	2.64%
2010	401	15.42%	1.44%
2011	402	13.1%	1.32%
2012	380	13.52%	1.67%
2013	410	12.88%	1.2%
2014	391	12.45%	1.49%
2015	349	14%	2.03%

As we can see from table 10, the increase in the companies' investment growth and employment growth seems to move in the opposite direction from the increase of zombie companies, except during 2007-2008 period, when almost every company was suffering from the impact of global financial crisis.

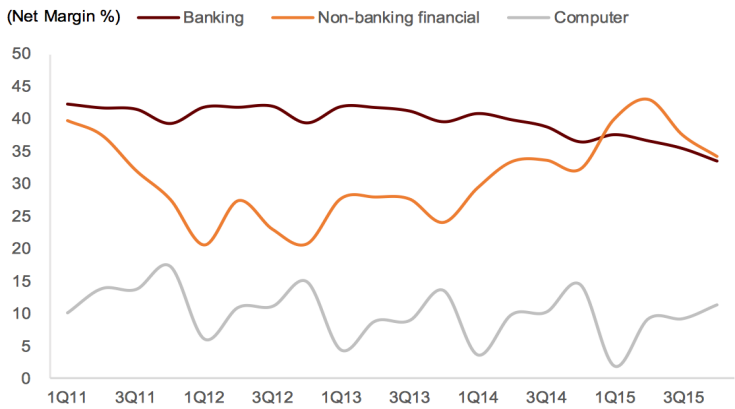

Figure 1: Net Profit Margin of top three industries with the most zombie companies

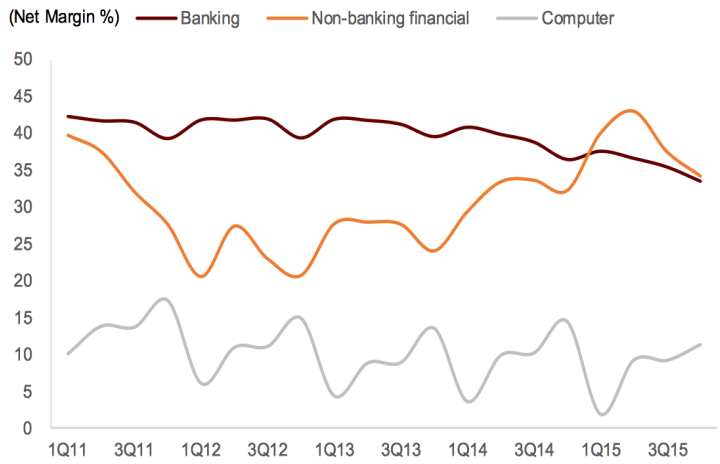

Figure 2: Net Profit Margin of the three healthiest industries with the least zombie companies

With Figure 1 and Figure 2, we are able to compare the net profit margin between the industry with the "most" zombie companies and the "least" zombie companies. We can see that the difference between the net profit margin is in the range of 10%/45%[1].

The above analyses confirm our suspicion that the presence of zombie companies affects the economy at large. Specifically, as more zombie companies are created, the investment growth and employment growth of non-zombie companies dropped significantly. In fact, we can expand our research to quantify the impact of zombie companies to non-zombies. Specifically, we are able to find out how much more non-zombie companies can increase their investment and employment if there are fewer zombie companies in the economy.

We can calculate the cumulative investment during a certain period and compare it with the normal annual investment in the industry. We can also compare the decline in employment within healthy companies in a "zombie era" with the typical annual change in the industry. With the data obtained, we take the regression estimates based on industry index and percentage of zombie companies. Furthermore, by controlling dependent variables, we are also able to determine whether or not there exists a factor that can determine the effects of zombie companies, on a company's sales, cash flow or something else[2].

Policy Suggestions

In this final part, we focus on the potential policy changes that can diminish the negative impact of zombie companies. So far, our analyses have shown which factors help form zombie companies, and our estimates also show that zombie firms are becoming

significant obstacles to China's economic development. Now, we intend to provide some policy suggestions to alleviate some facets of the problem.

The greatest obstacles for the government in shutting down zombie companies are the unemployment rate and the decrease in local GDP. The GDP-based model to evaluate local governments' performances has been used since the Reform and Opening-up policies of the 1980's. The model worked very well at first; policies successfully helped to boost economic development. However, as growth slowed down, the model became a burden for government officials, who are effortlessly trying to meet GDP targets.

Therefore, we suggest a shift from a GDP-based model to a system based on regular audits of environmental, economic and social measures. This new system is intended to provide local governments greater operational flexibility and encourage them to pursue investment projects that can bring different benefits to the society, not just GDP growth.

As for unemployment, we suggest that the government creates a flexible "Debt to Equity Swap" policy, which allows banks to swap the debt they are holding in underperforming companies for their stock or bond holdings. This aims to deleverage more efficient companies, especially state-owned enterprises in relatively good financial health, leading to a higher appetite for credit by the firms receiving the swaps. Meanwhile, since market imperfection seems to create restrictions on the exit of financially-dead firms, it is crucial that the legal system be improved given that an efficient legal system is instrumental to the effectiveness of firms' insolvency processes[3]. With the help of an effective judicial system, underperforming companies that are not qualified for D —> E should be asked to go through the bankruptcy procedure and give up their resources to other companies. On the other hand, reallocation-friendly policy is needed to facilitate job rearrangement from bankrupt companies and encourage labor mobility to more productive firms. Since the exit of underperforming companies will generally create unemployment, it is important to manage the costs of labor reallocation, and to bring efficient workers to rising companies that have gained opportunities in the absence of low-productivity companies.

