CONSEQUENCES ON LABOR MARKET AND EDUCATIONAL OUTCOMES ACROSS RACES AND GENDERS FROM GRADUATING HIGH SCHOOL DURING A RECESSION

by

Priscila G. Baddouh

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Approved by:

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Dr. Paul Gaggl

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Dr. Lisa Schulkind

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Dr. Kelly Vosters

ABSTRACT

PRISCILA G. BADDOUH. Consequences on labor market and educational outcomes across races and genders from graduating high school during a recession (Under the direction of DR. PAUL GAGGL)

This study investigates the effects of graduating high school during a recession on real wages, educational attainment, and probability of being in five professional occupation fields, most of them high wage occupation fields. I use data from the 1980, 1990, 2000, U.S. Censuses and the American Community Survey (ACS) from 2001 to 2015 to analyze these outcomes for people of different races and genders who graduated between 1979 and 2015. I estimate the effect of the state unemployment rate during high school graduation and specific recessions. For the case of the 1980-82 and 1990-91 recessions, I include short- and long-term effects on real wages. I find negative and persist effects of graduating from high school during a recession. Adverse labor markets have a stronger negative effect on women and minorities. However, these groups of individuals also recover faster than white men. Although the state unemployment rate has a small effect on educational outcomes and the probability of being in the occupational fields analyzed in this study, graduating during the actual recession years, especially for the recessions of 1990-91 and 2007-09, influences both educational outcomes and career trajectories.

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CHAPTER 1: INTRODUCTION

Starting a new career is a challenge regardless of age or the current overall economic conditions. However, a recession can make entering the labor market more difficult for young people, and can have long-lasting consequences on wages and career paths. Researchers such as Kahn (2010) and Oreopoulus, Wachter, and Heisz (2008) investigated the negative effects, specifically on wages, of graduating from college during a bad economy. Nonetheless, research on the effect of graduating from high school during a recession is still small. Although more people are obtaining a college degree, the number is modest compared to those who completed only high school. As of 2015, 88.4% of the U.S. population under 25 years old and 90.5% between 25 and 34 years had a high school diploma, only 32.5% of the U.S. population under 25 years old and 36.1% between 25 and 34 years old had a college degree (Ryan & Bauman, 2016). These numbers are even lower for African Americans, among which only 22.5% had a college degree in 2015, on average (Ryan & Bauman, 2016). Furthermore, low-wage workers, i.e., normally people who only obtained a high school degree, typically experience more cyclical unemployment (Abraham & Haltiwanger, 1995; Hines, Hoynes, Krueger, 2001). Hence, they are more affected by recessions than high-wage workers.

Therefore, research on the labor market consequences of graduating from high school during a recession is likely relevant for understanding the current labor market – in the aftermath of the Great Recession of 2007/08 – , and for guiding policy that aims at

minimizing the effects of recessions on the labor market. This study focuses on the effects of graduating during a recession on wages, educational attainment, and occupational choice. Since labor market outcomes likely vary substantially for men and women as well as different races, I conduct my analyses separately for men and women, African Americans and whites separately. I exclude other races and foreigners because they are more likely to face specific difficulties to enter the labor market such as language and immigration requirements. I find negative long- and short-term effects of graduating from high school in an adverse labor market on real wages, the probability of obtaining a college degree, postgraduate education, and occupational choice. I also analyze these effects separately for different recessions.

This paper adds to the research of entering the labor market during a recession in several ways. To my knowledge, only a few studies explore the experience of graduating from high school during a recession (Hershbein 2012; Kondo 2015), and most of the studies on the effects of graduating from high school or college have focused on the 1980-1982 recession. Although I also include an analysis of people who graduated between 1979 and 1989, most of this paper investigates the effect of four recessions in the U.S.: 1980-1982, 1990-1991, 2001, and 2007-2009. The majority of previous studies uses the National Longitudinal Survey of Youth (NLSY79) while my study uses the data from the U.S. Census and the American Community Survey (ACS). By using these datasets, I am able to explore the experience of a large number of individuals. In addition, I explore the effect of recessions on specific occupations, many of them high wage occupations.

This paper is structured as follows. Section 2 includes a brief review of related existing work. Section 3 describes the data and explains the methodology. Section 4 presents and discusses the results. Section 5 concludes the paper.

CHAPTER 2: RELATED LITERATURE

A number of studies have shown that younger people are especially affected by recessions because of their lack of experience and skills (Hoynes, Miller, and Schaller, 2012; Verick, 2009; Abel, Deitz, and Su, 2014; Fogg & Harrington, 2011). As Figure 1 shows, the unemployment rate for people between 16-19 years old, which includes high school graduates, tends to be about 1-2 times higher than for people between 20-24 years, and about 3 times higher comparing with people older than 24 years. For example, the average unemployment rate for people between 16-19 years old in 2010, the year after the official end of the Great Recession, was 25.85%, while for people over 24 years old it was 8.24% (BLS, 2017). As younger people are more sensitive to changes in the labor market, starting their careers during a recession can have lasting effects on their wages. A reason for that is job mismatching, which is more common during times of high unemployment. Search frictions increase during recessions, making the probability of finding a job lower (Rogerson & Shimer, 2010). As workers have fewer options, they tend to accept lower wage jobs, losing on average 2% of starting wages for each 1% of additional unemployment (Bowlus, 1995). However, for those who are graduating from high school, a recession can also become an opportunity to obtain a college degree, which on average has a lifetime-return relative to investment of 15%, being as high as 21% for engineering degrees (Abel and Deitz, 2014). In addition, those who pursue a college degree are likely to graduate college during a better economic period, a time when workers tend to move towards higher wages firms (Hines et al., 2001). High wage

industries have more pro-cyclical job creation (Oreopoulus, 2018), which increases the chances of those who complete college of obtaining a high wage job.

This study takes an approach similar to Kahn (2010), whose study has become one of the main references for the effects of entering in the labor market during a recession or a post-recession period in the U.S., when the unemployment rate is still high. Kahn (2010) investigates the effect of graduating from college between 1979 and 1989, and how the recession of 1980-1982 affected wages, educational attainment (postgraduate education), occupational prestige, job tenure, weeks worked, and the probability of being employed. Her sample only includes white males, and her data is from the NLSY79. She finds negative effects of graduating during a high unemployment rate period, especially a high national unemployment rate, which is related to a wage loss of 0.062 log points. The effects persist up to 10 years, when using an OLS model, and up to 5 years, with an IV model. Kahn also finds that, although state unemployment rate has no effect on educational attainment, graduating during years with the highest national unemployment rate, from 1981 to 1983, increased the probability of obtaining a graduate degree. However, neither the national nor the state unemployment rate affected any of the other outcomes at 5% statistical significance.

