

# ECONPress

*of Northeastern University*

ECONPress is a publication for undergraduate compositions in economics. We publish twice a year during each fall and spring semester. ECONPress invites the highest quality submissions from undergraduate students in various economics related disciplines. It provides a forum for the undergraduate economics community to engage in active discussion and debate about the topics, theories, and applications they've learned in the classroom.

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## Letter from the Editors

It has been six years since the collapse of the world financial markets and developed economies have yet to find their way back to their pre-crises norms. In the United States, central bank liquidity production has driven a fragile recovery and positioned the economy for what appears to be a promising future despite depressed inflation, and above average unemployment. Increasing disparity amongst social classes, and historically low rates of return on fixed assets has facilitated the potential for sector specific bubbles. Only time will tell whether the public has learned dangers of excess, but at the moment it is difficult to turn a blind eye to uncertainty of the financial markets. While divergent opinions amongst economist with regards to the extent in which a central bank should intervene and influence the economy, the positives appear to have outweighed the negatives for the time being. Central bankers must continue to effectively stimulate the wealth effect and ease the burdens of debtors. While there appears to be a light at the end of the tunnel for the United States economy, the European outlook is far less optimistic. The entire region and southern Europe in particular, remains mired in depression. Structural unemployment in nations bordering the Mediterranean remains dangerously high as the likelihood of a full Eurozone recovery diminishes and fears of a Japanese deflationary period grow. Emerging market economies once characterized by cheap labor and capital inflows, are now characterized by overcapacity and potentially unsustainable sovereign debt levels. Inflows into China continue to grow in an effort to accommodate their increasing their expanding capacity constraints. Their neighbor to the east has been less fortunate. Japan has been marred by close to two decades of deflation and without a drastic reversal in expectations; this trend is set to continue. Economists are at the heart and soul of the recovery. The policies implemented are a direct result of econometric models that attempt to solve an incredibly difficult dynamic problem; how do we recover and direct society towards financial stability and economic equality? The economic progress made over the next year will have a substantial impact on the world economy for many years to down the road.

We hope you will enjoy the research inside. The papers presented here do not outline a model society nor do they make claims of absolute truth. Instead, they represent the opening remarks to the discussion that will shape the global society that we live in. Thank you for reading and continuing to rethink your world by contributing to the debate

Thank you for taking part,

*Jason Fertig*

*Austin Bell*

*Harry Siggins*

*Lindsey Freeman*

*Tajudeen Akinbode*

*Douglas Pagani*

# How has the Liberalization of Federal Campaign Finance Laws post-Citizens United Affected Senate Challengers Likelihood of Victory?

Jonas Edwards-Jenks  
Northeastern University

## Introduction

The Supreme Court of the United States' ruling in the January 2010 case *Citizens United v. FEC* has drastically reshaped the landscape of campaign finance laws. The majority opinion ruled that major portions of the 2002 Bipartisan Campaign Reform Act were unconstitutional, specifically the ban on independent expenditure groups (IEs) spending on electioneering communication within 30 days of an election, and removed previous limits and restrictions on corporation spending on elections.<sup>1</sup>

Resulting from this ruling has been the creation of entirely new political independent expenditure groups supporting or opposing specific issues, candidates, and parties. This ruling drastically reversed the post-Watergate trend of increasing campaign finance restrictions,<sup>2</sup> and this has created what I will call from here on out as "free market campaign finance" as those who want to spend (either individuals,

unions, or corporations) may now spend as much as desired with little to no restriction.

There has been continued debate as to the influence money has in politics and the economics of campaign finance. Rarely do we see such drastic changes to markets and institutions as has been seen since the advent of the *Citizens United* decision, which provides us with a unique opportunity to examine the impact money has in elections by comparing money spent on elections before and after and the impact it has had.

I will not study the legal framework or the moral implications of this ruling. Instead I look to examine how this free marketization has affected a United States Senate challenger's chances of unseating the incumbent senator in either the primary or general election. The goal of this analysis is to study the economics of campaign finance as it relates to challengers against incumbent senators and the relationship or impact money has upon challenger success.

## Literature Review

Campaign finance rules, limits, and restrictions have been a long debated and studied topic. As this analysis is focused on the economics of campaign finance both before and after *Citizens United*, I will provide a review of literature that studies the legal changes and impact of *Citizens United* as well as on campaign finance and the role money plays in elections.

In his analysis of the decision, Richard Epstein agrees with the court that corporations should have the legal right to engage in electioneering communications based upon judicial precedent and constitutional law. He counters this with a hypothesis that corporations with broad customer bases

could see greater risk than reward by engaging in political spending; instead he sees political organizations and labor unions benefitting most from the decision.<sup>3</sup> This hypothesis has proven to be more or less true based upon Briffault's analysis of the creation of the Super PAC in the aftermath of *Citizens United*. Briffault outlines the structure in which tax-exempt advocacy organizations called Super PACs have been able to form and act as conduits for outside money to be spent on electioneering communication. Further he finds that a majority of this money has come not from corporations, but from wealthy individuals and labor unions.<sup>4</sup>

The fact that *Citizens United* has brought a significant increase in outside spending is undisputed. The exact effects of this have been studied by some and agreed upon that outside IE spending have very different affects than campaign spending. Brooks and Murov's 2012 article about the increase in outside-organization spending and negative advertisements post-*Citizens United* state that negative advertisements by IEs are much more effective than negative advertisements by the actual campaign.<sup>5</sup>

That is not to say that voters like negative advertisements, as Lau et al. prove that negative advertisements decrease voters' approval and trust in government. Fur-

ther, Lau et al. state that negative advertisements aren't necessarily effective in garnering votes, but they do have a lasting effect on how voters view the campaign.<sup>6</sup>

I believe the reasoning behind these findings is that voters dislike negative advertisements in principle, but the message still sticks with voters. Most importantly, voters do not hold the candidate as responsible for IEs negative ads against their opponent as they would if their campaign produced them. With these conclusions holding true, *Citizens United* has essentially allowed campaigns to outsource negative advertisements in the most effective way.

New IEs or Super PACs created post-*Citizens United* have been effective in impacting voter feelings, but how much of an impact does money have on actually dictating a winner? There are many scholars who have written and studied the impact money has in elections, and not surprisingly the opinions are scattered. Some argue that it is the most important determinant, while others believe it is negligible and overstated.

Gary Jacobson is one of the most trusted and cited scholars in this field and has written much about this subject. In his 2006 study of the U.S. House and Senate races of 2000, he finds that challenger spending dictates incumbent spending levels. Further, challengers deemed competitive politically are able to raise, and thus, spend much more than challengers without that support.<sup>7</sup> Alan Abromowitz goes one-

1 130 S. Ct. 2010. 876

2 Briffault, Richard. "Super PACs." *Minnesota Law Review*. (2012)96:1646.

3 Richard Epstein. "Citizens United v. FEC: The Constitutional Right That Big Corporations Should Have But Do Not Want." *Harvard Journal of Law & Public Policy*. (2012)34(2):644.

4 Briffault, "Super PACs," 1644-1693

5 Deborah Brooks and Michael Murov. "Assessing Accountability in a Post-Citizens United Era: The Effects of Attack Ad Sponsorship by Unknown Independent Groups." *American Politics Research*. (2012) 40(3):386.

6 Richard Lau, Lee Sigelman and Ivy Brown Rovner. "The Effects of Negative Political Campaigns: A Meta-Analytic Reassessment." *The Journal of Politics*. (2007)69(4):1200.

7 Gary Jacobson. "Campaign spending effects in the U.S. Senate elections: Evidence from the National Annenberg Election Survey." *Electoral Studies*. (2006) 200.

step further in his analysis and conclusion from U.S. House elections in the 1980s that challenger spending is the most important variable in dictating the election outcome. Coupled with campaign fundraising and spending restrictions of the time, Abramowitz found challengers at a competitive disadvantage due to their inability to effectively raise, and thus spend, at equal levels as incumbents.<sup>8</sup>

In looking to challenge the view that challenger spending is the most important variable in determining the election outcome, Alan Gerber conducts a review and analysis that finds challengers have greater marginal returns on spending compared to incumbents. Although there is a difference in returns, he attributes this to the fact that challengers are much less known to the electorate and thus their initial spending provides a huge return, but once spending gets to the level of the incumbent, the effects are negligible. He concludes that with this, campaign fundraising and spending restrictions put challengers at a competitive disadvantage.<sup>9</sup>

The overall consensus from Jacobson, Abramowitz, and Gerber is that challenger spending is one of, if not the most, important variable in determining electoral outcomes.

There are caveats, mainly that the impact, although present, is generally negli-

gible the more equal spending gets. Further they conclude that restrictions on fundraising and spending prove to inhibit challengers more than incumbents.

Of the opposing view regarding the impact and affect of money on elections is Jeffrey Milyo. In his 2003 article comparing what he sees as common knowledge that money decides elections to that of literature and research findings regarding money in politics. He states that the affects of money are overblown and are instead negligible in determining final outcome.<sup>10</sup> His reasoning is instead that the relationship between money and election outcomes is more correlation than causation, as “competent candidates are adept at both convincing contributors to give money and voters to give their vote.”<sup>11</sup>

There are two main views on the role money play in elections: money is the key to winning; or politically viable candidates are the key to winning and are just better at raising money. That said, many of the academics mentioned above suggested that campaign finance limits and restrictions put challengers at a disadvantage.<sup>12</sup> Given the impact Citizens United had in creating free market campaign finance, repealing much of the campaign finance restrictions of past, there is a unique opportunity to test

10 Jeffrey Milyo. “What Does Academic Research Tell Us About the Role of Money in American Politics?” *Engage*. (1991) 4(1):81.

11 Ibid.,81.

12 Abramowitz, Alan I. “Incumbency, Campaign Spending, and the Decline of Competition in U.S. House Elections,” 38.

13 Alan Gerber. “Estimating the Effect of Campaign Spending on Senate Election Outcomes Using Instrumental Variables,” (2012) 408.

8 Alan Abramowitz. “Incumbency, Campaign Spending, and the Decline of Competition in U.S. House Elections.” *The Journal of Politics*. (1991) 53(1):38.

9 Alan Gerber. “Estimating the Effect of Campaign Spending on Senate Election Outcomes Using Instrumental Variables.” *The American Political Science Review*. (1998) 92(2):406.

the overall affect money has on elections. If challenger spending dictates overall spending levels, and the challenger sees greater marginal return, but is at a disadvantage due to restrictions, then shouldn't challengers see greater success post-Citizens United where access to money is less limited? Or is Milyo more accurate that the money is negligible and instead good candidates win regardless of money, and thus challengers won't see better odds post-Citizens United?

### Hypothesis

Given the conclusions stated in the previous section, I hold two separate hypotheses for my analysis of U.S. Senate challenger success pre- and post-Citizens United and the affect money has on that success:

1. Challengers receive more money post-Citizens United due to increased access to outside spending and there will be a positive relation between spending and success for challengers. Thus, challengers will have better odds of success post- Citizens United.
2. Challengers receive more money post-Citizens United due to access to increased outside spending, but challengers will not have better odds of success post- Citizens United due to the limited impact money has in relation to other political factors.

### Data

To conduct this research I collected data from the Federal Elections Commission (FEC) regarding campaign and IE spending from the 2006, 2008, 2010, and 2012 United States Senate elections. There were minor hurdles and differences in data

sets from cycle to cycle that had to be adjusted for, but for this analysis I gathered all of my data exclusively from the FEC as it is the official body in regards to campaign finance laws, financial reporting, and enforcement. From the outset I will admit that all data will not be completely accurate to the exact dollar, but what my goal in collecting and analyzing this data was to find the most accurate representation for total funds spent on behalf of each challenger and incumbent.

The FEC maintains a Disclosure Data Catalog, which breaks many data sets down by category of spending. The two data sets I pulled from was their Candidate Summary sets, which include financial information for each registered candidate or person that appears on a ballot for the U.S. House of Representatives or U.S. Senate, and the IEs. The Candidate Summary sets are available from 2008-2014 and provide information regarding all sources campaign funds are raised, either through direct contributions, party or PAC transfers, or loans. I focused exclusively on each candidate's total disbursed amount. The 2006 cycle's data is different than the other three years in format, but the variable of total disbursements was present in both sets, and thus remains constant.

In regards to the IEs, the data was much more crude, yet I believe I was able to use the data to accurately achieve my goal of finding the most accurate representation for funds spent on behalf of each candidate. The FEC's Disclosure Data Catalog only holds Independent Expenditure data from 2010 through 2014, the post-Citizens United years. As the laws regulating IEs changed drastically post-2010, so did the way in which IEs reported their finances. The 2006-2008 data regarding IE spending was also held by the FEC but in a different



format than the more recent years.

Again, this data was of a different in format but maintained reports for every expenditure made by FEC-registered political committees and if they were in support or opposition to a candidate allowing me to aggregate totals.

I used this raw data to find the total spent on behalf of each candidate. The sum of IEs in support of said candidate plus the sum of IEs in opposition to their opponent equaled total outside spending on the candidate's behalf. This number was then combined with the total campaign disbursements to give me the total spending on by or on behalf of each candidate.

Overall, the data is not perfect. That said, I believe it is the most perfect data one could assemble given the availability and the reporting laws. Some of the biggest flaws come in IEs, as the reporting is much less uniform. Throughout the data sets there were many missing fields or mislabeled data. An example is that the IEs would provide a different spelling of the candidate or label the wrong state for which the candidate was running in what I would assume to be efforts meant to mislead their opponents or hide their spending. This required a lot of cleaning and relabeling to make the data as accurate as possible, but due to this I can thus not promise perfect data. Again, I was not going for perfect, but most accurate representation of total spending levels.

The other variables I used in this analysis were more control variables than anything else and were represented by either a "0" or "1" in my data set. This included whether the challenger won or lost, whether or not the race was a primary or

general election, if the race was before or after Citizens United, and whether the challenger was of the same party of which their state voted in the most recent presidential election. All of this information was gathered from the FEC's official election results publications.

### *Methodology*

To begin, I established that I would only examine races that were a challenger versus an incumbent. Thus, I did not include races to fill an empty seat due to retirement. Then, I only included challengers that: A) received 25% or more of the vote in either the primary or general election, and B) the challenger reported contributions and expenditures to the FEC, meaning they raised over \$5,000. The reasoning for these two rules is to show that these challengers were viable candidates and to weed out many of the challengers who did not have a chance.

The final rule I employed was in the rare instance (twice in this data set) in which the incumbent lost in the primary only to run against the same challenger in the general election either as an independent or as a write-in candidate, I did not include the general election rematch. My reasoning is that once the incumbent lost the election was then for an open seat and not to be included. The primary race was still included in my data.

As my intention is to study the relationship between money spent by and on behalf of a challenger and their probability of victory, I aggregated all money disbursed by a challenger's campaign, as well as spent by independent expenditure groups both supporting the challenger and opposing the incumbent. I then aggregated all money spent by the incumbent in the same way.