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INCOME INEQUALITY IN RELATION TO VOLATILITY OF THE STOCK MARKET

Diana Riazi

There are many macroeconomic factors related to income inequality. In this paper, we choose to look at its relationship with the stock market. Using the Lotka-Volterra model, we model the flow of income, where individuals are measured in two groups: shareholders and non-shareholders. For the second portion of the paper, a society is simulated in MATLAB, in which everyone starts out with the same income, and income is modeled by geometric Brownian motion. Ultimately, this paper finds that introducing a sufficient amount of volatility results in income inequality, which otherwise would not be present in the economy.

Introduction

The subject of income inequality has been a topic of increasing interest today, given that studies have suggested that income inequality has been on the rise since the 1970s in the United States. It is important to further investigate income inequality, because it can foster economic and social problems across societies, such as poverty and the inhibition of growth.

As one can imagine, there is a combination of forces which appear to influence the observable level of income inequality in various nations. For instance, evidence from the Federal Bank of St. Louis shows a positive correlation between gains in the stock market and a rise in the Gini coefficient, an indicator of income inequality. While income inequality is certainly connected to a variety of macroeconomic factors, this paper focuses on the specific relationship between income inequality and the stock market.

First, I adapt the Lotka-Volterra (predator-prey) model in an attempt to explain class struggle and the flow of income in some simulated economy, where there are two types of individuals, namely share-holders and non-shareholders. Second, we conceptualize an economy where every individual is a shareholder in some endowment economy; thus, each individual's income is determined by the stock market, which is modeled by a geometric Brownian motion.

Model Description

1) Lotka-Volterra Model:

While the Lotka-Volterra model is mainly used to model biological or environmental systems, one can observe that a similar predator-prey dynamic emerges in human economies. To study income inequality and its relationship with the stock market, we can consider an economy where there are two types of individuals: those who own stocks and those who do not. This kind of construction appears to be analogous to a socio-economic class structure of upper-class and lower-class.

First, we utilize the Lotka-Volterra model to derive a pair of coupled ordinary differential equations between the share of wealth of stock-owners in an economy and the share of wealth of those that do not own any stock, whose income is assumed to be determined by the benevolence of the government that acts via taxation in this model. It should be noted that, in this situation, we are considering an endowment economy, in which there is no income from labor. We choose this approach in order to focus on the relationship between the distribution of wealth and changes in the prices of stocks. We will assume that investment in stocks is controlled by the general interest rate of the market. Generally, decreasing the interest rate will encourage higher investment, and increasing the interest rate will discourage investment.

In terms of the Lotka-Volterra equations, stock owners are considered predators, while those who do not own any stock are seen as preys.

Consider the following pair of coupled ordinary differential equations:

$$\dot{x} = rx - tx - D + \mu y - Cx$$

$$\dot{y} = tx + D - Cy$$

where $\dot{x}$ is the change of shareholders' income over time and $\dot{y}$ is the change in non-shareholders' income over time.

The parameter r is defined to be the general interest rate. Next, we have t as the income tax rate and μ is defined to be reimbursement rate. A lump-sum tax is denoted by D. C_x is the cost of living for stock-owners. Similarly, C_y is the cost of living for individuals who are not stock-holders.

Now, we may turn our attention to describing the behavior of the model, that is the relationship between the incomes of shareholders and non-shareholders. When non-shareholders' income increases, shareholders' income increases more rapidly. Additionally, it can be argued that the shareholders' income grows more rapidly over time when the interest rate is greater than the income tax rate. In the results, we will non-dimensionalize the equations, classify the fixed point, and observe its implications.

2) A Society of Shareholders:

Now, we turn our attention to the next part of this paper. Let us think of a society where everyone is given the same income, and everyone is considered to be a shareholder. Thus, everyone's income in this endowment economy is controlled by a geometric Brownian motion.

As shown below, we utilize the stochastic differential equation of geometric Brownian motions to model the fluctuations of the stock market, which determine the income of individuals in this economy.

$$dS_t = \mu S_t dt + \sigma S_t dW_t$$

Within the simulation, we consider the analytic solution of the SDE at some arbitrary initial value S_0.

$$S_t = S_0 \exp\left(\mu - \frac{\sigma^2}{2}\right)t + \sigma W_t$$

W_t is a Brownian motion of Wiener process. Here, the process follows a normal distribution. The deterministic constant, μ, is defined as the "percentage drift," or how much prices of stocks vary on average in a given period. Next, the parameter σ (or "sigma") is known as the volatility parameter, which is a way of incorporating random market shocks (e.g. fluctuations in oil prices or the occurrences of natural disasters) into the model.

These random shocks can cause certain individuals' income to grow while others' income declines, thus ultimately generating income inequality.

In the simulation, we consider the number of time steps, initial levels of income, number of people, social safety net, volatility, and general interest rate.