Her results are similar to Oreopoulus et al. (2008), who research the effect of labor market conditions on males who graduated college between 1982 and 1999 in Canada, and find an initial wages loss of 9% for those who graduated during a recession. The effect on wages lasts, on average, from 6 to 8 years. A reason for the loss in wage is the quality of the first employer, which may explain between 30 to 40% of the initial earnings losses. Oreopoulus et al. (2008) divide their sample between lower and higher

predicted wage college graduates based on college attended, major, years of study, and province of study. One year after a 5% increase in the unemployment rate, the group predicted to have the lowest earnings experiences a decrease of 15% in wages, and after 10 years, the decrease is still 7.5%. For individuals with the highest predicted wage, after a 5% increase in unemployment rate is associated with a wage loss of 7.5% after one year and 2% after 10 years.

Oreopoulus and colleagues also develop a search model to investigate the effect of recessions on higher and lower skilled workers. Their model predicts that the intensity of search and skills are related. Higher skilled workers search for new jobs more than lower skilled workers. Consequently, they are able to move to better companies more quickly, and their wages also improve faster. Once they obtain jobs in a high wage/ productivity firm, they have better opportunities to develop human capital; as a result, they have opportunities to change to better positions within the firm, and their wages increase. But in his model, a fraction of low skill workers may completely stop searching. In this case, catch-up does not occur, and lower skilled workers are permanently in low pay firms. Although in reality it is unlike that workers will completely stop searching, the effect of graduating in an unfavorable labor market on the long-run may be stronger for low skilled workers.

His model is particularly relevant for this study because the focus of this study is on low skilled workers. The wage models in this study aim at investigating how a recession affects people who only graduated high school. The educational attainment models aim at investigating whether people who graduated from high school during a recession search for human capital development through education, once their chances of

human capital development within a company decreases. Increases in human capital through schooling are associated with increased productivity and higher wages. Further education may increase wages more than training on the job, since productivity increases from firm-specific skills do not necessarily generate higher wages (Acemoglu & Autor, 2011).

CHAPTER 3: METHODOLOGY

The data in this paper includes the 1980, 1990, and 2000 U.S. Censuses, as well as the ACS from 2001 to 2015. Differently from other studies, the dataset in this study is not a panel dataset. The total sample is 11,552,307: 46.30% are white women, 42.18% are white men, 6.49% are black men, and 4.94% are black women. The people in the sample are between 18 to 54 years old, with a mean of 33 years old, and they graduated high school between 1979 and 2015. I restricted my sample to only people who graduated regular high school, excluding all that obtained a GED. As it is unlikely that high school students would delay their graduation because of labor market conditions, e.g. would repeat a grade because of a recession, I assume that they graduated when they were 18 years old.

There are eight dependent variables in this study: log of real wages, college degree, postgraduate education, managerial professional area, STEM professional area, health professional area, educational professional area and other professional areas. I developed four different types of OLS regression models to analyze the consequences of graduating during a recession on the dependent variables. In all models, the standard errors are clustered in high school graduation year. The first two models are for the log of real wages, in which real wages refer to dollars in 2015 (adjustments were made using PCE deflator). These models are similar to Kahn (2010). The first model includes workers who graduated between 1979 and 1989, which means that those workers have between 26 and 36 years of potential experience. The second model includes workers

who graduated from 1989 to 1999, and have 16 to 36 years of potential experience. The third model includes workers who graduated during 1999 and 2010, and have 5 to 16 years of potential experience. I decided to include people who graduated in two different recessions, 2001 and 2007-09, in the third model because of sample sizes, and the fact that the 2001 recession was mild, the one with the lowest unemployment rate among the four recessions.

(1)

$$Log\ of\ \widehat{Real}\ Wages_{it} = \alpha + \beta_1\, UE_{GY,S} + \beta_2\, UE_{GY,S} * Exp_{it} + \beta_3\, UE_{Y,S} + \gamma' Edu_{it} + \beta_4\, WWorked_{it} + \beta_5\, HWorked_{it} + \beta_6\, Exp_{it} + \beta_7\, Exp_{it}^2 + u_{it}$$

Where:

α is a constant

$UE_{GY,S}$ is the high school graduation unemployment rate in the state where the person was born

$UE_{GY,S} * Exp_{it}$ is the interaction between the state high school unemployment rate and potential experience

$UE_{Y,S}$ is the state unemployment rate for where and when (year) the variable was measure, this variable controls for differences among local labor markets

Edu_{it} is the vector of education: the base for the regression is high school, the control variables in this vector are some college, associate degree, college degree, and graduate school

WW_{it} is the number of weeks worked in the previous year of when the variables were measured

$HWorked_{it}$ is the usual hours worked

Exp_{it} is potential experience: high school graduation year – 18

Exp_{it}^2 is potential experience squared

In analogy to Kahn (2010), the main variables of interest in this model are the high school graduation unemployment rate in the state where the individual was born, and the interaction between this variable and experience. The unemployment rate refers to the state where individuals were born because neither the Census nor ACS provides the state where they graduated high school. Therefore, the variable for birthplace is a proxy to location of high school graduation. I use the state unemployment rate rather than national unemployment because local conditions are more prone to affect high school students. Considering that less educated workers are less likely to move to other states than college graduates (see for example Wozniak, 2006), I assume that people with only a high school degree will be more affected by local labor markets than national. The unemployment rate shows the initial effect of graduating from high school in a bad economy, while the interaction shows how the effect changes over time (Kahn, 2010).

The control variables in this study are different from the control variables in Kahn's study. For example, as there are no variables in the Census or ACS that can be a proxy for ability at the entrance in the labor market, as the Armed Forces Qualification Test in Kahn's study, the closest control for ability is education. Yet education can be a signal for ability, as Acemoglu & Autor (2011) discuss in their Labor Market Signaling

model. Also the dataset in this study is not a panel. Therefore, the individuals in this study may have participated in the Census and ACS only in one year. Furthermore, differently from Kahn (2010), I did not use an instrument in my regression because high school graduation is unlikely to be endogenous. Consequently, the state unemployment rate of when the individual graduated is also exogenous.