Dividing the challenger total by the incumbent total gave me my X1 variable, or ratio of spending. If  $X1 > 1$ , then the challenger spent more; if  $X1 < 1$ , then the incumbent spent more. I used a ratio instead of keeping the amounts in total dollar amounts to compensate for different levels of spending by state, as a candidate running in Florida will raise and spend much more money than a candidate in Rhode Island due to population and media markets.

The other variables used in this analysis are:

- X2 = Primary (0) or general election (1)
- X3 = Pre-Citizens United (0) or Post-Citizens United (1)
- X4 = Challenger of opposing party as state voted for President (0) or challenger is of same party as state voted for President (1)

X2 is to determine if a challenger of the same party is more likely to unseat an incumbent in the primary, or if a challenger from the opposing party has better odds during the general election. X3 is the variable that is the basis of this study, showing us if challengers have a better likelihood of winning now with free market campaign finance, or before Citizens United. I included X4 to be a political makeup variable, as a Democrat running in a traditionally blue state against a Republican will have an inherent advantage.

As Senate races are statewide elections for federal office, I believed using how the state voted for President in that cycle or the most recent cycle to be the best indicator for the political makeup of the state in terms of federal politics. The 2006 data

used 2004 Presidential results, and 2010 data used 2008 Presidential results. 2008 and 2012 data used the Presidential results from the same year.

I also employed dummy variables for each election year to see if the relationship between variables changed dramatically based upon the election cycle. The reasoning for this is if the dummy variables showed direct impact, than that would show there were influences for each of these cycles outside of the variables I am already studying and thus it would prove inaccuracy in my other variables and findings.

With my dependent and independent variables set, I then used a logistical regression model, or logit model, to test the relationship between the categorical dependent variable of win or loss with the primary independent continuous variable of X1.

I then ran three different variations of the test. The first was of all variables and all races, giving me 102 observations (races). The second test included all variables, but I took out all races in which the challenger received no reported IEs support. I called this the "competitive races only" test as the reasoning for this was that if a challenger received no IEs than the political community would have already deemed the race not worth investing in, and thus not as competitive as those in which there is reported IEs. The third and final test I returned to all races but excluded the X2 variable that states whether the race was a primary or general election

## Results

The results of the three logistical regression model tests are seen in Figure 1 below:

Figure 1: Logistical Regression Results<sup>14 15 16 17 18 19 20 21</sup>

Y: Challenger Win / Loss	Trial: 1	Trial: 2	Trial: 3
X <sub>1</sub> : (Total Challenger \$ / Total Incumbent \$)	1.2 (0.004)	1.09 (0.02)	1.18 (0.005)
X <sub>2</sub> : Primary / General Election	-0.5 (0.5)	-0.9 (0.3)	-
X <sub>3</sub> : Pre- / Post-Citizens United	-0.75 (0.2)	-1.3 (0.06)	-0.7 (0.3)
X <sub>4</sub> : Party of State's Vote for President	1.75 (0.005)	1.3 (0.05)	1.9 (0.001)
Pseudo R <sup>2</sup>	0.2169	0.1878	0.2124
Chi <sup>2</sup>	21.27	15.01	20.83

All three trials show with significance that there is a positive correlation between the ratio of total challenger spending to incumbent spending. The more a challenger spends, the more likely they are of winning. Also, there is a positive correlation between the Y variable (challenger winning) and the

presidential support variable. It can then be concluded that a challenger who is of the same party that the state votes for president who spends more money than the incumbent will have a greater likelihood of victory. This is not far out of what would be expected, and fits with the basis of both hypothesis.

In examining the results of the X3 variable, or the likelihood of victory pre-versus post-Citizens United, there is a negative correlation with partial significance. In Trial 2 non-competitive challengers were removed and there is a negative correlation with significance. Non-competitive is defined as a challenger with no reported IEs on their behalf. As Milyo stated that politically viable and competitive candidates are more likely to receive broad support, those without outside spending are thus non-

competitive.<sup>22</sup>

Trial 3 removes the Primary / General Election variable as throughout the previous two trials it showed a correlation that is not significant. This change brought little change in X1 and X4, but weakened X3. Further trials were run using variables to determine election cycle that came back non-conclusive, showing that year-specific variables were insignificant on the likelihood of challenger success.

Overall, the results of this analysis show that money does have an effect, but challengers are less likely to be victorious in the post-Citizens United than they were pre- Citizens United. In looking at aggregate totals in Figure 2 below, there are more findings to be gained:

Figure 2: Challenger Victories and Aggregate Spending Levels in Millions of Dollars<sup>23</sup>

Year	Challenger Wins	X <sub>1</sub> : Spending Ratio	Challenger Campaign Spending	Challenger IEs	Challenger Total	Incumbent Campaign Spending	Incumbent IEs	Incumbent Total
2012	2	0.87	\$170.2	\$102.6	\$272.8	\$242.1	\$69.8	\$311.9
2010	5	0.67	\$117.8	\$68.7	\$186.5	\$234.1	\$43	\$277.1
'10-'12 Total	7	0.78	\$288	\$171.3	\$459.3	\$476.2	\$112.8	\$589
2008	5	0.77	\$110	\$75.95	\$185.95	\$202.7	\$37.6	\$240.3
2006	7	0.53	\$147.6	\$35.5	\$183	\$312.6	\$31.7	\$344.3
'06-'08 Total	12	0.63	\$257.6	\$111.5	\$369	\$515.4	\$69.2	\$584.6
Difference	-5	0.15	\$30.5	\$59.85	\$90.3	-\$39.2	\$43.6	\$43

Figure 2 shows that challengers are spending more in relation to incumbents since *Citizens United* than they did previously, as the X1 ratio is closer to one, thus challengers are spending at levels closer to parity. Also worth noting is the difference between incumbent's campaign spending and IEs, as their campaigns on aggregate are spending approximately \$40 million less since *Citizens United*, but the IEs on their behalf have increased by \$43.6 million. I believe this illustrates further that *Citizens United* has had more of an impact on challenger spending than incumbent spending, as incumbent spending had already reached equilibrium, while challenger spending is just now reaching the ability to do so.

In looking at challenger victories though, there were five more challenger victories prior to *Citizens United* than post. This goes to the previous point from Figure 1 that challengers are now less likely to win than before.

<sup>14</sup> FEC. 2012. "2012 Candidate Summary." FEC, Washington, DC.

<sup>15</sup> FEC. 2010. "2010 Candidate Summary." FEC, Washington, DC.

<sup>16</sup> FEC. 2008. "2008 Candidate Summary." FEC, Washington, DC.

<sup>17</sup> FEC. 2006. "2005-2006 House and Senate Financial Activity." FEC, Washington, DC.

<sup>18</sup> FEC. 2012. "2012 Independent Expenditures." FEC, Washington, DC.

<sup>19</sup> FEC. 2010. "2010 Independent Expenditures." FEC, Washington, DC.

<sup>20</sup> FEC. 2008. "Independent Expenditure Data Summary Table: 24-Month Data Summaries (1/1/07 – 12/31/08)." FEC, Washington, DC.

<sup>21</sup> FEC. 2006. "Independent Expenditure Data Summary Table: 24-Month Data Summaries (1/1/05 – 12/31/06)." FEC, Washington, DC.

<sup>22</sup> Milyo, "What Does Academic Research Tell Us About the Role of Money in American Politics?"

<sup>23</sup> Ibid. FEC sets from footnotes 14-21.

One final look at aggregate spending levels of IEs in Figure 3 and where the money specifically is coming from gives a

unique perspective on the shift of power away from the national parties.

*Figure 3: Top Five Independent Expenditure Groups and their total spending in each election cycle in millions of dollars (includes presidential, senate, and congressional spending).<sup>24</sup>*

2012		2010		2008		2006	
Name	Total	Name	Total	Name	Total	Name	Total
Crossroads <sup>25</sup>	\$57.1	DSCC	\$39.2	DSCC	\$74.5	NRCC <sup>26</sup>	\$64.9
DSCC <sup>27</sup>	\$52.1	Crossroads	\$31.7	NRSC	\$38	DCCC <sup>28</sup>	\$55.1
Majority PAC <sup>29</sup>	\$36.7	NRSC	\$25.9	SEIU <sup>30</sup>	\$2.7	NRSC	\$18.1
NRSC <sup>31</sup>	\$31.7	NRA <sup>32</sup>	\$5.6	NRA	\$1.5	RNC <sup>33</sup>	\$13.9
USCC <sup>34</sup>	\$24.5	CFG <sup>35</sup>	\$4.9	NFIB <sup>36</sup>	\$1.3	AFSCM <sup>37</sup>	\$3.8

In 2006 and 2008 the Republican and Democratic Senatorial Committees spent on average \$42 million each per cycle, while the most spent by a non-affil-

iated group was \$3.8 million in 2006 by the American Federation of State County & Municipal Employees union. In comparison, the average spent by the party's senate committees in 2010 and 2012 was \$37 million each per cycle, while the most spent by a non-affiliated group was \$57 million by the American Crossroads and their partner Crossroads GPS Super PAC.

### Conclusion

The Supreme Court decision in *Citizens United v. FEC* was a landmark decision that has drastically reshaped the landscape of campaign finance. The total impact and effects I believe have created a free marketization of campaign finance and created a unique opportunity to study the role of money in campaigns.

In analyzing U.S. Senate races in which a candidate challenges an incumbent in either the primary or general election from the two cycles prior and the two cycles post *Citizens United* I have been able to see exactly how this dramatic change has affected challengers probability of winning. My findings show that a challenger has greater odds of victory if they spend more than the incumbent, but further challengers are less likely to win now in the free market campaign world then they were previously.

My hypothesis on how this dichotomous relationship in spending to success can exist falls primarily in the final paragraph of the previous section. Before *Citizens United*, national parties were the only force in outside spending, helping dictate exactly who challenges the incumbent and were often more interested in victory over ideology. Now, outside groups unaffiliated with the national party and who are more ideologically rigid have become real players in the outside spending game, thus helping more ideological challengers emerge from primary fields to contest incumbents. Thus, a more politically viable and competent candidate would have a greater probability of unseating an incumbent than a less politically viable challenger with more money.

I would recommend further research into this hypothesis in the future, as well as testing this same methodology with U.S. House of Representatives elections to see the different impact money has on state-wide versus district races.

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24. Ibid. *FEC*- 2006-2012 Independent Expenditures

25. "Crossroads" stands for the combination of the independent expenditure groups Crossroad Grassroots Policy Strategies and American Crossroads, which are partner organizations.

26. "NRCC" is the National Republican Congressional Committee

27. "DSCC" is the Democratic Senatorial Campaign Committee

28. "DCCC" is the Democratic Congressional Campaign Committee.

29. "Majority PAC" is the Democratic Senator's Super PAC.

30. "SEIU" is the Republican International Union Committee

31. "NRSC" is the Republican Senatorial Campaign Committee.

32. "NRA" is the National Rifle Association of America Political Victory Fund

33. "RNC" is the Republican National Committee

34. "USCC" is the acronym for the United States Chamber of Commerce

35. "CFG" is the Club for Growth Action

36. "NFIB" is the National Federation of Independent Business.

37. "AFSCM" is the American Federation of State County & Municipal Employees Union.



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## The Returns to Education Versus the Returns to Experience

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### Introduction

This study investigates the difference between individual returns to education and individual returns to experience in the United States. The purpose of this research is to determine what level of schooling is optimal, and specifically, whether it makes economic sense for a college student to continue his or her education after completing his or her undergraduate degree, or whether it makes more sense to enter the labor force immediately after finishing his or her undergraduate program. The logic is that if the marginal increase in earnings from a year of experience in the labor force, is greater than the marginal increase in earnings from an additional year of schooling, then a student should, from a purely earnings maximizing standpoint, not pursue any further education.

In order to model individual decision-making, this analysis uses cross-sectional and panel microdata from the 1997 National Longitudinal Survey, collected by the Bureau of Labor Statistics. The 1997 NLS collects data on close to 9,000 individuals annually on many variables including wage, employment history, schooling, health, and family background. The NLS is appropriate because the survey is completed by the same individuals every year, and therefore, there is a record of employment

history for each individual, which is important for getting an accurate measurement of experience, one of this study's main focuses. The NLS also has information on years of schooling and highest degree attained by each individual, both of which are necessary for this study. Controlling for family background is especially important when estimating individuals' earnings functions, which is another advantage of using microdata.

Determining the relative impact education and experience have on earnings has very important implications for reforming institutions of higher education, but of course one size does not fit all. The returns to both education and experience should in theory vary across academic fields and professions, which needs to be considered. For example, in disciplines where returns to experience are relatively high, while returns to education are relatively low, universities could tailor course curriculums to include more opportunities to gain work experience (whether that be through providing internships or by including more applied academics in coursework). Applications of theoretical physics are probably best explained in a classroom on a chalkboard, but teaching a freshman computer science major how to code on the job might make him or her more directly aware of the practical applications of coding.

Philosopher and statistician Nassim Taleb, points out in his book *Antifragile* that even two very related disciplines have historically required a different educational approach, "[t]he two professions of medical doctor and surgeon were kept professionally and socially separate, one was an ars,

the other scientia, hence one craft was built around experience-driven and the other responded on theories”<sup>1</sup> Of course if colleges were to adjust their courses, the ‘experience’ part of the curriculum would have to differ depending on a student’s major. Perhaps students in the social sciences would learn more about their respective areas of expertise by spending a semester focusing on a single research project, while business majors would learn accounting practices by interning at an accounting firm.

If we can identify areas of study where individuals gain more from experience than from education then it would make sense to reform our education system to take this into account; schools would be less focused on teaching theory and more focused on developing practical skills in these areas. This is not to say that theory is not important in each discipline; there will hopefully always be academics who discuss their disciplines on a higher plane but for the majority of people who go to college and get a job afterwards, job skills are what will matter when new college graduates are entering into the labor force.

A further use of these estimates might be to either adjust the time necessary to complete certain degrees or to price tuition fees relative to the returns on education and the returns on experience. For example, in an industry where experience plays a relatively important role, if the opportunity cost of an additional year of schooling is greater than the increase in earnings gained by joining the labor force, then it

might make sense for degrees of that nature to take less time than in industries where the marginal returns to schooling is greater. In addition, universities could hypothetically, with accurate enough estimates, offer different tuitions for different degrees based on the value added by an additional year of schooling for a specific degree, rather than offering a flat rate tuition for all degrees. For disciplines where the relative individual returns to education are greater, tuition could be made more expensive to reflect that fact. In disciplines where the relative individual returns to education are smaller, tuitions could be made less expensive.

### Literature Review

Richard Freeman summarizes in detail various influential papers, important findings, and statistical techniques that have shaped the discourse on earnings functions. Richard B. Freeman discusses different proposed economic theories on the relationship between education and earnings, of which the human capital view is most widely accepted. The human capital view states that “education is a productive input, whose marginal contribution can be roughly measured by wage differentials between more and less educated labor.”<sup>2</sup> Therefore, on the national scale, output (production) would be a function of capital and labor where an increase in the level of education would positively influence the productivity of labor.

$$Q=f(E, K)$$

Where Q=output, E=effective units of labor, where education raises effectiveness, and K= capital.