Through this particular simulation, the objective is to show that while everyone may start off with the same income, volatility will eventually cause a prevalent state of income inequality. In other words, given a value of sigma and some fixed interest rate, we ask the question, how long will it take until income inequality gets out of control? More specifically, we can adjust the value of sigma, and then observe the resulting level of income inequality within this endowment economy. In reality, the manner in which these constants change, or fluctuate, can be connected to the type of government in power; more liberal or conservative forms of government may correlate with various levels of volatility, but that is beyond the scope of this paper.

To measure income inequality, it is customary to use the Gini coefficient, derived from the Lorenz Curve, which shows the graphical relationship between the cumulative percent of a country's population and the cumulative percent of income. The Gini coefficient ranges from 0 to 1, where 0 represents perfect equality and 1 denotes perfect inequality. We may visualize this with the diagram below.

Referring to **Figure 1**, by summing over the area of each region, namely A and B, the Gini coefficient is calculated as $\frac{A}{A+B}$.

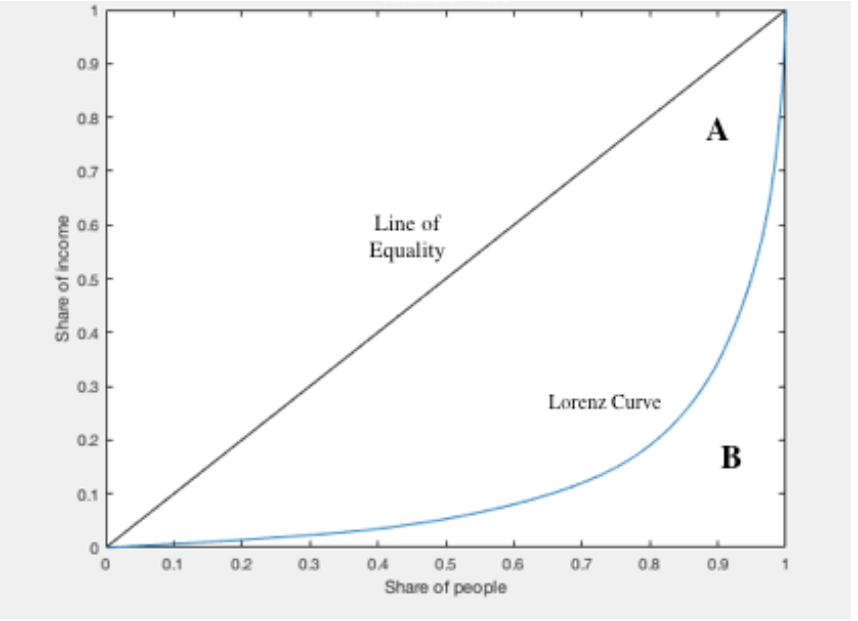

Figure 1: Lorenz Curve

One should keep in mind that this society, simulated in MATLAB, starts off with a Gini coefficient of 0, since everyone starts off with the same amount of income. In other words, there is complete equality before we introduce volatility over time.

Within this simulation, we make a modeling decision that a high level of income inequality can be equated to a Gini coefficient of 0.9. Thus, given some value of sigma and a fixed interest rate, we may observe how many time steps it takes for this simulated economy to reach what we have defined as "high inequality."

Results

1) Lotka-Volterra Model:

We begin by non-dimensionalizing the equations:

$$\dot{x} = rx - tx - D + \mu y - Cx$$

$$\dot{y} = tx + D - Cy$$

We now have:

$$\dot{x} = r - T - D + \mu y - C_x$$

$$\dot{y} = x + \frac{D}{T} - \frac{C_y}{T}$$

$$A = \frac{C_y}{T}, B = \frac{D}{T}, F = r - T$$

$$\dot{x} = Fx + \mu y - C_x - D$$

$$\dot{y} = x + G$$

$$G = B - A, H = -C_x - D$$

Finally, we find the non-dimensionalized equations to be:

$$\dot{x} = Fx + \mu y + H$$

$$\dot{y} = x + G$$

For the one fixed point of the system, we compute the Jacobian matrix,

$$\begin{pmatrix} F & \mu \\ 1 & 0 \end{pmatrix}$$

where we find: $\Delta = -(\mu)$, where $\mu > 0 \quad \tau = F$, where $F > 0$

Given the determinant is negative, we then classify the fixed point as a saddle-point. This generates the following phase diagram shown in **Figure 2**, where F=1, $\mu = 1$, H=0, and G=0.