The second model for log of real wages has the same variables as the first model with the addition of a vector of recessions, including the recession of 1980-82, 1990-91, 2001, and 2007-09. These variables refer to graduating high school during one of those recessions. The addition of recession dummies to a model that already has state unemployment may at first seem redundant, but the time of recession does not necessarily matches the time of high unemployment rate. For example, for the 2007 Great Recession, although the recession was between 2007 and 2009, the aggregate unemployment rate only became high in 2009 (9.3% annual). This model includes workers who graduated from high school between 1979 and 2010. As some of the individuals will have as little as 5 years of potential experience, this model focus on short-term effects. In this model, the variables of main interest are the high school graduation state unemployment rate, the interaction between the unemployment rate and experience, and the recession dummies that make it possible to compare the effect of different recessions on wages.

The third type of model for the dependent variables college degree and postgraduate schooling is a linear probability model (LPM). The graduate school variable only indicates that the individual has started graduate school, it does not indicate completion. The model is as follows:

(2)

$$\widehat{Dep.\ Variable_{it}} = \alpha + \beta_1 UE_{GY,S} + \gamma' Recession_G + \beta_3 FCollege_{it} + \beta_4 MCollege_{it} + \beta_5 Exp_{it} + \beta_6 Tuition_{it} + u_{it}$$

Where the variables that differ from equation 1 are:

$Recession_G$ is the a vector of recessions (1980-82, 1990-91, 2001, and 2007-09), and represents graduating high school during one of the years in a recession

$FCollege_{it}$ is a dummy variable that indicates whether the individual's father has a college degree

$MCollege_{it}$ is a dummy variable that indicates whether the individual's mother has a college degree

$Tuition_{it}$ is the log of average cost in 2015 dollars of undergraduate tuition and required fees for 4-year institutions when the person graduated high school

The main variables of interest in this model are the state unemployment rate when the individual graduated high school, and the recession dummies. Initially, the model also had a variable for parents' wages and income. However, financial information about parents of those who graduated high school in 1979, the 1980s and 1990s are not reliable estimators, since those parents are likely to be in their elderly years and not in the labor market anymore. Therefore, their wages and income are different from when their children graduated from high school, and decided to go to college or not. Furthermore, as Acemoglu & Autor (2011) explain, parental education is a better predictor for

educational attainment than parental income, because parents with a high income do not necessary provide more education to their children, but a higher quality education. The data for the college tuition is from the National Center for Education Statistics (2015). The variable for college tuition is included in both recessions for college degree and graduate school because student debt that financed a college degree may interfere in the ability and willingness of going to graduate school. I do not add a variable for cost of graduate school because I do not have information of when a person in the sample was in graduate school. Therefore, knowing the cost of graduate school during the period of attendance is unfeasible.

The last LPM model measures the probability of being in one of five professional areas: managerial, STEM, health, education, and other professional fields. The dependent variables are based on Dorn's (2009) occupation codes. Dorn created an occupation system to match occupation codes from the Census (1950-2000) and the ACS. His system has six major categories. This study only uses the first category called Managerial and Professional Specialty Occupations because these are professions that tend to yield a higher wage and income, with exceptions such as K-12 teachers. Therefore, they are financially attractive professions, and may be a better investment for those who choose to pursue a college degree. Furthermore, the unemployment rate for those professions is low. For example, while the average national unemployment rate between 2009-11 was 9.3%, the average for recent graduates, between 22 and 27 years old, for engineering majors in the same period was 5%, Math and Computers majors was 6%, Science was 5%, Health was 3%, and Education was 4% (Abel et al., 2014). The predictor variables for this model are similar to the previous models, except for state fixed effects

($\gamma' State_Y$). I included state fixed effects for these models because certain industries are more concentrated in specific states. This is specially the case for technology and science. Consequently, STEM occupations are likely to be concentrated in those states. Similarly, for Education field, states vary in requirements and wages for teachers. Therefore, incentives to become a teacher also vary among states. The LPM model for these dependent variables is as follows:

(3)

$$Dep.\ \widehat{Variable}_{it} = \alpha + \beta_1\, UE_{GY,S} + \beta_2\, UE_{Y,S} + \gamma' Recession_G + \beta_5\, Exp_{it} + \gamma' State_Y + u_{it}$$

CHAPTER 4: RESULTS

Tables 1 and 2 provide a description of sample characteristics that is relevant to the dependent variables in the model. From the 11,552,307 people in this study, 59.95% was employed full-time during the previous year that the data was collected, which I defined as individuals who worked at least 48 weeks in the previous year, and usually work at least 35 hours weekly, 25.40% had a college degree, and 10.05% had postgraduate education. For African American women, the average full-time real wage in this sample is $38,538.34, 53.67% worked full-time, 17.08% had a college degree, and 7.28% had postgraduate education. For African American men, the average full-time real wage is $43991.90, 56.60% worked full-time, 13.92% had a college degree, and 4.48% had postgraduate education. For White women, the average full-time real wage is $46,483.74, 50.51% worked full-time, 27.55% had a college degree, and 11.14% had postgraduate. For White men, the average full-time real wage is $64,931.31, 70.69% worked full-time, 25.69% had a college degree, and 9.93% had postgraduate education. As the models in this study use log of real wages rather than the level variable, Table 2 also includes the overall log of real wages, and for each demographic group. The overall log of real wages is 10.11 (SD=1.23), African American women: 9.82 (SD=1.20), African American men: 9.95 (SD=1.25), White women: 9.91 (SD=1.22), and White men: 10.37 (SD=1.20).

4.1 Log of Wages by period

Table 3 addresses the short-run and long-run effects of graduating during the 1980-82 recession. Although this table only contains the coefficients of interest for this analysis, a complete table with all coefficients can be found in the Appendix A. State unemployment rates at the time of high school graduation affects wages only for White males. For this group, a 1% increase in unemployment rate decreases real wages by 0.0041 log points, which is statistically significant at the 5% level of significance. Each year the effect dissipates by 0.0001 log points. The effect is still statistically significant for at least 15 years. At year 15, the fitted effect is a wage loss of 0.0020 log points. Comparing to Kahn (2010), the initial decrease in log of wages is smaller, at 0.0041 rather than 0.0200, but it is statistically significant, and it is persistent. A reason why the recession in the beginning of 1980s may have not affected women as much as men, regardless of race, is because of the increase in female labor market participation during the 1980s (Hoynes et al, 2012; Blau & Kahn, 2007). Since female labor market participation was lower in the beginning of the 1980s, the period of the recession, compared to the other recessions, the effect of the recession on women will also appear to be lower.