However, as Freeman points out, economists find relating education to productivity problematic because, as early labor researchers discovered, “ditch-diggers with PhDs were found to be no more productive than ditch-diggers without PhDs.”<sup>3</sup> Despite this fact, many labor economists still use models based on the human capital view today, since few satisfactory alternatives have challenged the model. Overwhelmingly labor economists working with the standard human capital earnings function, developed by Jacob Mincer, find education, measured in years of schooling, “has a significant and sizable impact on earnings. However, at the same time, every study also finds that by itself, years of schooling explains a relatively small part of the variance of log earnings, say 3–5 percent at most.”<sup>4</sup> Economists trying to explain more of the variation in earnings, look to measures of background like family income and IQ to help flesh out the model. Controlling for family income and IQ does indeed strengthen the model without decreasing the estimated impact of schooling.<sup>5</sup>

A more recent overview of the role education in economic growth also suggests that regressing cognitive test scores might

give economists a better clue about what really drives earnings. They suspect that the focus on years of schooling, which measures educational attainment more than anything else, is a mistake “because it distorts analysis and the policy discussions.” Instead they believe “[i]ndividual earnings are systematically related to cognitive skills. The distribution of skills in society appears closely related to the distribution of income”.<sup>6</sup> A problem arises when education is only represented by schooling, because “[i]f more able people tend also to obtain additional schooling, the estimated schooling effect could include both the impacts of schooling and the fact that those continuing in school could earn more in the absence of schooling.” Hanushek and Wößmann cite various sources that use the NLS dataset and estimate a regression with AFQT (Armed Forces Qualification Test) scores to determine cognitive ability.<sup>7</sup>

Another paper that presents a unique take on the NLS, analyzes how returns to secondary education are affected by the selectiveness of colleges.<sup>8</sup> Monk finds that the more selective an institution student goes to, the greater his or her earnings are. Monk also finds that there is a wage premium for graduating from colleges with advanced programs and research

1 Nassim Talib . *Antifragile: Things that Gain from Disorder*. (Penguin Books Limited, 2012.) Page 435.

2 Richard Freeman. “Demand for Education.” *Handbook of Labor Economics*, 1. (1986). 360. Print.

3 Freeman, “Demand for Education”

4 Jacob Mincer. “Schooling, Experience, and Earnings.” *Journal of Political Economy* 83, no. 2 (1974):444.

5 Ibid.,445

6 Eric Hanushek and Ludger Wößmann. “The Role of Education Quality in Economic Growth.” *World Bank Policy Research Working Paper* 4122 (2007).

7 Ibid., 85

8 Monks, James. “The Returns to Individual and College Characteristics: Evidence from the National Longitudinal Survey of Youth” *Economics of Education Review* 19 (2000): 281

9 Ibid.,286

institutions as opposed to graduating from a liberal arts school.<sup>9</sup> These findings are significant because they suggest that researchers should control for the quality of college, rather than assuming all college education is relatively equal. Robert J. Willis further discusses Mincer's earnings function and its form, focusing on the role of experience in explaining wage differentials. The Mincer model was important for labor economics because it introduced a measure of experience to earnings functions in a simple but innovative way. Willis explains,

[s]ince early data sources such as Census data did not record a worker's actual labor force experience, a transformation of the worker's age was used as a proxy for his experience. Mincer uses the transformation  $x = a - s - 6$ , which assumes that a worker begins full-time work immediately after completing his the age of school completion is  $s + 6$ .<sup>10</sup>

Hundreds of different papers have been written using variations on the Mincer earnings function, and it is clear that experience measured by the proxy above, or by a different method, has a significant positive impact on earnings. Frank Stafford notes that "[d]ifferences between men and women in their work histories as measured by experience segments appear to account for perhaps 70 percent or more of the wage differences between men and women",

reinforcing the significance of experience.<sup>11</sup> Mincer's initial earnings function was only dependent on schooling and experience and was specified as such:

$$\ln y = B_0 + B_1s + B_2x + B_3x^2 + u$$

Mincer used experience squared in his model because he observed that earnings tend to increase as experience increases but only up until a point after which earnings decreases. This is why "[t]he concavity of the observed earnings profile is captured by the quadratic experience terms,  $x$  and  $x^2$ , whose coefficients [...] are respectively positive and negative."<sup>12</sup> David Card conducted an analysis to determine which econometric model was most appropriate for measuring earnings as a function of experience and education finds that even 25 years after Mincer specified his original model, the OLS estimate of a Mincerian earnings function is arguably still the least biased way to measure returns to experience and education. Card compared the standard human capital earnings function to an estimation using instrumental variables, a study conducted on returns to education and returns to schooling with twins, and another study that controlled for a variety of demographics,

10 Robert Willis. "Wage Determinants: A Survey and Reinterpretation of Human Capital Earnings Functions." *Handbook of Labor Economics*, Volume 1 (1986) 543.

11 Frank Stafford. "Forestalling the Demise of Empirical Economics: The Role of Microdata in Labor Economics Research." *Handbook of Labor Economics*, Volume 1 (1986). 388.

12 Willis, "Wage Determinants: A Survey and Reinterpretation of Human Capital Earnings Functions", 530.

but Card found the HCEF to be the best.<sup>13</sup>

Perhaps the most interesting study, with regards to experience, is one that looks at how changes in the demographics of the labor force might affect returns to experience in the labor market. Not only is this study interesting because it addresses the fact that returns to experience are dynamic, but also because the authors come up with a completely different way to determine an individual's level of experience. Instead of using Mincer's  $x = a - s - 6$  rule they do the following:<sup>14</sup>

Each year in which an individual works more than a critical level of hours of work  $h$ , the worker accumulates one unit of experience (or learning-by-doing) skill. Thus, the total stock of experience,  $e$ , of a  $j$ -year old worker is given by

$$e = \sum_{k=0}^j I(h_k > h)$$

It might be possible to use this model with data from the NLS considering how extensive the dataset is, which would allow for a much more accurate measure of experience than would be possible using Mincer's transformation.

13 David Card. "The Casual Effect of Education on Earnings." *Handbook of Labor Economics*, 3 (1999). 1805.

14 Mincer, "Schooling, Experience, and Earnings", 445.

## Data

The data used to estimate the model in this study is panel data spanning 1999 to 2008 collected from the 1997 cohort of the National Longitudinal Survey. The NLSY97 cohort consists of data collected each year on a sample of just under 9,000 Americans born between 1980 and 1984. Because the BLS has conducted annual interviews with participants since 1997, estimating an econometric model with this type of longitudinal data allows the researcher to aggregate up-to-date measures like cumulative years of schooling or cumulative weeks of employment. During the initial stages of the project, the BLS sought to compile a sample that was statistically representative of American youths born between 1980 and 1984 using a complex screening process. The sampling process is described as follows:

The listing of eligible housing units was composed of 96,512 households, defined as a single room or group of rooms intended as separate living quarters for a family, for a group of unrelated persons living together, or for a person living alone. The list of housing units for each sample was selected in the following manner. First, 100 primary sampling units (PSUs) for each sample were chosen from the National Opinion Research Center's (NORC) 1990 master probability sample of the United States. NORC is the organization that was contracted to manage the sampling process. Note: There are 100 PSUs in the cross-sectional sample and 100 PSUs in the oversample; however, some PSUs were selected in both samples. Thus, there are a total of 147 non-overlapping PSUs included in the NLSY97. In the cross-sectional sample, each PSU represented either a metropolitan area or one or more non-metropolitan counties with a minimum of 2,000 housing



units. The supplemental sample defined PSUs differently from the cross-sectional sample; counties containing large percentages of minorities were merged to create areas containing a minimum of 2,000 housing units. Second, regardless of sample, segments containing one or more adjoining blocks-and at least 75 housing units were selected from each PSU. Finally, a subset of housing units within the segment compromised the listing of households eligible for interview.<sup>15</sup>

After a list of eligible households was created, 75,291 households out of the 96,512 eligible households interviewed for screening purposes (National Longitudinal Surveys). In those households, 9,907 individuals were identified as eligible for the NLS97 cohort, and of those eligible individuals, 8,984 participated in the first round. The majority of interviews (approximately 90%) conducted after the screening process were administered by an interviewer with a laptop computer, during which the participants could choose to interact directly with the interviewer or record answers on the laptop, depending on the respondents' sensitivity to the questions (National Longitudinal Surveys). Interviews that could not be done in person were conducted over the phone. Because of the extensive nature of the dataset (over 60,000 variables) there are potential problems with the accuracy of responses, missing responses, and retention of participants. Issues with accuracy would largely be related to human error, either on the part of interviewer or interviewee. Responses are missing for a variety of reasons: The participant's refusal to answer a

question, inability to schedule an interview for a particular round of the survey, etc. As is to be expected, retention of participants declined over time, as participants refused to be interviewed, were unable to be located, became ill, or died. To incentivize participation in the study, the NLS offered each participant 10 to 15 dollars each year he or she filled out the survey (National Longitudinal Surveys). Even still, the number of missing observations for some variables is the main weakness of this dataset.<sup>16</sup>

Since this study seeks to explain income as a function of years of schooling and experience, the dependent variable is represented by total personal income reported in the year prior (for example level of income included in the 2008 panel, is the actually the individual's reported income in 2007). Because panel data is used to estimate some results, income is corrected for inflation using Bureau of Labor Statistics calculated CPI. The variable for years of schooling is simply the cumulative years of schooling completed. Experience can be represented by one of two variables, either Mincer experience (*age – years of schooling – 6*) or by cumulative years of work. Interestingly enough these measures of experience differ drastically [see descriptive statistics and histograms], which might suggest either that Mincer's theoretical approximation of experience is a poor approximation (at least of this age group, which is relatively young) or that cumulative years of work is not comparable to cumulative years of experience (i.e. 'experience' cannot solely be quantified by

the number of years an individual spends working). The number of years of work variable was calculated by simply adding up each individual's work history. Every year the NLS questionnaire asked participants to list all their past job, the date they started each job, and the date they finished each job, which allowed the researchers to create a variable for total years worked. Despite high variation, a basic scatter plot of income versus total years worked shows a positive correlation between the two variables.

As mentioned earlier, the AFQT (Armed Forces Qualifications Test) score, collected for the NLS 1979 cohort, has been used in a variety of studies as an indicator of an individual's level of intelligence. The NLS 1997 equivalent is the ASVAB (Armed Services Vocational Aptitude Battery) score. The exam is scored from 0 to 100,000 and tests on the following subjects: General science, arithmetic reasoning, world knowledge, paragraph comprehension, mathematics knowledge, electronics information, auto and shop information, mechanical.

comprehension, and assembling objects (ASVAB). According to ASVAB researchers, approximately half the population of test takers score at or above 50%, therefore median score of the NLS 1997 cohort (42,886) appears to be below average [see descriptive statistics below] (ASVAB). Also, exam scores for the 1997 sample do not appear to be normally distributed, which is unexpected for a variable that is a proxy for intelligence [see histograms]. We would expect, in theory, for intelligence level to be normally distributed.

As one would expect of a representative sample, the number males and females are relative equal. The bar graphs in the appendix help visualize some other demographics of the sample with respect to race and ethnicity and intelligence. Non-black/non-Hispanics is the largest represented ethnic group, while mixed race is by far the smallest. As for measures of educational attainment, the majority of people in the sample received only their high school diploma, while the next largest category graduated college with a bachelor's degree.