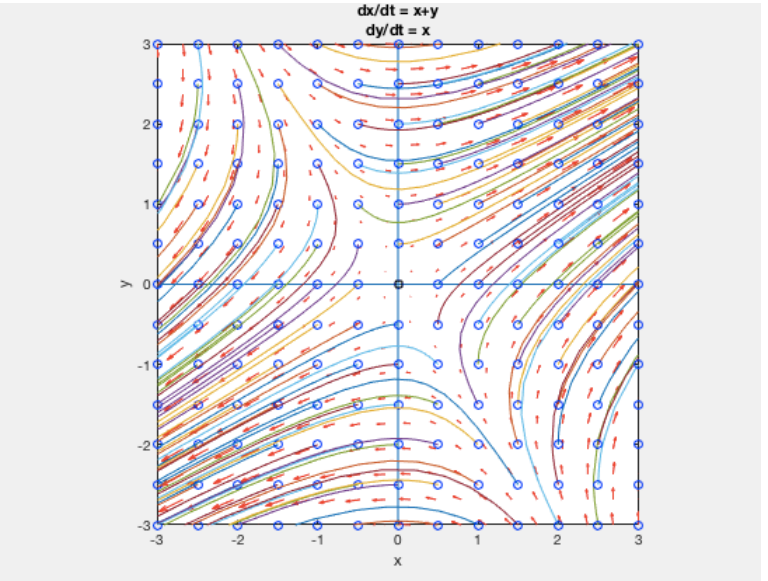

Figure 2: Phase Diagram

Conceptually, this suggests that when the stock market is "booming," all the wealth tends towards the stock-owners. This can appear to be analogous to wealth going to the more advantageous class. Moreover, this pattern makes sense when the business cycle is considered to be in a boom. When the economy is in a state of a "bust," we see that wealth is flowing away from stock-owners; that is, they are losing money and the flow of the income of non-stock-owners is constant. This interpretation of the result appears to confirm the intuitive notion that shareholders' incomes will rise as the stock market performs better.

2) A Society of Shareholders:

Using MATLAB, I simulate a society where there are 1,000 individuals that each start out with the same amount of income (1,000.) Here, all individuals are shareholders, and thus all individuals' income is determined by the geometric Brownian motion.

If we set sigma equal to 1 and the interest rate equal to 0.25, we find the following results, shown in **Figure 3**:

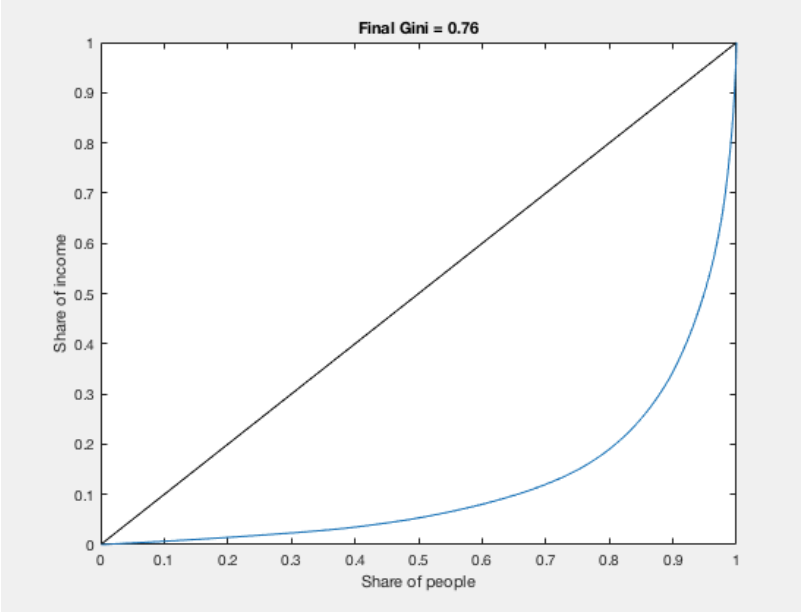

Figure 3: Lorenz Curve and Gini Coefficient

We observe that we end up with a Gini coefficient of 0.76. We can notice that the farther the Lorenz curve stretches away from the line of equality, the more income inequality is observed.

If we continue to increase the value of sigma, we see that the Gini coefficient increases. In other words, as we observe in the simulation, we conclude there is a positive relationship between volatility and the Gini coefficient.

Next, we consider the number of time steps it takes for this economy to reach a level of "high inequality," which we define as a Gini coefficient of 0.9. In the simulation, we see that it takes about 11 time steps to reach this level of high inequality as shown in **Figure 4**; that is, it takes 11 time steps for this society to go from perfect equality, a Gini coefficient of 0, to high inequality, a Gini coefficient of 0.9.

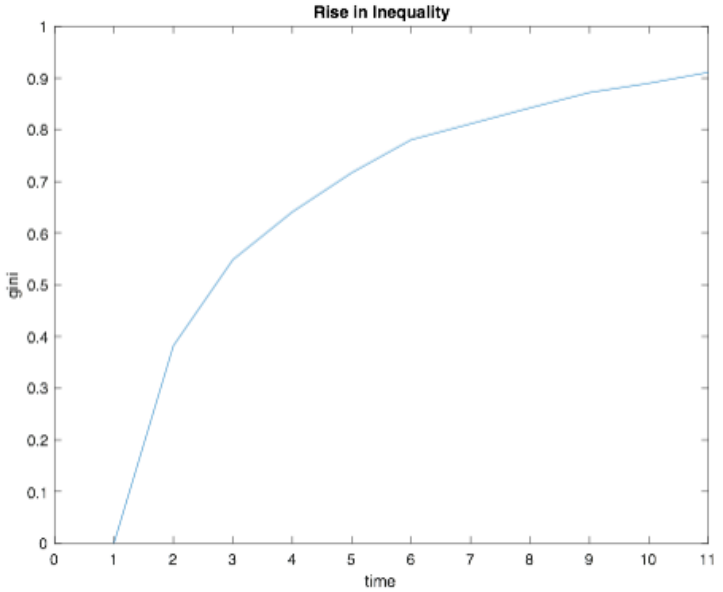

Figure 4: Number of time steps it takes to reach 'high inequality'

Now, keeping the interest rate constant, and changing the value of sigma to be very close to zero, say 0.01, we get the following output, shown in **Figure 5**.