Table 4 addresses the short- and long-term effects of graduating during the 1990-91 recession, as well as the subsequent years when state unemployment rate was high. For this recession, there were no statistically significant results for any of the demographic groups. Table 5 shows the short-term effects of graduating during the 2001 or 2007-09 recessions. Surprisingly, the results indicate that the only group that is affected is White women. For a 1% increase in state unemployment rate when they

graduate high school, they experience a decrease of 0.0159 log points in wages. Each year the effect dissipates by 0.0193 log points, which is not statistically significant. By the fifth year after the initial increase in unemployment rate, there is no statistically significant effect.

The results were surprising, especially for minorities which are expected to be the most affected group in recessions. However, the labor market had significant changes in the last three recessions. Several researchers (Cortes, Jaimovich, and Siu, 2016; Jaimovich & Siu, 2012; and Gaggl & Kaufmann, 2016) have discussed job polarization, jobless recoveries, and the disappearance of routine occupations that have been presented in the last three recessions. As Jaimovich and Sue (2012) explain job polarization is the increase in concentration of workers in the highest and lowest paying occupations. Researchers who investigate the process of job polarization divide occupations into four groups: routine cognitive occupations, routine manual occupations, non-routine cognitive occupations, and non-routine manual occupations. In general, low and middle skilled workers used to be mostly in routine occupations, while high skilled workers have been in non-routine cognitive occupations. However, since 1967 routine occupations have been in declined, a process that accelerated during the 1980s and 1990s (Jaimovich and Sue, 2012).

Before the 1990s, workers with low levels of education, such as high school dropouts and those who only completed high school, typically had routine occupations. Starting in the 1990-91 recession, routine occupations became the most affected occupations during a recession. Some of the jobs classified as routine occupations have actually disappeared after the last three recessions. Therefore, one of the reasons why this

study may not find the same effects as Kahn (2010) and other researchers is that the population investigated in this study is low-skilled workers. Those who graduated high school from 1989 to now and did not pursue further education were more likely to be in a manual non-routine occupation. The advantage of such occupation is that non-routine occupations, regardless of being manual or cognitive, are only mildly affected during recessions (Jaimovich and Sue, 2012). Therefore, even if the unemployment rate changes, it should have a small effect or no effect at all on people in those occupations. A disadvantage is that people who only completed high school are likely to stay in low wage occupations regardless of the period in the business cycle.

The wage information on Table 2 may indicate that this is what is happening in this sample. Because non-routine manual occupations tend to be in fields such as food service, cleaning services, and protective services, for example, in which part-time work is common, average real wages is a better representation of the sample. Average real wages is the lowest for African Americans, at $30,030.71 for African American women and $35,592.44 for African American men, indicating that they may be more likely to be in non-routine manual occupations, and thus are not as affected by recessions, but have low wages throughout the business cycle.

Although a direct relationship between log wages and state unemployment rates when minorities and low-skilled workers graduated high school was not found in this study, recessions may affect this population through the disappearance of routine jobs. If that is the case, those individuals have two options: accept a likely permanent state in low-wage occupations, regardless of the time in the business cycle, or develop human

capital through educational attainment, which would give them the opportunity to be in a non-routine cognitive occupation, i.e., on the side of job polarization that has high-wages.

4.2 Log of Wages (graduation year from 1979 to 2010)

Table 6 addresses mainly the short-term effect of graduating during a recession, but these models also estimate the effect that each recession had on log of wages. The results changed from the first models with the inclusion of recession dummy variables. The recession variables reflect different information than the state unemployment rates. First, the recession dummy variables reflect graduating high school during the official dates in a recession according to NBER, rather than just differing levels of unemployment. Second, since they are a reflection of official recession dates, they represent the effect from national labor market conditions rather than local labor market conditions. Third, as national labor market variables, they are more likely to be related indirectly to major changes in the labor market through job polarization since this is a national phenomenon.

Now looking at the effects of local labor market conditions while controlling for graduating during a recession, I find that graduating high school during a period of high state unemployment has a negative effect on log of wages for all genders and races, and the effect is statistically significant at the 1% level of significance. For African American women, a 1% increase in unemployment rate has an effect of 0.0160 losses in log points. For African American men, the effect is a loss of 0.0120 in log points, for White women, the effect is a loss of 0.0128 points, and for White males, the effect is a loss of 0.0097 points. These results are consistent with other studies (e.g., Hoynes et al., 2012), which

showed that high unemployment rates affect women and minorities. The effects of state unemployment rates persist for at least five years.

The interaction between the unemployment rate and experience is statistically significant at least at the 5% level for men and at the 1% level for women. Compared to people of the same race, adverse local labor market conditions affect women's wages more than men's wages at first, but they recover faster than men. Each year the unemployment rate effect dissipates by 0.009 log points for African American women, 0.0006 points for African American men, 0.0005 points for White Women, and 0.0004 points for White men. After five years, for African American women, a 1% increase of state unemployment rate still decreases log of real wages by 0.0116 log points, for African American men the loss in wages is 0.088 log points, for White women it is 0.0104 log points, and for White men it is 0.0075 log points. Although high unemployment rate has the strongest effect on African American women, the results indicate that they recover faster than White males, which is the least affected group by state unemployment rate.

The recession of 1980 did not have a statistically significant effect at the 5% level for any of the four groups. These results do not contradict the results from the first model (high school graduates between 1979 and 1989), since the variable for the 1980 recession refers to graduating between 1980 and 1982. Although the national unemployment rate started increasing in 1980 (7.1%), it reached its highest point in 1982 and 1983 (9.7% and 9.6% respectively), and only decreased to 7% in 1986. Therefore, it is likely the individual states followed a similar pattern. The first model captures the effect of all the years with high unemployment rate in the 1980s, while the second model captures both

the state unemployment effect, and the effect of graduating in the actual official years of the recession.