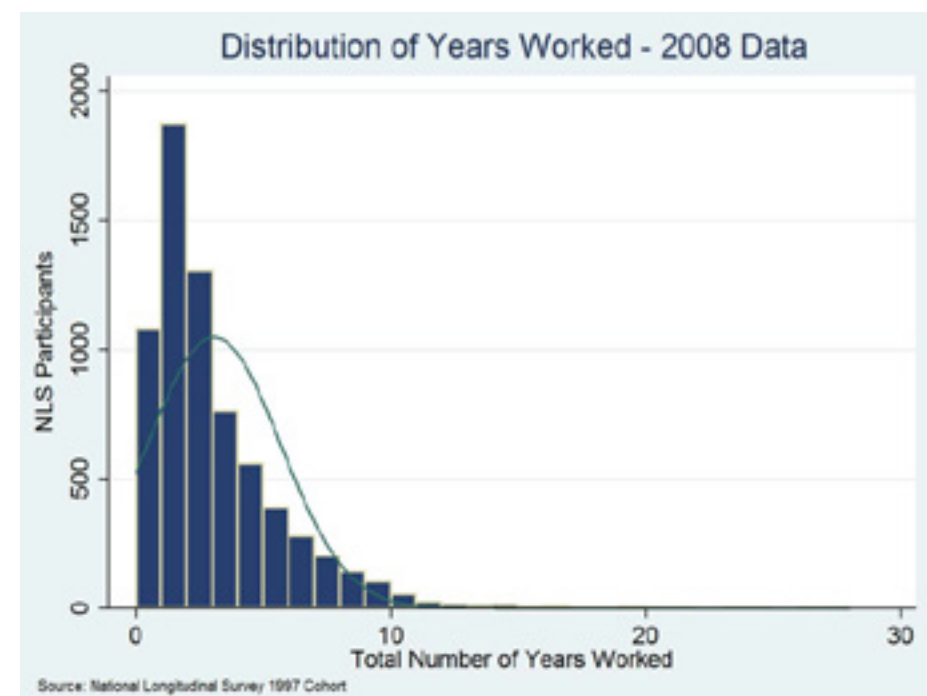
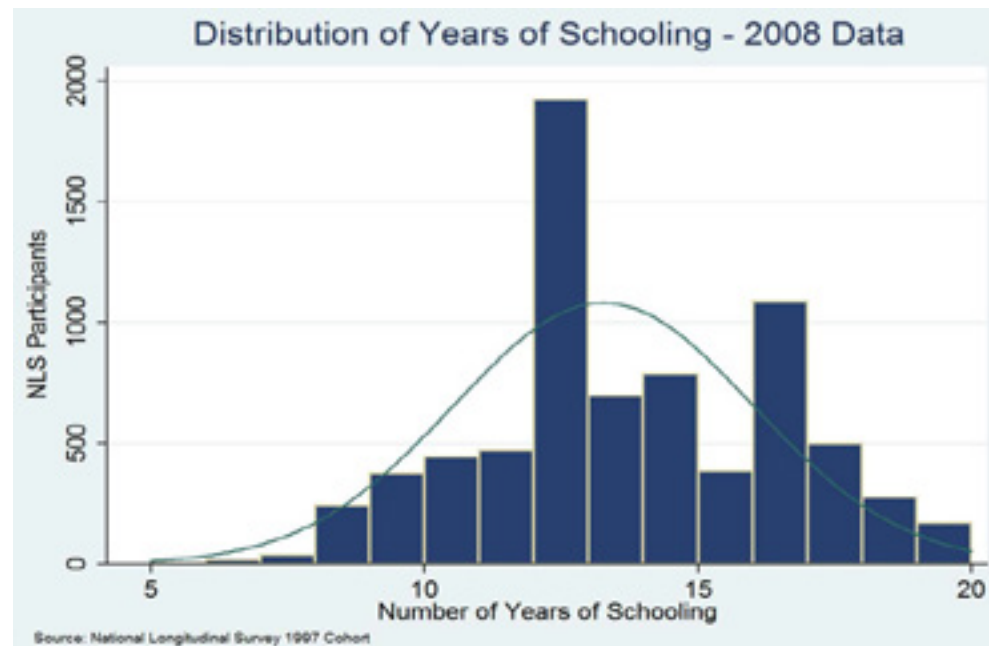
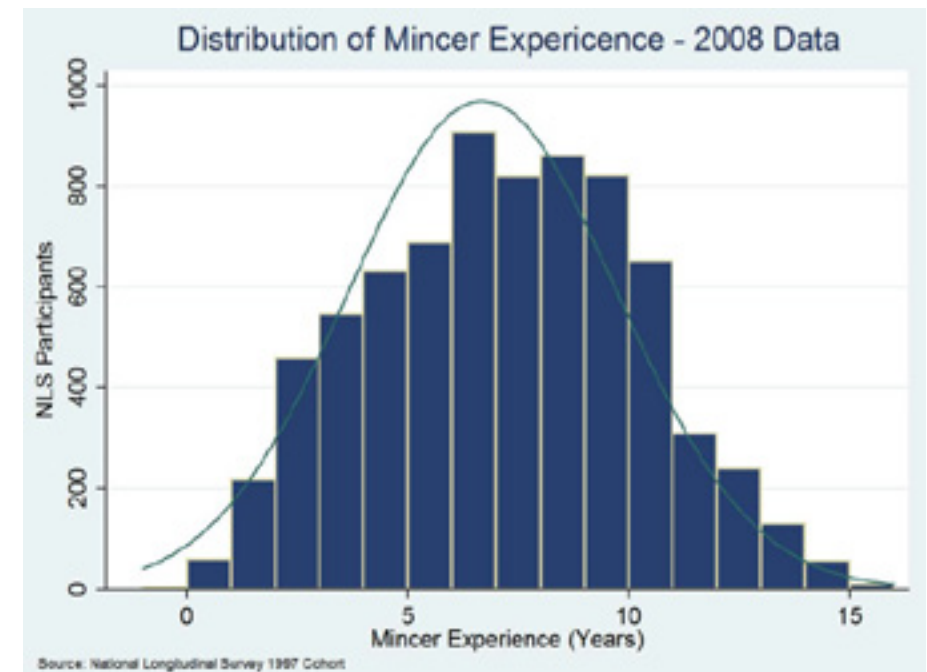
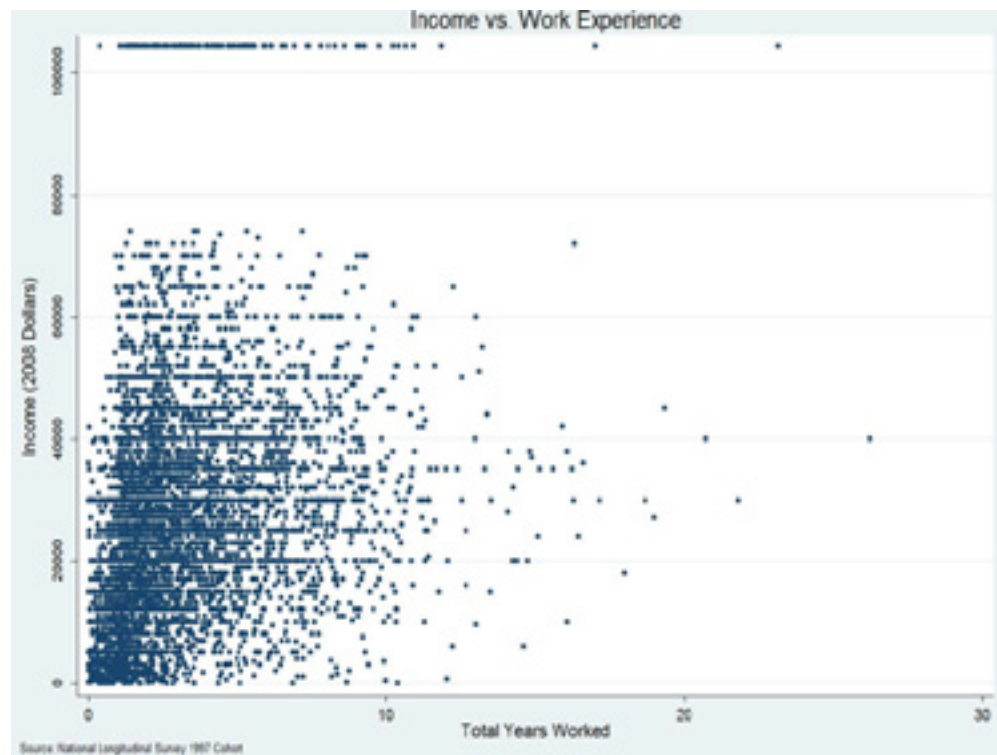
Descriptive Statistics - 1999 to 2008								
Variable	Mean	Median	Max	Min	Standard Deviation	Skewness	Kurtosis	Missing Observations
Years of Schooling	10.19	12	20	0	4.46	-0.75	2.77	15.22%
Mincer Experience	6.60	3	25	-3	7.50	1.13	2.83	15.22%
Total Years Worked	2.45	1.62	31.74	0	2.53	2.39	12.70	28.46%
ASVAB Score	45,317.19	42,886	100,000	0	29,172.26	0.20	1.81	21.05%
Income (2008 dollars)	19,965.63	15000	146,002	0	20,450.81	2.16	10.96	48.53%
Spouse's Income	31,873.70	26,500	163,797	0	25,849.97	2.51	12.49	84.45%
Age	22.99	23	31	15	4.47	0.00	1.93	0.00%

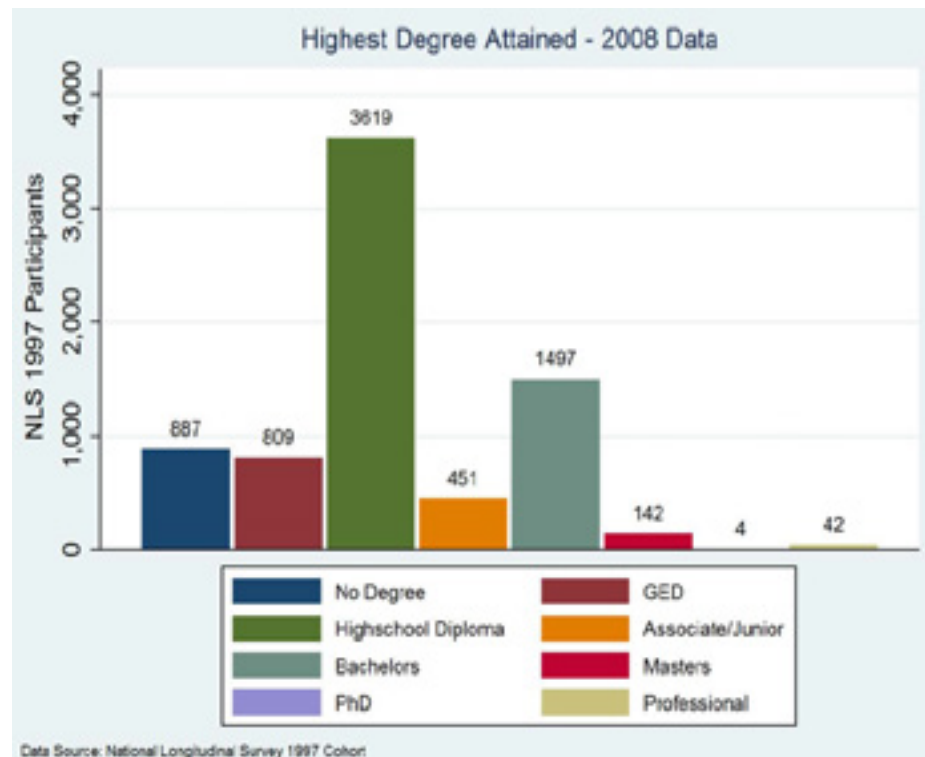
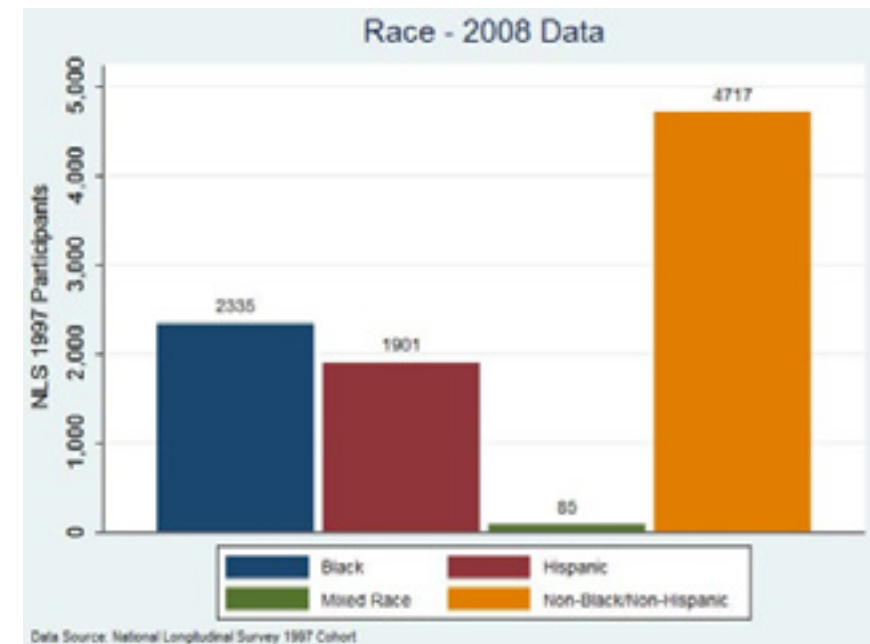
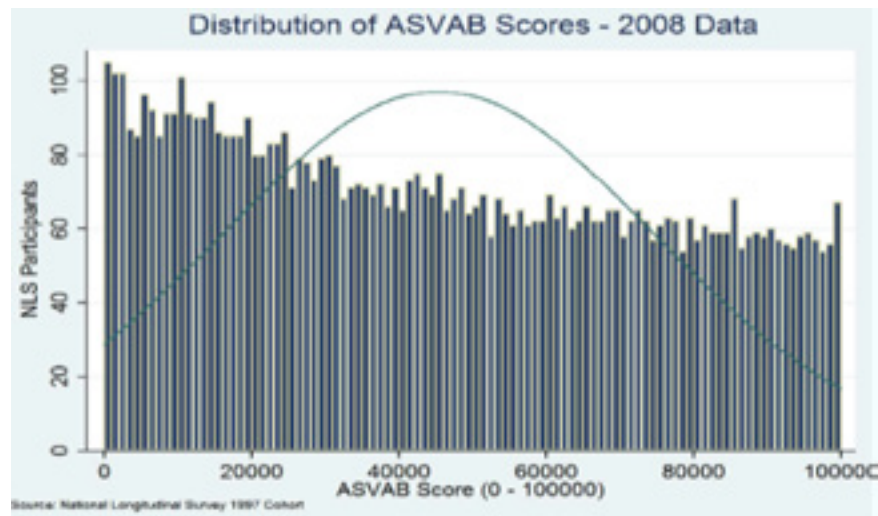
Total Number of Possible Observations = 44,920  
Source: National Longitudinal Survey 1997 Cohort

15 National Longitudinal Surveys. U.S. Bureau of Labor Statistics. Web. 21 Oct. 2013.

16 Ibid., National Longitudinal Surveys







### *Hypothesis*

One would think that studies comparing college majors would be relatively common, however papers testing the returns to specific college majors, using NLS data, seem to be lacking or hard to find. In his investigation of college characteristics, Monks finds that both the quality of college and whether or not the college is a graduate degree granting or research institution matters.<sup>17</sup> He also found evidence to suggest that graduates from private institutions may typically earn more than graduates from public institutions. Monks uses the NLS 1979 cohort to test his hypothesis, therefore it seems reasonable to extend his work to encompass college majors and job occupations.

In order to test whether or not there are significant differences between the re-

<sup>17</sup> James Monks "The Returns to Individual and College Characteristics: Evidence from the National Longitudinal Survey of Youth", 285.

turns to various college majors as well as between the returns to a variety of job occupations, first a simple econometric model was developed based on existing labor economics literature. The 'classic' Mincer model, discussed in the literature review, was used as a base to which different control variables were later added:

$$\ln y = B_0 + B_1s + B_2x + B_3x^2 + u$$

The Mincer model describes income ( $y$ ) as a function of level of schooling ( $s$ ) and experience ( $x$ ). Unlike many data sets, the NLS collects comprehensive data on individuals' work history, which meant that a person's total years of work could be calculated and used to measure experience as opposed to using the Mincer rule, *age - years of schooling - 6*, as a proxy. Using total years of work as a variable also allows the effect of age to be measured, which cannot be done if the proxy is used as a measure, because the two are perfectly collinear. To compare these measures of experience, regressions were run with each.<sup>18</sup>

There are a hundreds of different control variables, both quantitative and qualitative, that have been used to estimate individual returns to schooling and experience. Some of the most commonly used and perhaps most important are demographic, like sex and race. Historically, men have earned more than women and whites have earned more than other races, therefore both sex and race were included as dummy variables in the model. The NLS 1997 classifies an individual as black, Hispanic, mixed race, or non-black/non-hispanic, so dummies for black, Hispanic, and mixed race, as well as a dummy for female, were included in

the equation.

An important control variable that has often been problematic for labor economists to capture is natural ability or natural level of intelligence. Natural ability or intelligence has been a problem, because it is difficult to measure and often data is unavailable. When no measurement of intelligence is available, econometricians may specify an instrumental variable (IV) model in order to get an unbiased estimate for years of schooling, which theoretically should be positively biased when no measure of intelligence is included in the model. When data is available, some studies have used IQ score as a measure.<sup>19</sup>

Studies using the NLS data sets to estimate a model can include either the AFQT (Armed Forces Qualification Test) score or the ASVAB (Armed Services Vocational Aptitude Battery) score, depending on which cohort is used. The NLS 1997 cohort collected ASVAB scores during the first year of the survey; therefore, ASVAB score was included as a variable in the model to control for individuals' natural level of intelligence and ability. However, does this score truly capture a person's natural level of intelligence and ability? Even if we assume the score is a good measurement of natural intelligence, a person's ability is different than a person's intelligence. Furthermore, another factor that almost certainly influences an individual's salary, and probably biases the returns to level of schooling and the returns to level of intelligence, is effort. Effort is close to, if not, impossible to measure, therefore it might make sense to use

an IV estimator to account for its bias. It was determined that the IV model should not be used, because it was likely to create more serious issues, while only having the potential to solve one minor problem. A more straightforward model was used, which simply included ASVAB score as a control.