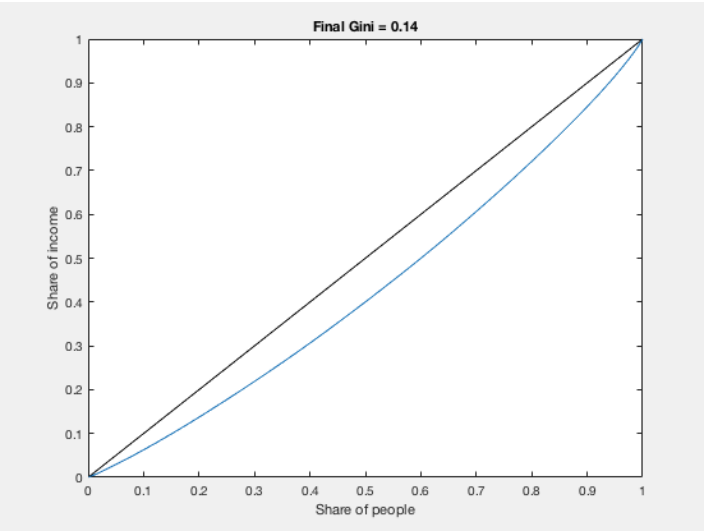

Figure 5: Lorenz Curve and Gini coefficient

Thus, we see that the Gini coefficient in one time step is only 0.14. After 1,000 time steps, we see that the Gini coefficient has barely increased past 0.1. Therefore, it seems that increases in volatility affect the Gini coefficient much more than changes in the interest rate; volatility is more important than the interest rate in generating income inequality.

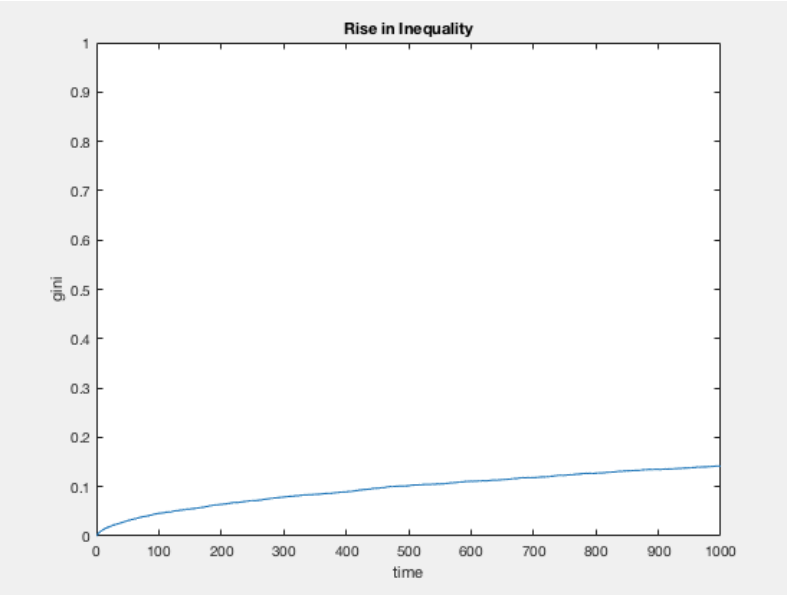

Figure 6: Number of time steps it takes to reach 'high inequality'

Conclusion

In essence, we have explained the behavior of the flow of income of a simplified society, where there are two types of individuals, shareholders and non-shareholders, via a Lotka-Volterra model. In addition, a society of just shareholders was imagined, whose income was determined by geometric Brownian motion. From the results, it has become clear that volatility and the Gini coefficient are positively related. In other words, this society started off classless, but ultimately income inequality prevailed, given that a significant amount of volatility was introduced.

It is important to realize some limitations of this model. As mentioned before, the nature of income inequality is complicated, thus some important factors were neglected by the model, such as the way in which labor income affects income inequality. In addition, a general shortcoming of the Gini coefficient should be noted: economies may have different income distributions but may still end up with the same Gini coefficient. More specifically, economies may vary in their demographic make-up but may very well result in an equivalent Gini coefficient.

It is necessary to understand that perfect equality isn't realistic, given that individuals across societies possess different levels of experience, education, and training. However, inequality is a problem given that its consequences include poverty, the inhibition of growth, and many other issues. While some shocks, like natural disasters, may be considered out of the control of governments, there are certainly some shocks and

other aspects of "randomness" that are connected to how the government operates, how it is organized, and which traditions of political thought it conforms to. With this in mind, we may wonder what role governments can play in addressing, and possibly alleviating, the inequality caused by volatility. One way of doing so would be to redistribute wealth using taxation, balancing out the unequal effects of a volatile stock market.

Acknowledgments

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A full reference of all data sets used can be found at our website, http://theeconreview.com/appendix

TOR: A TOOL OF LIBERATION OR TERROR?

Logan Simms Kelly

As the amount of personal data collected by large firms and national governments grows everyday, anonymity and privacy becomes harder to find both digitally and in the physical world. However, one powerful tool still exists in the digital age to veil your whereabouts and actions, and that tool is Tor. This paper aims to uncover the origins of Tor, its efficiency, and whether it is being used for good or evil.