The recession of 1990 is statistically significant at the 5% level only for White women; those who graduated between 1990 and 1991 have on average 0.0217 log points decrease in wage, in addition to the decrease in wage because of high unemployment rate. The recession of 2001 is statistically significant at least at the 5% level of significance for all groups, except for White women. African American women and men who graduated in 2001 had on average a loss of 0.0456 and 0.0772 log points, respectively, on the log of real wages. White men had a loss of 0.0299 points. The recession of 2007 had a statistically significant effect at 1% level of significance for all groups. African American women and men who graduated high school during 2007 and 2009 had a decrease of 0.1059 and 0.2008 log points in log of wages respectively, and White women and men had a decrease of 0.0808 and 0.1750 points in log of wages respectively.

The results indicate that increases in state unemployment rates during high school graduation year mainly affects women, especially African American women, while the least affected group is White men. But the effect is more persistent for men than for women in general. Furthermore, the recessions that had the largest effect on wages in this sample are the 2001 and 2007 recessions. The 2001 recession had the strongest effect on African American men, and the smallest effect (which is not statistically significant), on White women. The recession of 2007 had a strong effect on all groups, but men were the most affected, especially African American men. The least affected group was White women. This result is similar to Hoynes et al. (2012), who investigated how recessions affect different genders and races. Likewise, Hoynes et al. (2012) found that the Great

recession (2007) affected men, African Americans, and Hispanics/Latinos the most. Another interesting result from this model is that effects were only found in the last three recessions for any of the groups. Although the model does not include direct controls for job polarization, this may reflect such changes in the labor market starting in the 1990-91 recession. Note that each recession, beginning with the 1990-91 recession, had a stronger effect on log of wages than the previous one, even though the 2001 recession was mild compared to the 1980-82 and 2007-09 recessions.

4.3 Educational Attainment

The state unemployment rate during an individual's graduation year does not have a statistically significant effect on college degree completion for any of the groups. This may happen because it is unlikely that a high school student will decide to go to college because of the unemployment rate in his or her state. As would be expected, parents' educational attainment and cost of obtaining a degree, defined in this study as tuition and required fees, are stronger predictors of college completion (see Table 7). White women are the least sensitive group to tuition and recessions. On the other hand, African American men are the most sensitive group to tuition. An explanation is that African Americans may have less information about how to obtain a college degree, especially with respect to securing financial aid, and are more averse to financing a college degree through loans (Perna, 2000). Furthermore, African Americans are more likely to be the first generation college students, which may affect success in college (Fisher, 2007), and consequently college completion.

The recession of 1980s is statistically significant at 5% significance level for African Americans. Those who graduated between 1980 and 1982 are 4.35 percentage

points less likely to have a college degree. The recession of 1990 had a positive effect and the estimates are statistically significant at 5% level for African American males and White males: 2.22 and 3.01 percentage points, respectively. The recession of 2001 had a positive and the estimates are statistically significant at the 5% level for African American women. Those who graduated during this recession were 2.18 percentage points more likely to have a college degree. The recession of 2007 had a negative impact at the 5% level of significance for both genders and races, with a stronger effect for White individuals. African American men and women who graduated between 2007 and 2009 were 3.74 and 4.20 percentage points less likely to have a college degree. White men and women were 7.10 and 7.00 percentage points less likely to have a college degree.

A reason for the negative effect of the 2007 recession may be because of the dim prospects for recent college graduates. Although having a college degree is still correlated with higher salaries than high school graduates, Abel et al. (2014) found an upward trend for unemployment and underemployment (mismatched job skills, low-wage jobs, and part-time work, for example) among recent college graduates since 2001. Furthermore, while the overall cost of tuition and required fees in 1991 was $7,510.75, the recession where this study found a positive effect on college degree, by 2009 the average cost of tuition and required fees had increased to $ 13,545.45 (NCES, 2015). Therefore, another factor in the decision of whether to attend college is family financial condition, the ability to obtain a Pell grant and scholarships, access to information about finance aid, and the willingness to acquire student debt.

Table 8 shows the results for postgraduate education. Consistent with Kahn (2010)'s findings, the state unemployment rate does not affect postgraduate education for any of the groups, but the actual recessions have a stronger effect on postgraduate education than on college degree for this sample. The recession of 1980 had a negative and statistically significant effect on graduate school for all groups. African American women and men who graduated high school between 1980 and 1982 are 2.58 and 1.43 percentage points less likely to have postgraduate education, respectively, and White women and men are 3.41 and 2.53 percentage points less likely to have postgraduate education, respectively. The 1990 recession had a positive and statistically significant effect on graduate school. African American women and men who graduated between 1990 and 1991 are 2.16 and 1.25 percentage points more likely to have postgraduate education, respectively, and White women and men are 2.79 and 1.47 percentage points, more likely to have postgraduate education.

Similar to college degree, the recession of 2007 had a strong negative effect on graduate school for all groups that is statistically significant at 1% level. African American women and men who graduated between 2007 and 2009 are 2.81 and 1.18 percentage points, respectively, less likely to have postgraduate education, and White women and men are 5.04 and 2.61 percentage points less likely to have postgraduate education. Another factor to consider, however, is that the data only includes up to the 2015 ACS. Therefore, if a person graduated high school in 2009, he or she only had 6 years of potential experience. Undergraduate programs take on average four years to complete, and not all college graduates who eventually pursue postgraduate education do so right after graduating college. Still, in general, the results suggest that women,

especially White women, are the most sensitive group to recessions. Surprisingly, college tuition, a variable that influences the likelihood of student debt acquired before postgraduate education, and consequently the decision of postgraduate education, has no statistically significant effect on postgraduate education for women.

4.4 Professional occupations

As Dorn (2009) defined, the Managerial and Professional Specialty Occupations, which this study refers to as professional occupations, includes the best-paid occupational fields in the market. Since most of these occupations require a college degree, the sample for this section only includes individuals who have at least a college degree, and 28.34% also have postgraduate education. The total sample is 3,606,998: 4.71% are African American women, 2.64% are African American men, 50.43% are White women, and 42.22% are White men. Table 9 shows the mean and median real wages for people in the sample who worked full-time in the previous year and have a wage of more than $11,856.22, which is above of the tenth percentile in this sample and more realistic for these professions. The average wage for managerial occupations is $94,313.64, for STEM is $79,068.96, for Health is $96,679.32, for Education is $49,224.31, for other professional specialty occupations is $78,014.14, and for other occupations in general is $67,140.67. As expected, except for Education, all other areas of professional occupation have a higher wage than general occupations in the sample. Among the occupations of interest, most of the people in the sample, except for White women, have a managerial position. Most White women in the sample have a professional occupation in the field of Education (21.49%), followed closed by Managerial (19.55%). Education was the second highest for African American women (18.20%) and African American men (10.53%),

and STEM was the second highest for White men (11.60%). In fact, only a small percentage of White men in the sample, 8.62%, has an Education occupation, the lowest wage paying occupational field in the sample.