Another control variable suggested by the Handbook of Labor Economics is spouse's income. The theory is that the greater an individual's spouse's income is, the less income the individual needs to bring in because he or she is being supported more by the salary of his or her other half. From an economic standpoint this logic is reasonable, therefore spouse's income was included and the log transformation was applied to be consistent with the fact that the dependent variable (income) was also transformed. Although economically it makes sense that there would be a negative relationship between an individual's level of income and the level of income of his or her spouse, in reality it might make sense that individuals marry people with similar levels of income, which is possible for a variety of reasons (the couple may have met at work or in college etc.), therefore the expected sign is ambiguous.

As discussed earlier, age should have distinct effect different than that of experience and therefore should be included separately if possible. Like experience, age should be incorporated as a polynomial to account for its concavity (as one gets older income should grow at a decreasing rate, peak at some point, and then decline at an increasing rate.) Age and age squared are included in the model to capture this concavity.

Two more variables hypothesized to be significant were whether or not a par-

ticular individual is in school or in working. If the individual is in school, then he or she forgoing the salary that he or she could make now to invest in education and presumably increase his or her future salary. Additionally, whether or not an individual is currently working will almost certainly affect his or her income that year, therefore the model was specified to include dummies for currently in school and currently working.

As touched upon earlier, Monks finds evidence to suggest that the quality of college attended effects an individual's earnings, therefore the model should include variables to control for the characteristics of college. Unfortunately, unlike the 1979 cohort dataset, the NLS 1997 cohort dataset does not include a measure of the competitiveness of different institutions. However, 1997 dataset does collect information on whether or not the college attended was a public, private-non-profit, or private-for-profit institutions, which may be revealing given that Monks finds weak evidence that graduates from private institutions may earn more than graduates from public institutions.<sup>20</sup> Dummies for private-non-profit and private-for-profit institutions were included in the model to capture this effect.

Finally, to compare the returns to different college major and different fields of occupation, dummy variables were intended to be included for each college major and each job field. However, lack of observations for this data made running regressions impossible or decreased the sample size an unreasonable amount, therefore results including these dummies were omitted. This

18 Mincer, "Schooling, Experience, and Earnings", 446.

19 Stafford, "Foretelling the Demise of Empirical Economics: The Role of Microdata in Labor Economics Research." *Handbook of Labor Economics*, 400.

20 James Monks. "The Returns to Individual and College Characteristics: Evidence from the National Longitudinal Survey of Youth", 287.



means that the results, which follow, estimate the returns to schooling and the returns to experience but fail to take into account variation in these coefficients across academic fields and occupations. However, additional dummies were added to further flesh out educational attainment. Highest degree attained dummies were included to indicate whether an individual either didn't graduate high school, just graduated high school, received a GED, received an associate or junior degree, received a bachelors degree, or received a degree higher than a bachelors (masters, PhD, or professional degree).

$$\ln y = B_0 + B_1s + B_2x + B_3x^2 + B_4 \text{asvab} + B_5 \ln(y_{\text{spouse}}) + B_6 \text{age} + B_7 \text{age}^2 + u$$

Four sets of regressions were run using different estimation methods. The first three tables of results were run with 2008 data using OLS [see model above]. Next results were estimated using OLS and pooled data from 1999-2008 (with three year gaps). A fixed effects model was used after the pooled OLS results were estimated, in order to take full advantage of the panel data by estimating individual specific effects. Fixed effects also allow the researchers to take into account any individual factors we may not have considered in trying to explain income, thus helping to avoid omitted variable bias. Again these results were estimated using panel data spanning 1999-2008 with three year gaps. Lastly, a random effects model was used in order to estimate coefficients for the variable that have to be held constant when using a fixed effects model.

### *Empirical Findings*

Overall the estimation results seem significant and consistent with the researcher's hypotheses. The first two sets of regressions

were run using OLS with data from 2008 only. In the first specification the variable for ASVAB score was highly significant but had a coefficient of zero, therefore it was decided that a log transformation was necessary to interpret the effect of the variable. Once the log of the ASVAB score was taken, the variable had a coefficient of 0.145, meaning that a 1% change in an individual's score leads to a 0.145% change in his or her income, all else equal. If we further interpret this as meaning that those who are 10% 'more intelligent' see a 1.45% increase in income, then perhaps intelligence really isn't a large determining factor of income level. On the other hand perhaps the ASVAB test score doesn't truly capture a person's level of intelligence, thus underestimating the effect of intelligence.

The third specification included the log of spouse's income, which was initially insignificant, but when the dummy variable for female was added, in the fourth specification, spouse's income became significant with a positive sign perhaps reflecting the fact that individuals marry people with similar levels of income. However, similar to the ASVAB score, the coefficient on spouse's income is very small, and therefore may not truly be significant. Additionally because of the large amount of missing data for the variable, including spouse's income causes the number of observations to drop from 4,399 to 1,633 (observations drop even more dramatically for pooled OLS, fixed effects, and random effects). This wouldn't necessarily be a problem apart from the fact that the drop in observations almost certainly leads to sample selection. Sample selection occurs in this case because the individuals who reported their spouse's income are married, while those who did not report an answer during the interview either refused to answer the question or skipped the question, because they aren't

married. Therefore, the 1,633 people left in the sample are all married, while many of those left out are not, so the two groups are fundamentally different. A future solution to this problem would be to include a dummy variable that indicates whether an individual is married or not.

The dummy variable for female was highly significant, negative as expected, and also fairly large, suggesting that females make 49.5% less than males, holding everything else constant. Next the race dummies were added. The black and Hispanic dummies were negative as expected, while the mixed race dummy was positive. Individually none of the race dummies were found to be significant, however a F-test was run to see if they turned out to be collectively significant; the null hypothesis was rejected, suggesting that together they were in fact significant. The currently working dummy was another dummy that turned out to be significant (it also had the expected sign), while the currently in school dummy was not found to be significant and did not exhibit the expected sign. Consistent with Monk's findings, private-non-profit schools exhibited a significant premium over public schools, however the private-for-profit school dummy was insignificant. When an F-test was run to test the institutional dummies together, the null hypothesis could not be rejected and therefore together the dummies were insignificant.

Comparing the specifications that used total years of work as a measure of experience with the specifications that Mincer used, one can see that while total years of experience and total years of experience squared are consistently highly significant no matter how many variables are added to the model, Mincer experience and Mincer experience squared start to lose significance

as more variables are added. Because using total years worked to measure experience also allows age to be included, we are able to assess the impact of age on income. Age is only significant at the 10% level when all variables except the base variables are left out of the model; therefore, age may not be significant.

Estimation of the years of schooling coefficient appear to be very consistent with the literature on labor economics, which puts the coefficient on schooling between 3 to 5 percent, whereas academics estimate the range to be from 6 to 15 percent.<sup>21</sup> Looking at the difference between the estimated coefficient on schooling and the coefficient on experience, the experience lands anywhere between 15 to 32%, which seems to indicate that returns to experience are higher than returns to education by a significant amount (this trend is consistent throughout the pooled OLS, fixed effects, and random effects models). Comparing OLS estimates to fixed and random effects estimates of the coefficient on schooling, FE and RE estimates are much more variable and in many cases are significantly higher than OLS, which may suggest that OLS underestimates returns to schooling because it doesn't take into account individual specific effects.

The initial 2008 OLS estimations suffered from heteroskedasticity as confirmed by the White-test, therefore another regression was run (this time using only total years worked as a measure of experience) with robust standard errors in order to obtain accurate t-scores. Comparing the initial model to the robust model there

21 David Card. "The Casual Effect of Education on Earnings." *Handbook of Labor Economics*, 3 (1999). 1820.



2008 Data

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
OLS										
Years of Schooling	0.016*** (0.008)	0.018*** (0.008)	0.052*** (0.010)	0.067*** (0.010)	0.064*** (0.010)	0.037*** (0.007)	0.031 (0.021)	0.060*** (0.016)	0.016 (0.022)	
ASVAB Score	0.000*** (0.000)									
Log of ASVAB Score		0.145*** (0.023)	0.056** (0.027)	0.065** (0.026)	0.051* (0.027)	0.053* (0.027)	0.149*** (0.019)	0.053* (0.027)	0.009 (0.078)	
Total Years Worked	0.236*** (0.025)	0.233*** (0.024)	0.177*** (0.018)	0.168*** (0.017)	0.162*** (0.017)	0.225*** (0.015)	0.349*** (0.060)	0.151*** (0.017)	0.314*** (0.063)	
Total Years Worked Squared	-0.012*** (0.002)	-0.012*** (0.002)	-0.007*** (0.001)	-0.007*** (0.001)	-0.008*** (0.001)	-0.007*** (0.001)	-0.012*** (0.006)	-0.007*** (0.001)	-0.027*** (0.006)	
Log of Spouse's Income		0.027 (0.018)	0.052*** (0.018)	0.052*** (0.018)	0.051*** (0.018)		0.074* (0.041)	0.058*** (0.018)		
Female			-0.495*** (0.043)	-0.495*** (0.043)	-0.49** (0.043)		-0.37*** (0.091)	-0.478*** (0.043)	-0.352*** (0.093)	
Black				-0.102 (0.065)	-0.108 (0.065)		0.118 (0.139)	-0.108* (0.065)	0.149 (0.140)	
Hispanic				-0.056 (0.056)	-0.054 (0.056)		0.024 (0.113)	-0.044 (0.055)	0.027 (0.114)	
Mixed Race				0.048 (0.189)	0.062 (0.189)		0.300 (0.426)	0.096 (0.188)	0.315 (0.423)	
Age					0.417 (0.666)	0.971* (0.524)	1.020 (1.376)	0.402 (0.663)	1.390 (1.378)	
Age Squared					-0.007 (0.013)	-0.018* (0.010)	-0.019 (0.010)	-0.007 (0.013)	-0.027 (0.026)	
Currently in School							0.083 (0.092)			
Currently Working							0.267*** (0.072)	0.192 (0.148)		
Private (Non-Profit)								0.221* (0.131)		
Private (For-Profit)								-0.076 (0.154)		
Constant	8.625 (0.117)	7.312 (0.230)	7.971 (0.295)	7.761 (0.284)	7.946 (0.304)	1.900 (0.669)	-5.998 (6.797)	-5.438 (17.801)	1.912 (8.635)	0.15 (17.801)
Adjusted R-Squared	0.10	0.10	0.11	0.18	0.18	0.18	0.11	0.14	0.19	0.15
Number of Observations	4399	4399	1613	1613	1613	1613	4399	375	1613	362

Notes: Standard Errors are in parentheses. \*\*\*, \*\*, and \* denote 1%, 5% and 10% significance levels respectively.  
Source: National Longitudinal Survey 1997 Cohort

2008 Data

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
OLS								
Years of Schooling	0.128*** (0.015)	0.130*** (0.015)	0.127*** (0.020)	0.134*** (0.019)	0.135*** (0.019)	0.078** (0.038)	0.133*** (0.018)	0.034 (0.038)
ASVAB Score	0.000*** (0.000)							
Log of ASVAB Score		0.156*** (0.024)	0.072** (0.029)	0.083*** (0.028)	0.066** (0.029)	0.049* (0.083)	0.055** (0.028)	0.045 (0.081)
Mincer Experience	0.248*** (0.029)	0.235*** (0.029)	-0.005* (0.038)	-0.004 (0.036)	-0.004* (0.036)	-0.006 (0.067)	-0.005** (0.034)	-0.008 (0.064)
Mincer Experience Squared	-0.012*** (0.002)	-0.012*** (0.002)	-0.005** (0.002)	-0.004* (0.002)	-0.004* (0.002)	-0.006 (0.005)	-0.005*** (0.002)	-0.008 (0.005)
Log of Spouse's Income		0.027 (0.020)	0.056*** (0.019)	0.056*** (0.019)	0.056*** (0.019)	0.088** (0.044)	0.053*** (0.018)	0.064 (0.042)
Female			-0.552*** (0.046)	-0.551*** (0.046)	-0.551*** (0.046)	-0.477*** (0.097)	-0.502*** (0.044)	-0.383*** (0.096)
Black				-0.552*** (0.070)	-0.551*** (0.070)	-0.477*** (0.147)	-0.502*** (0.066)	-0.383*** (0.145)
Hispanic				-0.132* (0.060)	-0.018 (0.122)	-0.127** (0.057)	0.121 (0.118)	0.118 (0.118)
Mixed Race				0.060 (-0.008)	0.122 (-0.066)	0.057 (0.120)	0.118 (0.483)	0.118 (0.483)
Currently in School					0.200 (0.077)	0.413 (0.098)	0.193 (0.098)	0.437 (0.098)
Currently Working							0.397*** (0.073)	0.421*** (0.141)
Private (Non-Profit)								0.221 (0.135)
Private (For-Profit)								-0.176 (0.137)
Constant	6.906 (0.290)	5.540 (0.357)	6.561 (0.473)	6.448 (0.454)	6.626 (0.467)	7.242 (1.170)	6.402 (0.448)	7.853 (1.141)
Adjusted R-Squared	0.05	0.06	0.03	0.12	0.12	0.07	0.14	0.09
Number of Observations	4468	4468	1640	1640	1640	383	1614	363

Notes: Standard Errors are in parentheses. \*\*\*, \*\*, and \* denote 1%, 5% and 10% significance levels respectively.  
Source: National Longitudinal Survey 1997 Cohort

1990-2008 Panel Data

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Pooled OLS - Schooling Regression														
Years of Schooling	0.204*** (0.007)	0.151*** (0.008)	0.079*** (0.010)	0.085*** (0.010)	0.151*** (0.008)	0.179*** (0.008)	0.208*** (0.010)	-0.019*** (0.011)	-0.084*** (0.010)	-0.081*** (0.010)	0.333*** (0.012)	0.086*** (0.010)	0.082 (0.009)	0.020 (0.008)
Years of Schooling Squared														
Log of ASVAB Score		-0.086*** (0.014)	0.008 (0.013)	0.019 (0.012)	-0.085*** (0.014)	-0.081 (0.014)	0.087*** (0.012)	0.079*** (0.010)	0.018 (0.010)	0.183*** (0.012)	0.077*** (0.011)	0.083*** (0.012)	0.083*** (0.012)	0.010 (0.012)
Total Years Worked	0.300*** (0.024)	0.262*** (0.025)	0.221*** (0.017)	0.499*** (0.027)	0.499*** (0.024)	0.308*** (0.019)	0.317*** (0.020)	0.326*** (0.019)	0.306*** (0.018)	0.362*** (0.019)	0.361*** (0.018)	0.361*** (0.018)	0.361*** (0.018)	0.190*** (0.022)
Total Years Worked Squared	-0.025*** (0.001)	-0.011*** (0.001)	-0.012*** (0.001)	-0.025*** (0.001)	-0.025*** (0.001)	-0.025*** (0.001)	-0.025*** (0.001)	-0.025*** (0.001)	-0.025*** (0.001)	-0.025*** (0.001)	-0.025*** (0.001)	-0.025*** (0.001)	-0.025*** (0.001)	-0.025*** (0.001)
Log of Spouse's Income														
Female														
Female Schooling Interaction														
Black														
Hispanic														
Mixed Race														
Age														
Age Squared														
Currently in School														
Currently Working														
Private (Non-Profit)														
Private (For-Profit)														
Constant														
Adjusted R-Squared														
Number of Observations														