The story of Tor begins back in 1995, in a laboratory that was owned by none other than the US government. Military scientists at the Naval Research Laboratory were tasked with creating a counter surveillance tool that would prevent a user's internet activity from being traced back to them. This method is referred to as "onion routing" and works through redirecting your activity to multiple locations before sending your data to a final destination. Onion routing creates multiple layers to your digital activity (hence the Onion logo of Tor Network.) The project was funded by the Office of Naval Research and the Defense Advanced Research Projects Agency (DARPA,) which focuses on technological research that aids in the progression of US military technology. The initial goal of the onion routing technology was not to help journalists to hide from oppressive regimes, allow illegal drug sales, or create the hub for illegal pornography it is used for today. DARPA wanted to create a technological tool for government agencies such as the CIA to be protected when surfing the internet, whether that be for logging onto CIA.gov in a foreign nation or for creating a "fake" account to infiltrate a terrorist organization.

However, in order to mask government agents' use of Tor even further, the engineers realized it had to be released to the public on a global scale. At the "Wizards of OS" internet software conference in 2004, one of the government's researchers of Tor announced that: "The United States Government cannot simply run an anonymity system for everybody and then use it themselves only, because then every time a connection came from it people would say, 'Oh, it is another CIA agent.' If those are the only people using the network."

Thus, in the end of 2004, the US government cut a large portion of its funding to Tor and it was released for public use by the Electronic Frontier Foundation (EFF) as a 501c(3) non-profit organization. During the initial release of Tor to the public, Tor was marketed as a tool to promote the progress and stability of first amendment rights and free speech. However, it was clear that the government was utilizing Tor's unparalleled encryption abilities for other activities. A programmer named Dingledine, one of the co-executives of Tor following its change of ownership to the EFF, said that:
"[The U.S. Government does not] think of it as anonymity technology, although we use that term. They think of it as security technology. They need these technologies so they can research people they are interested in, so they can have anonymous tip lines, so that they can buy things from people without other countries knowing what they are buying, how much they are buying and where it is going, that sort of thing."

Fast-forwarding to today: according to TorMetrics, there are over two million daily users of the software. Who are these two million people using Tor and where are they from? Before we dive into that, let's take a look at why one uses Tor. I have concluded that there are primarily five reasons why Tor is being used in the current state of the internet:

1) **Protection of privacy from identity theft:** Your internet service provider (ISP) uses your traffic and activity as a source of revenue through the sale of your data. As a user of Tor, your data is encrypted.

2) **The cease of censorship:** Internet users who live in countries such as China, Russia, and the UAE use Tor to circumvent censored websites such as Facebook and Youtube.

3) **Encrypted Conversation and Transactions:** For better or for worse (we will get into that,) Tor has the ability to mask your discussions with other Tor users from nations, agencies, and hackers who wish to watch your online activity. The spectrum of this reason ranges in use from journalists in life-threatening situations to pedophiles looking for child pornography.

4) Online Surveillance: Tor can also be used by officials themselves, to target and conduct research on the questionable sites without leaving so much as a mark of who they are and what their purpose is on the website. Enforcement agencies also establish anonymous tip lines via Tor for there to be information disclosure in utter secrecy.

5) Whistleblowing: This final reason has correlation to Encrypted Conversation (#3.) However, in recent years, Tor has played such a significant role in the most severe cases of whistleblowing such as Edward Snowden's leak and the functionality of WikiLeaks, that this category stands alone for uses of Tor.

These five pillars of reason are the foundation of what makes the Tor community: law-abiding citizens, journalists, oppressed internet users, hackers, government agents, whistleblowers, arms dealers, activists, police, and pedophiles. It is difficult to find a broader spectrum than the one exhibited by the users of Tor. However, many of the largest media companies in the world would have you think differently; if you search "Tor Internet" on Google News, one of top articles that arises is *Isis is using the Dark Web* by the Business Insider. If you go onto the BBC webpage and search the same keywords ("Tor Internet") you will find that the top results yield articles related to child abuse, and politicians from the US and Russia warning citizens of Tor's harmful capabilities.

I suppose the success story and everyday use of Tor's technology is not as "sexy" in the world of click-bait publishing as a crackdown on gun runners or drug dealers, and that is partly in fault to the general population, who subliminally determines what is and what is not reported. After all, it is expensive to run the largest news agencies in the world, that makes revenue a top priority, leading them to publish content for the sole purpose of attracting readers and ad-money. This does not go without saying that there are still unbiased and informative articles pertaining to Tor. They are just more difficult to find.

Case Study: Government Surveillance

One example of a life-saving story due to Tor's encryption is told from a journalist in the Middle East. VICE released a video interview with Ehsan Norouzi, who assists in the publishing of information centered around government censorship and oppression in Iran. Norouzi talks about the difficult decision to become a journalist in the region:

"You are not the same person anymore [when you are monitored by the government.] You are trapped in a kind of self-censorship… just because my friend in Tehran is contacting me and giving me information about what is going on in the streets, they can simply be accused of espionage. And then what is the punishment for espionage? Death… It is a very hard decision. With governmental surveillance today, you cannot divide democracy and oppression because of what they are doing in terms of surveillance and utilizing your own data against you."