Table 10 shows the effect of state unemployment rate during high school graduation and each of the recessions on professional occupations for this sample, regardless of gender or race. Each 1% increase in unemployment rate (graduation year) is associated with 0.12 percentage points increase in the probability of having a managerial occupation. While for Education, higher unemployment rate has a negative effect, an increase of 1% in unemployment rate is associated with a decrease or 0.20 percentage points. The state unemployment rate has no effect on STEM or Health occupations. The recession of 1980 is associated with an increase of 0.72 in STEM and a decrease of 1.19 percentage points in Education and 0.61 in other professional occupations. The recession of 1990 had a positive effect for all occupations, probably because people who graduated high school between 1990 and 1991 were also more likely to obtain a college degree and postgraduate education. The 1990 recession increase the likelihood of being in a managerial occupation by 0.51 percentage points, in STEM by 0.39, in Health by 0.59, in Education by 0.90, and in other professional occupations by 0.56. On the other hand, the recession of 2007 had a negative effect on all professions, which may also be related to the decrease in the probability of having a college degree and postgraduate education. However, it is also relevant to point out that people who graduated in 2009, for example, had at the most 6 years of potential experience, which may not be enough for managerial careers. People who graduated between 2007 and 2009 were 3.74 percentage points less likely to be in a managerial occupation, 0.99 less likely to be in a STEM occupation, 1.33

less likely to be in a Health occupation, 2.15 less likely to be in an Education occupation, and 1.75 less likely to be in other professional occupations. In general, the results indicate that educational professions are more sensitive to changes in the unemployment rate and recessions. Likely because they are the least profitable among the occupations analyzed in this study, but they still require a college degree.

Table 11 shows the results for African American women for professional occupations. The results suggest that the state unemployment rate during high school graduation does not have a significant effect on occupations for African American women. The recessions that affected this group the most were mainly 1980, 1990, and 2007. Graduating during the 1980 recessions is associated with an increase of 0.31 percentage points in STEM occupations, and a decrease of 0.93 in Health, 1.20 in Education, and 1.21 in other professional occupations. Graduating during the 1990 recession is associated with an increase in the likelihood of being in a managerial occupation by 1.35 percentage points, STEM by 0.33, Education by 1.94, and other professional occupations by 0.65 percentage points. Graduating during the 2007 recession is associated with a decrease in the likelihood of being in any of the main professional occupations in this study: managerial by 5.88 points, STEM by 1.86, Health by 1.19, Education by 3.33, and other professional occupations by 2.86.

For African American men, a 1% increase in the state unemployment rate during high school graduation is related to a decrease of 1.46 percentage points in Education occupation, and 1.87 in other professional occupations. This is the group least affected by recessions. The only recessions that affected professional occupations were 1990 and 2007. African American men who graduated between 1990 and 1991 were 1.09

percentage points more likely to be in an Education occupation. The 2007-09 Recession had a negative effect for all professional occupations for African American men, decreasing the probability of being in a managerial occupation by 4.57 percentage points, STEM by 2.12, Health by 0.85, Education by 2.56, and other professional occupations by 2.86.

On the contrary, the state high school unemployment rate has a stronger effect for White women and men (Tables 13 and 14). For White women, a 1% increase in the state unemployment rate during high school graduation is associated with a 0.03 percentage point decrease in STEM occupations, a 0.10 decrease in Health occupations, and 0.19 percentage points decrease in Education occupations. White women who graduated between 1980 and 1982 were 0.67 percentage points less likely to be in a managerial occupation, 0.46 more likely to be in a STEM profession, 1.53 less likely to be in a Health occupation, and 0.71 more likely to be in a another professional occupations. Those who graduated between 1990-91 were 0.49 percentage points more likely to be in a managerial occupation, 0.77 more likely to be in a Health occupation, 1.22 more likely to be in an Education occupation, and 0.52 more likely to be in another professional occupation. The Recession of 2007 had a negative effect for all occupations, decreasing the likelihood of being in each occupational field by 3.70 percentage points for Managerial, 0.53 for STEM, 1.54 for Health, 3.38 for Education, and 1.61 for other professional occupations.

For White men, a 1% increase in state unemployment rate during high school graduation is associate with an increase of 0.15 percentage points in Managerial occupations, 0.07 decrease in STEM, and 0.15 decrease in Education occupations.

Regarding to the actual recessions, the 1980 recession is associated with a decrease in the probability of being in a managerial occupation by 1.23 percentage points, an increase in STEM by 1.00, a decrease in Education by 0.66, and a decrease in other professional occupations by 0.43. The 1990 recession had a positive effect for STEM, Health, and other professional occupations, 0.59, 0.53, and 0.60 percentage points' increases respectively. The recession of 2007 had a negative effect on the probability of being in all occupations: 3.22 percentage points decrease for managerial occupations, 0.94 for STEM, 1.27 for Health, 0.67 for education, and 1.70 for other professional occupations.

The results in this study suggest that differences in the effect of changes in local labor market conditions on the professional occupations in this study are more related to race than gender. Increases in the state unemployment rate during high school graduation affects Whites more than African Americans. Similarly, before the 2007 recession, graduating during the actual years of a recession had a larger influence on the careers of Whites than African Americans. The exception is the 2007 recession, which decreased the probability of being in any of those professions more for African Americans than Whites. These results, however, do not contradict previous findings that recessions have a greater effect on minorities.

The occupations in this study are more common among people who have college degrees, and in most of the cases they require college degrees. In some of the fields such as science, medicine, and law, postgraduate education is also necessary. Less African Americans than Whites, in this sample, 15.73% and 26.66% respectively, obtained a college degree, and that is an accurate representation of the population in the U.S.. In addition, those who obtain a college degree do not necessarily choose majors that can

give them access to those occupations, hence, high wages. For example, minorities are less likely to pursue a STEM major, and minorities who start college intending to pursue a STEM career are more like to switch to another field of study (Griffith, 2010). Consequently, African Americans are less likely to be in those professions regardless of labor market conditions. Therefore, changes in the unemployment rate and business cycle will affect Whites more than African Americans for high wage occupations that require a college degree. As the results indicate, this is especially true for STEM careers, in which the majority is White men.