Notes: Standard Errors are in parentheses. \*\*\*, \*\*, and \* denote 1%, 5% and 10% significance levels respectively.  
Source: National Longitudinal Survey 1997 Cohort

1990-2008 Panel Data

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Fixed Effects - Robust Standard Errors													
Years of Schooling	0.313*** (0.007)	0.412*** (0.008)	0.140*** (0.033)	0.421*** (0.012)	0.061*** (0.014)	-0.042* (0.022)	-0.023 (0.029)	0.028 (0.073)	-0.008 (0.016)	0.342*** (0.003)	0.092*** (0.032)	0.221* (0.129)	0.337* (0.308)
Years of Schooling Squared								0.001 (0.003)		-0.013*** (0.006)	-0.006 (0.006)	-0.002** (0.012)	
Total Years Worked		0.363*** (0.024)	0.232*** (0.029)	0.362*** (0.024)	0.190*** (0.018)	0.227*** (0.021)	0.227*** (0.024)	0.190*** (0.018)	0.190*** (0.018)	0.190*** (0.017)	0.190*** (0.018)	0.177*** (0.010)	
Total Years Worked Squared		-0.020*** (0.003)	-0.012*** (0.002)	-0.020*** (0.002)	-0.013*** (0.002)	-0.016*** (0.002)	-0.013*** (0.002)	-0.012*** (0.002)	-0.012*** (0.002)	-0.012*** (0.002)	-0.012*** (0.002)	-0.010*** (0.002)	
Log of Spouse's Income		0.126*** (0.041)										0.077*** (0.031)	0.031
Female Schooling Interaction				0.016 (0.014)	0.003 (0.017)	0.030* (0.020)	0.003 (0.014)	0.003 (0.014)	0.008 (0.014)	0.008 (0.014)	0.008 (0.014)	0.008 (0.014)	0.039 (0.063)
Age				1.180*** (0.051)	1.223*** (0.086)	0.871*** (0.132)	1.190*** (0.098)	1.276*** (0.081)	1.149*** (0.063)	1.221*** (0.064)	1.216*** (0.065)	0.572*** (0.065)	
Age Squared				-0.027*** (0.004)	-0.027*** (0.002)	-0.019*** (0.007)	-0.027*** (0.001)	-0.027*** (0.001)	-0.027*** (0.001)	-0.027*** (0.001)	-0.027*** (0.001)	-0.027*** (0.001)	
Currently in School					0.079 (0.040)								
Currently Working					0.091 (0.058)								
Private (Non-Profit)							0.034 (0.017)						
Private (For-Profit)							0.002 (0.002)						
GED								-0.008 (0.112)	-0.049 (0.111)	-0.006* (0.280)	-1.011* (0.381)	0.311 (1.290)	
GED Schooling Interaction										0.078 (0.051)	0.084* (0.051)	-0.019 (0.115)	
High School Diploma								0.240*** (0.051)	0.200*** (0.052)	2.176*** (0.349)	1.678*** (0.620)	-1.331 (1.318)	
High School Diploma Schooling Interaction										-0.165*** (0.031)	-0.122*** (0.032)	0.130 (0.108)	
Associate/Junior Degree								0.229*** (0.094)	0.278*** (0.094)	1.052 (0.819)	0.203 (1.114)	-2.872 (2.135)	
Associate/Junior Degree Schooling Interaction										-0.079 (0.038)	-0.018 (0.082)	0.271* (0.136)	
Bachelors Degree								0.820*** (0.078)	0.889*** (0.077)	1.720*** (0.781)	0.404 (1.284)	-3.285 (2.540)	
Bachelors Degree Schooling Interaction										-0.060* (0.031)	-0.011 (0.091)	0.306* (0.172)	
Higher Than Bachelors Degree								1.262*** (0.132)	1.476*** (0.134)	0.515 (1.081)	0.840 (2.341)	-4.187 (1.087)	
Higher Than Bachelors Degree Schooling Interaction										0.005 (0.111)	0.089 (0.142)	0.390 (0.229)	
Constant	2.482 (0.095)	0.101 (0.740)	6.300 (0.908)	3.085 (0.301)	-7.636 (0.514)	-7.077 (0.840)	-3.459 (1.105)	-7.587 (0.544)	-7.055 (0.623)	8.791 (0.714)	8.016 (0.628)	8.840 (0.857)	2.450 (7.087)
R-Squared Within	0.15	0.4	0.15	0.4	0.57	0.51	0.43	0.57	0.51	0.14	0.43	0.51	0.77
Number of Observations	17711	14045	7957	14045	14045	7951	5190	14045	13017	13017	13017	13017	7646

Note: Standard errors are in parentheses. \*\*\*, \*\*, and \* denote 1%, 5% and 10% significance levels respectively.  
Source: National Longitudinal Survey 1987 Cohort

1990-2008 Panel Data

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Random Effects - Robust Standard Errors														
Years of Schooling	0.340*** (0.006)	0.240*** (0.006)	0.003*** (0.010)	0.252*** (0.006)	0.220*** (0.006)	0.015* (0.006)	-0.041*** (0.013)	-0.083*** (0.014)	0.177*** (0.045)	-0.050*** (0.010)	0.112*** (0.034)	0.089** (0.021)	0.110 (0.081)	0.212 (0.105)
Years of Schooling Squared									0.002 (0.002)		0.002 (0.002)		0.004 (0.004)	0.010 (0.010)
Log of ASVAB Score				-0.019*** (0.017)	0.000 (0.024)	-0.111*** (0.017)	-0.109*** (0.017)	0.088*** (0.014)	0.188*** (0.021)	0.019 (0.030)	0.082*** (0.014)	0.178*** (0.014)	0.086*** (0.014)	0.086*** (0.014)
Total Years Worked		0.271*** (0.023)	0.260*** (0.023)	0.260*** (0.023)	0.260*** (0.023)	0.260*** (0.023)	0.260*** (0.023)	0.260*** (0.023)	0.260*** (0.023)	0.260*** (0.023)	0.260*** (0.023)	0.260*** (0.023)	0.260*** (0.023)	0.260*** (0.023)
Total Years Worked Squared		-0.024*** (0.003)	-0.011*** (0.003)	-0.024*** (0.003)	-0.024*** (0.003)	-0.024*** (0.003)	-0.024*** (0.003)	-0.024*** (0.003)	-0.024*** (0.003)	-0.024*** (0.003)	-0.024*** (0.003)	-0.024*** (0.003)	-0.024*** (0.003)	-0.024*** (0.003)
Log of Spouse's Income				0.131*** (0.032)									0.131*** (0.032)	0.131*** (0.032)
Female				-0.108*** (0.017)	-0.108*** (0.017)	-0.108*** (0.017)	-0.108*** (0.017)	-0.108*** (0.017)	-0.108*** (0.017)	-0.108*** (0.017)	-0.108*** (0.017)	-0.108*** (0.017)	-0.108*** (0.017)	-0.108*** (0.017)
Female Schooling Interaction														
Black														
Hispanic														
Mixed Race														
Age														
Age Squared														
Currently in School														
Currently Working														
Private (Non-Profit)														
Private (For-Profit)														
GED														
GED Schooling Interaction														
High School Diploma														
High School Diploma Schooling Interaction														
Associate/Junior Degree														
Associate/Junior Degree Schooling Interaction														
Bachelors Degree														
Bachelors Degree Schooling Interaction														
Higher Than Bachelors Degree														
Higher Than Bachelors Degree Schooling Interaction														
Constant	4.387 (0.076)	4.501 (0.154)	7.054 (0.144)	6.333 (0.172)	6.479 (0.184)	4.833 (0.199)	-7.823 (0.409)	-5.508 (1.132)	-9.211 (0.308)	-7.843 (0.838)	-9.792 (0.417)	-8.625 (0.344)	-8.924 (0.713)	0.917 (2.077)
R-Squared Within	0.15	0.38	0.13	0.38	0.38	0.52	0.57	0.42	0.52	0.52	0.52	0.52	0.52	0.21
Number of Observations	17711	14045	7957	14045	14045	7951	5190	14045	13017	13017	13017	13017	13017	7646

Note: Standard errors are in parentheses. \*\*\*, \*\*, and \* denote 1%, 5% and 10% significance levels respectively.  
Source: National Longitudinal Survey 1987 Cohort



there was little to know difference between the two, but to accurately estimate t-scores for the pooled OLS, fixed effects, and random effects models, all other models were estimated with robust standard errors. Another econometric problem for models that included years of schooling, years of schooling squared, and the degree dummies (GED, high school diploma, BA etc.) was severe multicollinearity. In the case where years of schooling and years of schooling squared are highly collinear, including both is justifiable since conceptually they make sense and because they are both statistically significant in a lot of cases, which means multicollinearity is not affecting their significance. On the other hand, when the degree dummies are also included, conceptually one could think that including both an individual's years of schooling and his or her highest degree may in a way 'double count' his or her level of education. Therefore, including years of schooling and the degree dummies might be a misspecification of the model.

### Conclusion

The highest estimates of returns to schooling that don't suffer from any obvious problems max out about 34%, while the lowest estimates are around 3%. In contrast, estimates of the returns to experience range from 15% to 50%. This gives us a loose indicator that an additional year of work experience has higher returns than an additional year of schooling. Perhaps then there is some substance to the argument that education beyond the undergraduate level is not the best investment immediately after graduating. We hear many stories about how there are too many PhD's looking for jobs, too many lawyers out of work, because there is oversaturation in these markets. This begs the question then, why is higher education in the United States so expensive and is it actually justified? If there is no economic justification, then maybe we need to realize that higher education isn't necessary for everyone and that on the job training could make up for the lack of a degree. Policy wise there isn't a lot that can be done unless the attitude about higher education changes (the attitude being that everyone needs a college degree). The implementation and promotion of some successful on the job training programs, however is one possible start to a solution and an attitude change.

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# The Relationship Between Financial Wellness and Depression

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## Introduction

The relationship between income and happiness has been studied throughout history, and the general conclusion is that there is no apparent association between these two. Therefore, the popular belief, money does not buy happiness. However, money is still a very important tool in today's world as a medium of exchange for goods and services. Almost everything costs money, including food, clothing, a place to stay, and many other necessities. Many kinds of insurance, healthcare and education are also very huge expenses for the majority of American families. Besides those essential needs, money can also buy us entertainment and experience such as relaxing vacation trips, concert tickets, and restaurant dinners. According to the Nicolao, Irwin and Goodman, spending money to buy experiences can actually promote happiness rather than buying material goods.<sup>1</sup> Also, contributing money to charities and good causes

that we care about cannot only benefit the recipients, but also make us feel happy and fulfilled.<sup>2</sup> Looking at the above functions of money, though it is not guaranteed that money buys happiness, it does buy comfort and security. The amount of money or wealth we have makes up the majority of our financial well-being. Living in poor financial state, and low socioeconomic status can negatively affect a person in many ways. Tight budget and financial stress keep us from doing many things we want. Moreover, a person with limited financial resources is likely to constantly worry about making ends meet, keeping up with the bills, or providing for his or her family. Hence, developing mental depression is more likely.

As mental health is crucial to a person's overall health, the government will be interested in identify the underlying causes of mental health related problems. For this study, I investigate the effect of personal financial wellness on adult major depression rate across the states in the U.S using time series panel data. I expect to find an inverse relationship between the two variables.

Major depression, or major depressive disorder (MDD), as defined in the DSM-IV-TR (Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision), is a condition where an individual experiences "depressed mood and/or loss of interest or pleasure in life activities for at least 2 weeks" and at least five of these symptoms interfere with daily activities: gloomy mood, loss of interest in activities, uncontrolled weight fluctuation, sleep deprivation, emotional instability or noticeable slowness in motor response, physical weariness or lack of energy, worthless and guilty feelings, reduction in concentration, and have suicidal thoughts.<sup>3</sup> Data for major depression rate of adults from age 18 and older is obtained from Substance Abuse and Mental Health Services Administration (SAMHSA), a Federal Government's agency in the Department of Health and Human Services. To determine financial health, I include medium household income, credit card debt to income ratio and unemployment rate for each state. Data for median household income and unemployment rate come from the U.S. Census Bureau, and data for average credit card debt is generated using SimplyMap, an online map application with more than 75,000 data variables.<sup>4</sup> Other variables that might have effects on major depression rate including alcohol dependence rate, educational attainment, health insurance status, and mean travel time to work are included as control variables.

If there is an inverse relationship between the two variables, financial wellness and major depression rate, there will be several policies that the government can pursue. The first is to improve household income so the citizens experience better living standards and less financial stress. The second is to support families with low income by providing monetary and clinical support as low income families are more vulnerable to depression. Besides these, the government can also temporarily increase income by offering tax breaks for needed families.

The relationship between personal financial health and major depression rate is likely to be a two-way relationship, in which one influences the other and vice versa. For instance, low salary and financial hardships can cause one to feel unsatisfied with life and develop major depression. On the other hand, suffering from major depression can in-

flict a negative effect on productivity, hence, low salary. The two can even involve in a positive feedback loop. For example, someone grows up with depression is likely to be less ambitious, less productive and have more difficulties in obtaining a high paying job and life satisfaction. This problem can actually worsen the person's existing depressive condition. However, the causality will not be at the focus here, only the correlation between the variables.

## Literature Review

Major depression costs the U.S. economy \$44 billion a year due to missed work days.<sup>5</sup> Because of this costly loss in productivity, understanding what associates with depression is critical to the economy and the society's well-being. Several studies, have found that non-economic factors such as gender, marital status, religion and education

1 Leonardo Nicolao, Julie Irwin, and Joseph Goodman eds., "Happiness for Sale: Do Experiential Purchases Make Consumers Happier than material Purchases?" *Journal of Consumer Research* 36, doi:10.1086/597049.

2 Elizabeth Dunn, Lara B. Aknin, and Michael Norton. "Spending Money on Others Promotes Happiness." (2008: *Science*) 319, doi:10.1126/science.1150952.

3 American Psychiatric Association "Diagnostic and statistical manual of mental disorders." (4th Text Revision ed.) Washington, DC: American Psychiatric Association. (2000)

4 Geographic Research, Inc.. Average Credit Card Debt 2010 Census Data. Retrieved from SimplyMap database. (2013)

5 Frederick Zimmeran and Wayne Katon "Socioeconomic status, depression disparities, and financial strain: what lies behind the income-depression relationship?" *Health Economics*, 14, (2005) doi:10.1002/hec.1011.



are all possible depression predictors.<sup>6,7,8,9,</sup>

Other studies have found economic factors including income, employment, and debt-to-asset ratios to have association with depression.<sup>10</sup> Researchers around the world have been curious about how personal financial wellness affects one's mental health and vice versa. In general, studies on this subject have found similar results that indicate a negative correlation between financial wellness and depression.