Norouzi's work with Tor and his ability to communicate with on-the-ground journalists is a shining example of the effectiveness the encryption tool has when one lives in a realm of fear to speak freely, and can help reveal the truth of heinous acts through concealment of data. In fact, Tor can pinpoint users geographically via TorMetrics, and their data reveals that the highest volume of activity (a staggering 49.90%) that requests bridge connection hails from the United Arab Emirates. Bridge connection is the highest form of encryption Tor offers and, as a result, is slower in connection but makes your data nearly impossible to track. This figure reveals that nearly half of all the global users that request the deepest level of encryption live under a regime where secretive communication spells death, and thus most likely use it for encrypted conversation rather than drug sales or other nefarious activity. I have attached a table below (from TorMetrics) of the top five countries whose daily users request bridge connection.

Country	**Mean Daily Users**
United Arab Emirates	57,732 (49.90%)
Russia	7,412 (7.01%)
United States	7,136 (6.75%)
Turkey	4,172 (3.95%)
India	2,818 (2.67%)

Table 1: (TorMetrics)

When studying Iranian Tor users, Oxford University exhibited in their report, *The Anonymous Internet*, that Iran "accounts for the largest number of Tor users outside Europe and the United States, and counts 50% more users than the United Kingdom, despite having only one third of its internet population." This data serves as another example of a regime leaving its citizens no option but to communicate safely through Tor.

After this analysis concerning the use of Tor, I suggest a general pattern in the media coverage of anonymous browsing: the number of informed and well-thought out

articles about Tor is miniscule, while the number of articles that might scare you is substantial.

In order to further define this pattern, I have included a map of the Nordenskiöld Archipelago in which the insignificant size and limited frequency of the islands corresponds to the visibility and volume of positive articles pertaining to Tor. The sea represents the negative articles in the same regard; the portion of the map covered by the sea is dark and encompassing.

This paper does not claim that Tor is not used for criminal activity. In fact, it is difficult to get an exact number on the ratio of criminal users to non-criminal users so we cannot conclude Tor is overwhelmingly used for good. However, what can be said is that web anonymity is societally stigmatized. To stem from that perspective, I introduce the following case study on firearm sales via online anonymity.

Case Study: GUNS GUNS GUNS

On August 11th 2016, CNN published an article titled "Inside the Illegal Online Weapons Trade" which garnered thousands of shares via Facebook and Twitter. In the article, CNN referred to the transaction process of buying a gun online as "buying a bar of chocolate" and that the Tor browsing realm was comparable to the "Wild West." In the same year, President Obama unveiled several executive orders on gun control, including a $4 million-dollar allocation and the creation of 200 additional positions within the ATF (The Bureau of Alcohol, Tobacco, Firearms and Explosives) to specifically hone in on the tracking of illicit online gun sales. Speaking on behalf of Obama's recent executive order, Attorney General Loretta Lynch referred to the use of the "dark-web" and its effects on increased gun violence in America.

However, I suggest anonymous market activity pertaining to gun sales is negligible. Nicholas Christin, a professor at Carnegie Mellon University was one of the core researchers of an academic analysis on transactions and dealings on the deep-web from 2013-2015. Following the arrest of the operators of the Silk Road in October of 2013, Christin and his colleagues were interested in how the "online anonymous marketplace ecosystem" would evolve. The multi-year project was quickly approved and backed by the USENIX Security Symposium to research and collect data from 35 anonymous marketplaces over the two-year span. In an interview with Christin following the project, he stated that, surprisingly, "weapons represent a very small portion of the overall trade on anonymous marketplaces" and that they were so uncommon in Christin's findings that they were pooled into the "Miscellaneous category" which are products that collectively account for the bottom 3% of sales on anonymous marketplaces. The other goods that were placed in the miscellaneous category were drug paraphernalia, electronics, tobacco, Viagra, and steroids.

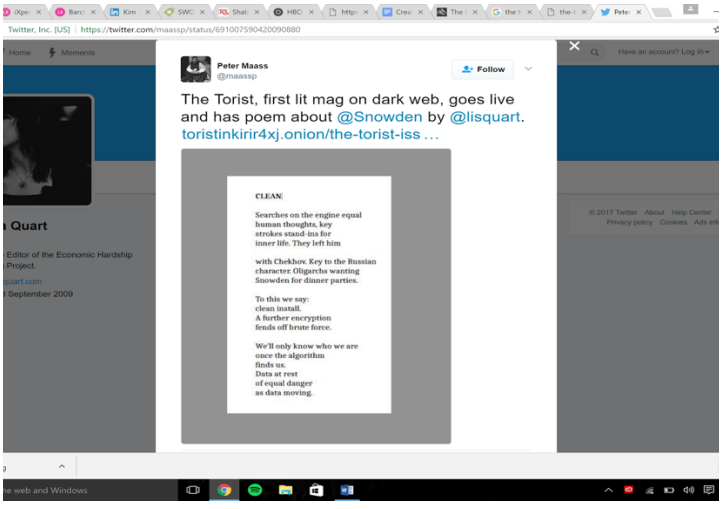
More recently, on May 4th of 2017, it was reported by WHNT News that the ATF released data showing that there has been a national increase in gun-related violence nationwide, exhibiting the lack of cause to gun related dark web activity. This case study and analysis pertaining to anonymous online gun sales is a clear example of the societal fear, misinformation, and stigma around the understanding of online anonymity. If governments continue to increase the level of surveillance and policing of online traffic, and if large media outlets simultaneously continue to publish scare-tactic content, the future of Tor and free speech via the internet will be rendered to non-existence. Although this prediction sounds bleak for users who find the software essential to their daily life and survival, I believe there is still hope.