CHAPTER 5: CONCLUSION

In this study, I investigated the effect of graduating high school during an adverse labor market period on real wages, educational outcomes, and the following professional occupational fields: Managerial, STEM, Health, Education, and other professional occupations (see Appendix B for a comprehensive list) across races and genders. Furthermore, I analyzed the effect of each recession, 1980-82, 1990-91, 2001, 2007-09, on those outcomes. The results in this paper agree with previous research in the field: graduating high school during a recession has a negative and persistent effect on real wages. Overall, those who graduated during a recession have an initial loss of wages of 0.0117 log points, which is as high as 0.0160 log points for African American women. Although my results are smaller than Kahn (2010)'s, they are persistent. Changes in state unemployment rate affect women more than men, and African Americans more than Whites. However, women and minorities recover faster from an increase in the state unemployment rate. Comparing specific recessions, the strongest negative effect is from the Recession of 2007. Those who graduated between 2007 and 2009 have, on average, a 0.1139 log points decrease in real wages, and as low as a 0.2008 decrease for African Americans. No effect was found from graduating high school in 1980-82. The reason may be that the minimum potential experience for this sample is 33 years, and no research has found an effect that would be persistent for decades. Another reason is that the labor market changed at a faster rate starting in the 1990s with job polarization, which

would explain why workers who graduated high school during the last recessions were more likely to experience effects on their wages.

For educational outcomes, the state unemployment rate during high school graduation does not have a statistically significant effect at the 5% level of significance for college degree nor postgraduate education. However, graduating in the actual years of recessions is related to an increase or decrease in educational attainment, varying for different recessions. The recessions of 1980 and 2007 had a negative effect on educational attainment, while the recessions of 1990 and 2001 had mostly a positive effect on educational outcomes, increasing the probability of obtaining a college degree and postgraduate education. These recessions have a similar effect on the probability of being in the professional occupations included in this study. An exception is for careers in Education. Overall, people who graduated during a recession, except for the 1990 recession, were less likely to be in an occupation in the field of Education. Occupations in this field do not have a return as high as occupations in managerial, STEM, and health areas. Therefore, they may not be as attractive as occupations in high wage industries. In addition, recessions affect the probability of being in one of those professions more for Whites than African Americans. Most of those occupations require a college degree, and Whites are more likely to obtain a college degree as well as postgraduate degrees. Therefore, they will be more affected for those occupations. However, this may change as more minorities acquire college degrees and postgraduate education, and become candidates for high wage occupations.

This paper provides evidence of a negative and persistent effect of the state unemployment rate and specific recessions on wages, as well as two factors that influence

wages, i.e. education and occupation. Investigating these effects across races and genders is relevant because regardless of labor market conditions, their experience as workers differ because of their socio-economic context and access to opportunities. As the U.S. is a diverse country, an extension of this study would be to research the effect of recessions for other minorities, such as Latinos. Furthermore, as other researchers such as Abel et al. (2014) found, for those who obtained a college degree, the unemployment rate affects them differently depending on their majors. As access to high wage occupations such as the ones analyzed in this study depends on college degrees, another extension is to analyze how recessions may affect college degree choices and completions across races and genders.

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Table 1
Demographics

	N	%	Age (mean)	[a]Full-time Employment (%)	College Degree (%)	Postgraduate Education (%)
Black Females	761,024	4.94	32	17.08	17.08	7.28
Black Males	570,311	6.59	32	13.92	13.92	4.48
White Females	5,348,531	46.30	33	27.55	27.55	11.14
White Males	4,872,441	42.18	33	25.69	25.69	9.93
Overall	11,552,307	100.00	33	25.4	25.4	10.05

Note: [a]Full-time employment refers to having working at least 48 weeks during the previous years when the variable was measured, and usually work at least 35 hours per week.

Table 2

[a]Real Wages - Descriptive

	[b]Real Wage (Full-time) mean	Real Wage (all) mean	Real Wage (all) median	Log of Real Wage mean	Log of Real Wage SD
Black Females	38,536.34	30,030.71	24,902.32	9.82	1.20
Black Males	43,991.90	35,592.44	28,499.39	9.95	1.25
White Females	46,483.74	37,127.44	27,000.00	9.91	1.22
White Males	64,931.31	54,237.29	41,020.90	10.37	1.20
Overall	55,108.02	42,932.63	32,482.80	10.11	1.23

Note:[a]Real wage is based on 2015 dollars

[b]Real wage (full-time) is the average for people who worked at least 48 weeks in the previous year, and usually work at least 35 hours per week.

Table 3
Log wage regression results (High School Graduation from 1979 to 1989)

	Black Women	Black Men	White Women	White Men	Overall
A: *Regression Coefficients*					
Sate UE	0.0009	0.0047	-0.0028	-0.0041 **	-0.0043 **
	[0.0021]	[0.0050]	[0.0017]	[0.0018]	[0.0018]
Sate UE * Exp	0.0001	-0.0001	0.0000	0.0001	0.0002 **
	[0.0001]	[0.0003]	[0.0001]	[0.0001]	[0.0001]
B: *Fitted effects for selected years of experience*					
Years after High School Graduation					
1	0.0010	0.0045	-0.0028	-0.0040 **	-0.0041 **
	[0.0020]	[0.0047]	[0.0017]	[0.0017]	[0.0018]
5	0.0014	0.0040	-0.0027 *	-0.0034 **	-0.0034 **
	[0.0015]	[0.0037]	[0.0013]	[0.0014]	[0.0014]
10	0.0018	0.0034	-0.0026 **	-0.0027 **	-0.0025 **
	[0.0010]	[0.0025]	[0.0026]	[0.0010]	[0.0010]
15	0.0023 **	0.0029	-0.0025 **	-0.0020 **	-0.0015 *
	[0.0009]	[0.0017]	[0.0009]	[0.0008]	[0.0007]
20	0.0028 **	0.0023	-0.0024 **	-0.0013	-0.0006
	[0.0012]	[0.0018]	[0.0009]	[0.0008]	[0.0005]
25	0.0032	0.0017	-0.0023 *	-0.0006	0.0004
	[0.0018]	[0.0028]	[0.0011]	[0.0011]	[0.0006]
Observations	146,733	96,783	1,086,582	1,060,699	2,390,797
R-squared	0.6427	0.6446	0.6419	0.6462	0.6612

significance at 10%: *, 0.05%: **, 0.01%:***

Table 4
Log wage regression results (High School Graduation from 1989 to 1999)