A study on the "robustness" of depression and income relationship, used data collected by the U.S. Bureau of Labor Statistic – the National Longitudinal Survey of Youth – and employed non-parametric regression, negative binomial regression and individual fixed-effects analysis.<sup>11</sup> In the results, they found a strong connection between income

and depressive symptoms among adults in the regression analysis. Moreover, individuals with income at the lower end are more prone to depression than those with income at the higher end. However, in a multivariate regression, when controlling for other variables including education, job-type, and the debt-to-asset ratio, the relationship becomes weaker. Although they did not find income and depression to be influencing each other, they did find unemployment and financial strain to have negative impacts on depression in the fixed-effects analysis.<sup>12</sup>

Another study, found that low socio-economic status contributes to increases in depressive symptoms and major depression episodes among adults through a 7-year longitudinal population study in Belgium.<sup>13</sup> Depression in this study was determined, based on the Health and Daily Living (HDL) global depression scale, which allows the evaluation of the presence and severity of symptoms of major depression. The calculation for socio-economic status consists of material standard of living, skills and social relationships. With regard to the inevitable loss of follow-up in a longitudinal study, controlled for biased results (e.g. low-income individuals are less likely to follow up in this research) by running a probit regression to estimate an inverse Mill's ratio, which was considered as an "explanatory variable" in the research.<sup>13</sup> Unlike the results in Zimmerman and Katon's study, this study found no association between unemployment and the likelihood of depression; however, they found that financial strain, loss

of wealth and poverty to increase the risk of depressive symptoms as well as major depression episodes.<sup>14</sup> Lorant et al. recommends that the results from their study should be used to help identifying individuals that are at risk of depression. Also, policy makers can refer to these results in designing appropriate policies that would lessen the effects of financial strain and unfavorable socio-economic conditions on mental health. Due to the limitation of this short-time longitudinal of this study, the causality between socio-economic status and depression is not well understood.<sup>15</sup>

In Greece, research revealed a similar negative relationship between personal financial wellness and mental health. In this study, the personal data were collected through two series of phone interviews across Greece, one in 2008 and one 2011.<sup>16</sup> Major depression and financial strain were measured by using the Structural Clinical Interview and the Index of Personal Economic Distress, respectively. In 2008, in the sample of 2,197 correspondents, 3.3% were assessed to have major depression. On the other hand, in 2011, 8.2% of the population of 2,256 correspondents was assessed to have major depression. In May 2008, the unemployment rate in Greece was 6.6%. After the 2009 financial crisis, the unemployment increased to 16.6%

by May 2011. There is a noticeable increase in the major depression prevalence associated with the significant increase in the unemployment rate. This study is consistent with study by Zimmerman and Katon, which also discovered the negative impact of unemployment on the mental health status. As unemployment results in reductions in income, and leads to financial strain, the increase in unemployment rate is followed by the increase in major depression rate indicates that financial strain indeed affects people's mental health.<sup>17</sup>

Similar to Lorant et al.'s study, the causality between financial strain and depression here is not straightforward.<sup>18</sup> The reason is this study was not designed in a way that could detect if the correspondents overestimated their depression condition as the aftermath of the economic crisis.<sup>19</sup>

The studies discussed above suggest an inverse relationship between financial wellness and major depression. Although the direction of the relationship is not clear, governments should reach out to households with low income, and financial struggles and extend monetary or clinical support to detect, prevent and treat major depression. In the meantime, more studies can be done to make better understanding of the cause-and-effect relationship between financial wellness and major depression.<sup>20,21</sup>

6 Angermeyer Alonso, S. Bernert, and Rose Bruffaerts, and eds, "Prevalence of mental disorders in Europe: results from the European study of the epidemiology of mental disorders (ESEMeD) project." *Acta Psychiatrica Scandinavica*, (2004) 109, 23.

7 Ayso-Mateos, Varquez-Barquero, Chris Dowrick, and eds., "Depressive disorders in Europe: prevalence figures from the ODIN study." *British Journal of Psychiatry*, 179, (2004) 310.

8 Sheila Marcus, AJ Rush, "Gender differences in depression" *Journal of Affective Disorders*, 87, (2005) 145.

9 Michael Economou, Lily Peppou, and Michael Medianos and eds, "Major depression in the Era of economic crisis: A replication of a cross-sectional study across Greece." *Journal of Affective Disorders*, (Science Direct:2013),309.

10 Zimmerman and Katon, *Socioeconomic status, depression disparities, and financial strain: what lies behind the income-depression relationship?*, 1200.

11 Ibid., 1197-1210

12 Ibid., 1197-1215

13 Vincent Lorant, Christophe Croux, and D. Deliege, eds., "Depression and socio-economic risk factor: 7 year longitudinal population study." *The British Journal of Psychiatry*, (2007), 293-298.

14 Zimmerman and Katon, *Socioeconomic status, depression disparities, and financial strain: what lies behind the income-depression relationship?*, 212.

15 Vincent Lorant, Christophe Croux, and D. Deliege, eds., "Depression and socio-economic risk factor: 7 year longitudinal population study." *The British Journal of Psychiatry*, (2007), 293-298.

16 Zimmerman and Katon, *Socioeconomic status, depression disparities, and financial strain: what lies behind the income-depression relationship?*, 1205.

17 Ibid., 1206

18 Ibid., 1207

19 Lorant, Croux, and Deliege. eds, *Depression and socioeconomic risk factor: 7 year longitudinal population study*, 295.

20 Ibid., 297

21 Zimmerman and Katon, *Socioeconomic status, depression disparities, and financial strain: what lies behind the income-depression relationship?*, 1206

## Data

The unit of observation in this study is the U.S. state. Panel data of fifty U.S. states and District of Columbia from 2005-2010 will be observed and analyzed. The variables being studied are: major depression rate as the dependent variable, median household income, credit card debt- to-income ratio, and unemployment as independent variables, educational attainment, alcohol dependence rate, health insurance status and mean travel time to work as control variables.

The major depression rate is one of the twenty-five measures of substance use and mental health disorder in the National Surveys on Drug Use and Health (NSDUH).

The NSDUH is a survey of U.S. civilian and noninstitutionalized population conducted annually and is sponsored by SAMHSA. The state estimates of NSDUH data are calculated based on the 2-year moving average to further improve the estimates' precision by including larger population in each estimate.<sup>22</sup> The NSDUH consists of state estimates for 12-17, 18-25, 26 and older age groups, and estimates for 18 years of age and older is used in this study. Survey participants are chosen according to scientific random sampling and each participant represents about 4,500 other U.S. residents. Under a contract with SAMHSA since 1988, the Research Triangle Institute (RTI) is responsible for conducting the NSDUH interviews. To collect information, RTI personnel bring their laptops to residents' homes and ask household correspondents to complete the questionnaires displayed on the computer screens. The participants answer

the questions in the NSDUH questionnaires either through the RTI interviewers or by themselves depends on the privacy content of the questions. Each participant is paid \$30 for completing the survey. The alcohol dependence rate also comes from the NSDUH reports.<sup>23</sup> The questionnaires for major depression and alcohol dependence are derived from the criteria described in the Diagnostic and Statistical Manual of Mental Disorders.<sup>24</sup> If the respondents answer yes to a number of the symptoms stated in the DSM-IV, then the respondents are considered to have major depression or alcohol dependence.<sup>25</sup> The alcohol dependence rate is a control variable in this study because a conducted research study suggests found that alcohol dependence is more common among patients with depression.<sup>26</sup>

The state median household income, measured in 2012 dollar, and educational attainment are from the Current Population Survey (CPS), a high-profile, official Government statistics on employment and unemployment sponsored cooperatively by the U.S. Census Bureau and the U.S. Bureau of Labor Statistics (BLS). The CPS interviews noninstitutionalized individuals 16 years of age and older to gather information on a variety of topics including household demographic characteristics, health, education, economic status, income, and so forth.

The CPS sample is chosen using probability sampling method. The goal of the

survey is to produce estimates for the entire nation from national to state level (source 3). Information is collected either through computer-assisted personal interviewing or computer-assisted telephone interviewing. For median household income data, respondents are asked to choose the ranges of income that applied to them and the estimates of median income are then calculated mathematically. Information on educational attainment is collected by asking "What is the highest grade of school...has completed, or the highest degree...has received?" The specific educational attainment category of interest in this study is the percentage of the population that has a bachelor's degree or higher.<sup>27</sup>

The debt-to-income ratio is the ratio of average credit card debt to median household income. Average credit card debt data was generated using SimplyMap and the data source is from the Survey of Consumer Finances sponsored by the Federal Reserve Board in cooperation with the Department of the Treasury. Participants in this study are chosen randomly and are asked to complete questionnaires with the interviewers.<sup>28</sup>

Data for other control variable, health insurance status and mean travel time to work, are from the American Community Survey (ACS), sponsored by the U.S. Census Bureau. This survey collects data on income, housing, race, journey to work, language spoken at home, and military services of U.S. residents. Addresses chosen to participate are selected randomly, and if selected, the candidates are required by law to complete the survey forms and send the forms back to the

U.S. Census Bureau.<sup>29</sup> Examples of questions regarding information on travel time to work and health insurance status are: "How many minutes did it usually take this person to get from home to work LAST WEEK?" and "Is this person CURRENTLY covered by any of the following types of health insurance or health coverage plans?"<sup>30</sup>

22 Sheila Marcus, AJ Rush, "Gender differences in depression" *Journal of Affective Disorders*, 87, (2005) 146.

23 Ibid., 146.

24 Ibid., 147.

25 Substance Abuse and Mental Health Services Administration. National Survey on Drug Use and Health. (2012).

26 Sheila Marcus, AJ Rush, "Gender differences in depression" *Journal of Affective Disorders*, 87, (2005) 147.

27 U.S. Census Bureau. *Current Population Survey*.

28 Federal Reserve Board. Economic Research & Data.

29 U.S. Department of Commerce. *American Community Survey*.2013a

30 U.S. Department of Commerce. *American Community Survey*.2013b.

Table 1. Descriptive Statistics 2008-2009

Variable	Observation	Mean	Std. Dev.	Min	Max
Major Depression Rate	102	6.806471	0.6870451	5.71	9.34
Median Household Income	102	53391.22	7947.107	38208.5	69611
Debt Ratio	102	0.1664902	0.0170855	0.135	0.208
Unemployment Rate	102	7.977451	1.990915	3.7	13.3
Alcohol Dependence	102	3.666078	0.3778107	3.02	4.87
Educational Attainment	102	27.61912	5.569618	17.2	49.3
Without Health Insurance	102	14.26353	3.922304	4.64	25.06
Mean Travel Time	102	23.49069	3.499496	16.3	31.55

Table 2. Table of Correlation 2008- 2009

According to Table 2, there is a nega-

	Major Depression Rate	Median Household Income	Debt Ratio	Unemployment Rate	Alcohol Dependence	Educational Attainment	Without Health Insurance	Mean Travel Time
Major Depression Rate	1							
Median Household Income	-0.124	1						
Debt Ratio	0.0706	-0.951	1					
Unemployment Rate	0.1812	-0.1754	0.3102	1				
Alcohol Dependence	0.0243	0.1414	-0.1734	0.0922	1			
Educational Attainment	-0.1723	0.7252	-0.6911	-0.0529	0.4314	1		
Without Health Insurance	-0.1062	-0.4465	0.4969	0.3225	0.0058	-0.4332	1	
Mean Travel Time	-0.1914	0.3155	-0.1743	0.3755	0.0405	0.4543	-0.0294	1

tive relationship between major depression rate and median household income, a weak positive relationship between major depression rate and debt ratio, and a positive relationship between major depression rate and unemployment rate. All the signs of the correlation coefficients are as expected.

Table 3. Descriptive Statistics 2005- 2010

Variable	Observation	Mean	Std. Dev.	Min	Max
Major Depression Rate	204	7.25799	0.9413251	5.02	9.82
Median Household Income	204	54232.15	8181.821	38209	76018
Unemployment Rate	204	6.271078	2.325421	2.6	13.3
Alcohol Dependence	204	3.631618	0.4069723	2.74	4.97
Educational Attainment	204	27.52549	5.651964	15.5	49.3
Without Health Insurance	204	21.95485	3.179462	16.3	31.55
Mean Travel Time	204	13.97931	3.902071	4.64	25.06

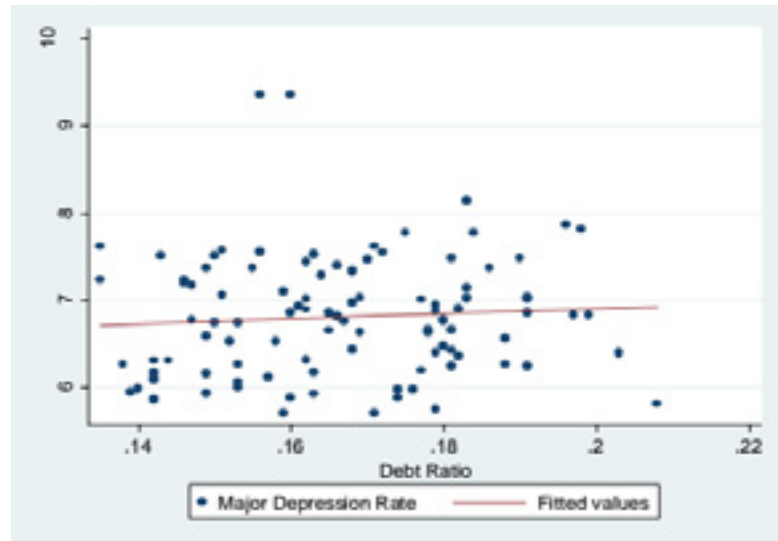
Table 4. Table of Correlation 2005-2010

	Major Depression Rate	Median Household Income	Unemployment Rate	Alcohol Dependence	Educational Attainment	Without Health Insurance	Mean Travel Time
Major Depression Rate	1						
Median Household Income	-0.1896	1					
Unemployment Rate	-0.2636	-0.1949	1				
Alcohol Dependence	-0.0164	0.1416	0.0948	1			
Educational Attainment	-0.2359	0.6998	-0.0259	0.398	1		
Without Health Insurance	-0.4072	0.2048	0.5513	-0.019	0.3604	1	
Mean Travel Time	-0.0668	-0.431	0.2133	-0.0311	-0.3875	0.0298	1

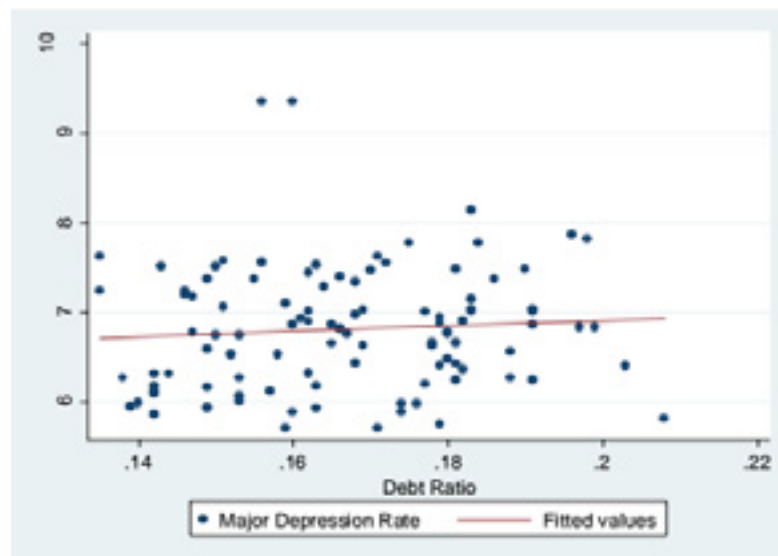
According to Table 4, there is a negative relationship between major depression rate and median household income, and a negative relationship between major depression rate and unemployment rate. While the sign of the correlation coefficient of major depression rate and median household income is as expected, that of major depression rate and unemployment rate is not as I am predicting that higher unemployment rate leads to higher major depression rate.