Tor's future will boil down to the activism of digital citizens versus the legislation of national powers. Today, both parties are actively pursuing their contrasting goals for the software. When Tor was first released to the public in 2004, the U.S. Government released a statement advocating its use and defined it as a tool to "promote first amendment rights and free speech." However, based on the recent actions from the judicial system, their motives concern the exact opposite.

There is an international race between the People and federal powers to solidify or deconstruct Tor's foundation. Nations in both the East and the West are beginning to explore their legislative options and increase technological research for tracking anonymous users. Last April, Dimitri Bogatov was arrested by Russian authorities with charges of "inciting terrorism" for having a Tor node in his home. Tor nodes are responsible for increasing the encryption level of the network since data from a user is bounced from several nodes before being directed to the recipient. Bogatov is a distinguished lecturer at the Moscow Finance and Law University and remains in custody at this time, on the grounds of being an operator of Tor. The BBC also reported back in 2014 that the Russian Interior Ministry had offered 3.9 million roubles ($110,000) to any Russian who could devise a method to crack the identities of Tor users. In 2016, the United Kingdom parliament approved the "Retention of Internet Connection Records" resulting in the government's unrestricted access of English-based internet provider's data customers' activity in the last 12 months. The Parliament stated that the primary purpose of this action was to hinder terrorist related activity. Although this act does not specifically

target the Tor network, it sets a legal precedent for the breach of a citizen's personal internet activity. A fourth example of national infringement on internet security would be in April 2016, when the Supreme Court of the United States approved the alteration of Rule 41, which allows judges to issue search warrants to law enforcement to hack a computer regardless of location, including locations outside the United States. The U.S. Department of Justice refers to the changes of Rule 41 as a granting of powers, so "a judge may consider warrants for certain remote searches." The change of Rule 41 subsequently allows the U.S. government to breach Tor Networks data servers without request and regard for a nation's internet privacy laws.

With this myriad of government activity, citizens around the globe have taken notice of these recent acts, and have begun to try and shield Tor from the onslaught of federal attacks. One organization at the forefront of this battle is the Electronic Frontier Foundation (EFF) whose sole mission is the protection of a citizen's online rights. One way in which the EFF is tackling this challenge is by attempting to make Tor a mainstream browser for the average citizen. In 2014, Facebook launched a form of their website only accessible through the Tor network, which enables more secure and anonymous connections to the website. This is imperative to the survival of Tor and its use for activism as citizens in countries like China and Iran, where Facebook is banned, have restricted access to online communication systems. Another step towards mainstream use of Tor is a newly released literary journal called "The Torist." The Torist is only accessible through the Tor Network and is a compilation of creative works promoting online privacy. The magazine sheds light on the utility of the deep web outside of nefarious activity, and gives citizens who are weary of anonymous web activity an outlet to check Tor out. In explaining why The Torist was created in the first place, the anonymous co-founder of The Torist known as G.M.H. wrote in an email to *WIRED* that "there is no reason our innocent activities—creative or mundane—should be wiretapped, and there is every reason they should not be." To give you an example of the work within the magazine I have attached a poem, that was in the first issue, about Edward Snowden. It was written by poet and journalist Alissa Quart, who has been featured in *The New Yorker* for her literary work.



These new outlets for utility, such as Facebook's approval to construct a Tor-based site and The Torist, exhibit the future potential for Tor, and stomps on the presupposed belief that all Tor users are criminals. However, the broader question to answer is: Will these types of activism bring about enough exposure to make a change, when a majority of citizens are watching media outlets that stigmatize online anonymity?

The story of Tor is one mankind has heard before; the transcendence of liberation through privacy. Man has fought for several millennia and will continue to do so whether Tor continues to stay encrypted or not. Today's factions of power that oversee the citizens of the world must decide what is more important to them: the rights of their people or their consolidation of power. The bottom line is that Tor is a double-edged sword: It is a tool with great power. Tools such as Tor can build empires as quickly as they can destroy them. The answer to what path Tor will go down lies within the hands that grasp the tool. The stigma surrounding the software and the lack of general understanding leads me to the conclusion that governments will be able to do what they want with the security of the Tor Network. In *Terms of Service*, Jacob Silverman talks about governments' stands on anonymity in society today. He states on page 179 that "banning anonymity is, in short, a strategy of the powerful. At minimum, it allows for greater data collection or control over a communications network. At its worst, it is a tool for authoritarian governments to monitor and track their citizens. That's not to say that governments don't like anonymity-when it serves them." Based on Silverman's assertion that there is no individual gain for citizens in losing their right to be anonymous, it can be ascertained that the only winner will be the authoritarian powers who will inevitably have more control over your life. It appears a tool that was once used for liberation is fated to be used for terror.

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