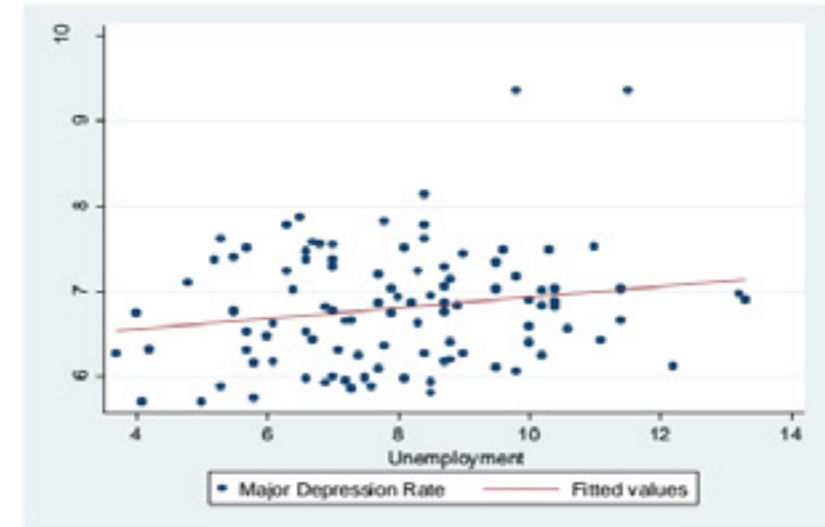
Graph 1. Major Depression Rate vs.  
Median Household Income 2008-2010



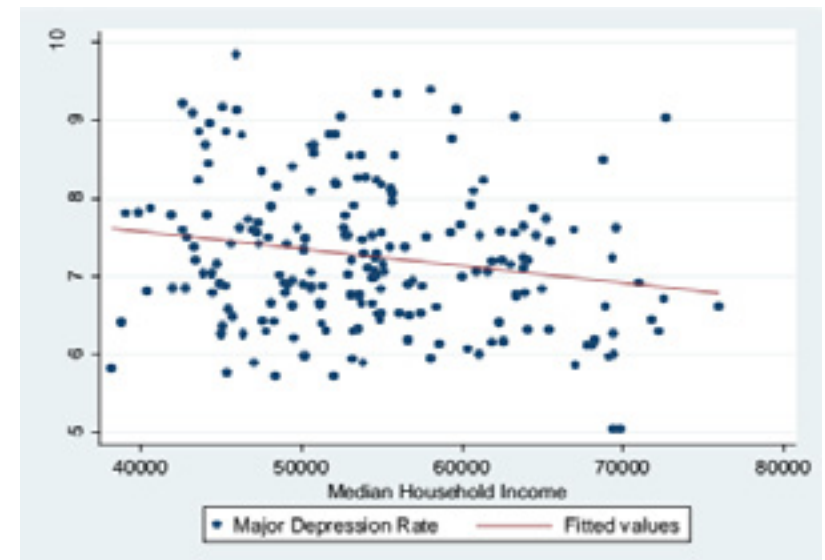
Graph 2. Major Depression Rate vs.  
Median Debt Ratio 2008-2010



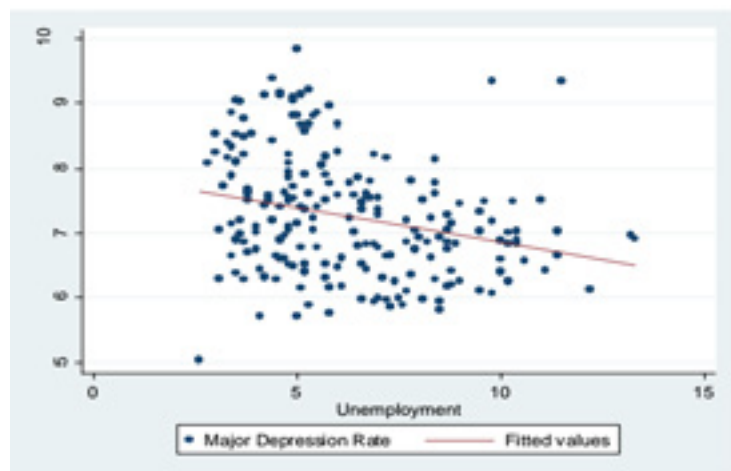
Graph 3. Major Depression Rate vs.  
Unemployment Rate 2008-2010



Graph 4. Major Depression Rate vs. Median  
Household Income 2005-2010



Graph 5. Major Depression Rate vs. Unemployment Rate 2005-2010



### Hypothesis

The hypothesis being tested is that higher income ( $X_1$ ), lower debt-to-income ratio ( $X_2$ ), and lower unemployment rate ( $X_3$ ), result in lower major depression rate ( $Y$ ) among the U.S. States and the District of Columbia. Evidence as shown that income does not have association with major depression.<sup>29</sup> However, debt-to-income ratio and unemployment status do appear to have effects on major depression. In existing literature<sup>30</sup>, this relationship in addition to other factors such as health insurance status, educational attainment and alcohol dependence were also shown to

have association with major depression. Therefore, I included these factors in my econometric model as control variables. Besides, I also control for mean travel time to work as I assume that longer commuting time can increase the risk of major depression. Although a number of studies found that female individuals are more vulnerable to major depression than their male counterparts, I was not able to control for this variable. First, because the NHDUS, which provides data on state major depression rate, does not provide gender information for the sample of each state, and second, the gender data from other surveys such as the American Community Survey (ACS) suggests very little fluctuations between female and male percentage for each state and might not be a good indicator of the sex ratios of the samples included in the NHDUS, hence can only lead to misleading results. However, unlike

the first data set which covers only two periods of time, 2008-2009 and 2009-2010, the second data set covers four periods of time 2005-2006, 2006-2007, 2008-2009 and 2009-2010. The reason for this is because the average credit card debt data, which is used to calculate the independent 'debt-to-income ratio' variable, is only available for the years in the 2008-2010 timeframe.

There are two data sets that are used in this study. The first data set includes the credit card debt-to-income ratio, while the second data set does not. However, unlike the first data set which covers only two periods of time, 2008-2009 and 2009-2010, the second data set covers four periods of time 2005-2006, 2006-2007, 2008-2009 and 2009-2010. The reason for this is because the average credit card debt data, which is used to calculate the independent 'debt-to-income ratio' variable, is only available for the years in the 2008-2010 timeframe.

In the first and second stages of the analysis, both OLS and fixed-effect at state level panel data regression were used for the first data set. The econometric equation used is as follow:

$$(1) \quad Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7$$

In equation (1),  $Y$  is the major depression rate, and  $B_1, B_2, B_3, B_4, B_5, B_6$  and  $B_7$  represent the regression coefficients of median household income, debt-to-income ratio, unemployment rate, alcohol dependence, educational attainment, without health insurance rate, and mean travel time to work, respectively.

health insurance rate, and mean travel time to work, respectively.

In the third stage, only the fixed-effect panel data regression was used for the second data set, and the econometric equation used is:

$$(2) \quad Y = B_0 + B_1X_1 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7$$

Equation (2) is similar to equation (1) except for the fact that  $X_2$  is omitted as the second data set does not contain data for debt-to-income ratio. The expected signs for the coefficients are displayed in Table 5:

Table 5. Expected Signs of Coefficients

$\beta_1$ Median household income	$\beta_2$ Debt-to-income ratio	$\beta_3$ Unemployment rate	$\beta_4$ Alcohol dependence rate	$\beta_5$ Educational attainment	$\beta_6$ Without health insurance rate	$\beta_7$ Mean travel time to work
-	+	+	+	-	+	+

In the reviewed literature on major depression rate and socioeconomic factors, data were collected and processed at individual levels. In my study, data were obtained from three different national surveys (the NHDUS, Current Population Survey and ACS) at the state level. It is not necessary that the samples from these surveys possess similar characteristics or represent the same population. As a result, my coefficients estimates might not turn out as expected.

29 Zimmerman and Katon, *Socioeconomic status, depression disparities, and financial strain: what lies behind the income-depression in an Australian nationally survey*, 161

30 Economou, Lily, Asthanasios eds., *Major Depression in the Era of economic crisis: A of economic crisis: A replication of a cross-sectional study across Greece.*, 313

## Conclusion

Regression results for the two periods 2008-2009 and 2009-2010 using the OLS regression are displayed in Table 6. The coefficients of the median household income stay negative throughout the regression, which suggests an inverse relationship with major depression. In the seventh regression, the coefficient  $-0.0000476$  for major depression rate and median household income means if income is increased by \$10,000, major depression rate will decline by 0.476%. This is quite a small reduction in major depression rate in response to a considerable increase in income. The debt-to-income ratio coefficients are relatively large negative numbers, which are counterintuitive since I expected higher debt-to-income ratio to result in higher major depression rate. The unemployment rate coefficients are positive, which is previously expected, and do not change in magnitude when taking into account of the control variables. The result in the seventh regression suggests that for every point increase in the unemployment rate, major depression rate increases by 0.14%. For the control variables, the educational attainment coefficients are negative as expected but remain small in magnitude. On the other hand, the coefficients of both without health insurance rate and mean travel time to work are negative, and this is in contrast to what I was expecting.

Regression results for the two periods 2008-2009 and 2009-2010 using fixed-effect regression are displayed in Table 7. The median household income coefficient in the last regression is negative and indicates

that \$10,000 increase in income results in 0.736% decline in major depression. For the debt-to-income ratio coefficients, there are significant fluctuations among the results. In the second regression, the coefficient is negative, then becomes a large positive number. In the sixth and seventh regression, the coefficients changes back to negative. The unemployment rate coefficients are positive in the third and fourth regressions, but are negative in the other regressions. According to the regression results in this stage, the unemployment rate has negative relationship with major depression, which is different from the results in Economou et al.'s study, where unemployment rate appears to positively correlate with major depression.<sup>31</sup>

To identify multicollinearity problem, VIF tests are run for both data sets. The tables below displays the results from two VIF tests: Table 8 includes debt-to-income ratio, Table 9 does not. In Table 6, both median household income and debt ratio have high VIFs. However, in Table 7, all variables have low VIF when the debt-to-income ratio got dropped off. Therefore, the elimination of the credit card debt-to-income ratio is necessary.

31 Economou, Lily, Asthanasios eds., *Major Depression in the Era of economic crisis: A of economic crisis: A replication of a cross-sectional study across Greece.*, 314

Table 8. With Debt-to- Income

Variable	VIF	1/VIF
Median Household Income	15.57	0.064228
Debt Ratio	15.56	0.064275
Educational Attainment	3.68	0.271505
Mean Travel Time	1.87	0.535346
Unemployment Rate	1.59	0.627161
Alcohol Dependence	1.55	0.645444
Without Health Insurance	1.53	0.653334
Mean VIF	5.91	

Table 9. Without Debt to Income Ratio

Variable	VIF	1/VIF
Median Household Income	2.97	0.336577
Educational Attainment	2.25	0.445138
Mean Travel Time	2.06	0.485823
Unemployment Rate	1.79	0.5585
Alcohol Dependence	1.41	0.70987
Without Health Insurance	1.32	0.754793
Mean VIF	1.97	

Regression without debt-to-income ratio results for four periods 2005-2006, 2006-2007, 2008-2009 and 2009-2010 using fixed-effects regression are displayed in Table 10. The median household income coefficient stays negative most of the time. The result from the sixth regression shows that \$10,000 increase in income will result in 0.888% reduction in major depression rate. If a state's major depression rate is 7.25%, which is the mean major depression rate for all states, 0.888% reduction in major depression rate is translated to approximately 12% reduction in the number of

people with major depression rate. Though this is a modest reduction, it is still worth to be considerate as mental health is greatly important to overall well-being. The unemployment rate negatively correlates with major depression rate, which is counterintuitive. All other control variables, except for mean travel time to work, correlate with major depression rate as previously expected. The reason I have to explain why the mean travel time to work does not correlation with major depression rate is that the data used are collected from different surveys, which might include different populations with different characteristics and employ different methods in estimating. The data for mean travel time to work includes individuals above 16 years old, while the data for major depression and alcohol dependence rate include individuals above 18 years old. Therefore the measures from these surveys are not entirely compatible. On the other hand, alcohol dependence rate correlates with major depression rate as expected because my data for major depression rate and alcohol depression rate both came from the NSDUH surveys.

According to the results above, out of three independent variables included in this study, median household income is the only factor that has the expected effect on major depression rate throughout three stages of the analysis. The debt-to-income ratio, in the second stage, when all the control variables were taken into account, has a negative effect on major depression rate, while the positive relationship was expected. However, the debt-to-income ratio should not be included in the first place according to the VIF tests. The unemployment rate, in the last stage of the analysis, consistently



negatively correlates with major depression rate. Those results do not resemble to the results in existing literature. In the existing literature, unemployment is shown to affect a person's depression state negatively. However, unlike my study which analyzes the data on the state level, other studies analyze their data on individual level.<sup>32</sup> This might be the reason for the difference in the results between my study and their study.

Results from existing literature prove that unsatisfactory socioeconomic conditions increase the risk of major depression. If unemployment causes the individual to stress over the imminent loss of income and potentially develop major depression, then financial supports in the form of unemployment benefits would be a major help during the difficult time. A more sustainable way is to maintain stable economic conditions so that unemployment rate stays at a reasonable level. In the case of high credit card debt-to-income ratio as a factor that increases the risk of major depression, workshops and resources on personal finance management can educate the people how to achieve and maintain financial wellness. On the other hand, there are also individuals that are forced to get into debts because of financial struggles. These individuals need to be identified and offered assistants. From my results, income also appears to have effect on mental wellness. In this case, I suggest the government to offer tax breaks to family with low income or having financial struggles to help them releasing the stress and give them more support in dealing with every day's financial hardships. In respect to clinical therapy, it might be help-

ful to consider financial distress as one of the underlying causes of major depression in order develop more effective and appropriate treatments.

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