	Black Women	Black Men	White Women	White Men	Overall
A: *Regression Coefficients*					
Sate UE	0.0085	0.0092	-0.0025	0.0058	0.0011
	[0.0095]	[0.0159]	[0.0061]	[0.0077]	[0.0067]
Sate UE * Exp	-0.0012	-0.0015	-0.0004	-0.0007	-0.0004
	[0.0009]	[0.0015]	[0.0007]	[0.0007]	[0.0007]
B: *Fitted effects for selected years of experience*					
Years after High School Graduation					
1	0.0073	0.0077	-0.0029	0.0051	0.0006
	[0.0087]	[0.0144]	[0.0055]	[0.0071]	[0.0061]
5	0.0026	0.0018	-0.0045	0.0022	-0.0012
	[0.0057]	[0.0088]	[0.0033]	[0.0047]	[0.0037]
10	-0.0033	-0.0056	-0.0064 **	-0.0013	-0.0034
	[0.0032]	[0.0038]	[0.0064]	[0.0028]	[0.0025]
15	-0.0092 *	-0.0129	-0.0084	-0.0048	-0.0056
	[0.0051]	[0.0080]	[0.0051]	[0.0042]	[0.0047]
Observations	92,061	57,814	655,525	589,522	1,394,922
R-squared	0.6315	0.6036	0.6632	0.6171	0.6431

significance at 10%: *, 0.05%: **, 0.01%:***

Table 5
Log wage regression results (High School Graduation from 1999 to 2010)

	Black Women	Black Men	White Women	White Men	Overall
A: *Regression Coefficients*					
Sate UE	-0.0230	-0.0182	-0.0159 **	-0.0175 *	-0.0161 *
	[0.0166]	[0.0194]	[0.0014]	[0.0077]	[0.0073]
Sate UE * Exp	0.0030	0.0010	0.0193	0.0024	0.0017
	[0.0025]	[0.0044]	[0.0021]	[0.0015]	[0.0014]
B: *Fitted effects for selected years of experience*					
Years after High School Graduation					
1	-0.0201	-0.0172	-0.0144 **	-0.0151 **	-0.0144 **
	[0.0141]	[0.0157]	[0.0050]	[0.0063]	[0.0059]
5	-0.0082	-0.0133	-0.0085	-0.0060 **	-0.0074 **
	[0.0050]	[0.0102]	[0.0019]	[0.0021]	[0.0018]
Observations	23,709	14,888	195,210	157,833	391,640
R-squared	0.6960	0.6952	0.6356	0.6441	0.7021

significance at 10%: *, 0.05%: **, 0.01%:***

Table 6
Log wage regression results (high school graduation from 1979 to 2010)

		Black Women	Black Men	White Women	White Men	Overall
A: Regression Coefficients						
Sate UE		-0.0160 ***	-0.0120 ***	-0.0128 ***	-0.0097 ***	-0.0117 ***
		[0.0039]	[0.0271]	[0.0021]	[0.0029]	[0.0022]
Sate UE * Exp		0.0009 ***	0.0006 **	0.0005 ***	0.0004 **	0.0006 ***
		[0.0039]	[0.0003]	[0.0001]	[0.0002]	[0.0001]
Recession 1980		-0.0158 *	-0.0036	-0.0118 *	-0.0162 *	-0.0163 *
		[0.0085]	[0.0080]	[0.0064]	[0.0059]	[0.0053]
Recession 1990		0.0132	-0.0031	-0.0217 **	0.0191 *	0.0172 *
		[0.0103]	[0.0163]	[0.0103]	[0.0107]	[0.0096]
Recession 2001		-0.0456 **	-0.0772 ***	-0.0161	-0.0447 ***	-0.0299 ***
		[0.0213	[0.0152]	[0.0097]	[0.0105]	[0.0087]
Recession 2007		-0.1059 ***	-0.2008 ***	-0.0808 ***	-0.1750 ***	-0.1139 ***
		[0.0220]	[0.0271]	[0.0124]	[0.0166]	[0.0133]
B: Fitted effects on UE for selected years of experience						
Years after High School Graduation						
	1	-0.0151 ***	-0.0113 **	-0.0123 ***	-0.0093 ***	-0.0112 ***
		[0.0037]	[0.0050]	[0.0020]	[0.0027]	[0.0021]
	5	-0.0116 ***	-0.0088 **	-0.0104 ***	-0.0075 ***	-0.0089 ***
		[0.0029]	[0.0039]	[0.0016]	[0.0022]	[0.0017]
Observations		243,268	157,097	1,792,688	1,678,944	3,871,997
R-squared		0.6508	0.6613	0.6548	0.6443	0.6878

significance at 10%: *, 0.05%: **, 0.01%:***

Table 7

College Degree

	Black Women	Black Men	White Women	White Men	Overall
Recession 1980	-0.03122*	-0.04345**	-0.04208	-0.04344	-0.04446*
	(0.01742)	(0.01749)	(0.02505)	(0.02595)	(0.02428)
Recession 1990	0.01800*	0.02217**	0.02340*	0.03009**	0.02477*
	(0.00901)	(0.00925)	(0.01324)	(0.01306)	(0.01254)
Recession 2001	0.02175**	0.01166	0.02626*	0.02030	0.02329*
	(0.00948)	(0.00844)	(0.01471)	(0.01311)	(0.01332)
Recession 2007	-0.04203**	-0.03737**	-0.07001**	-0.07092**	-0.06790**
	(0.01742)	(0.01521)	(0.02913)	(0.02678)	(0.02671)
UE High School	-0.00377*	-0.00254	-0.00520*	-0.00384	-0.00356
	(0.00188)	(0.00162)	(0.00269)	(0.00252)	(0.00251)
Experience	-0.00068	-0.00258***	-0.00030	-0.00121	-0.00110
	(0.00090)	(0.00092)	(0.00143)	(0.00140)	(0.00134)
dad_college	0.08204***	0.04401***	0.01956***	0.00142	0.02039***
	(0.00933)	(0.00597)	(0.00679)	(0.00570)	(0.00575)
mom_college	0.06782***	0.02803***	0.02326***	-0.00125	0.01329**
	(0.00681)	(0.00420)	(0.00707)	(0.00595)	(0.00592)
Log of Tuition	-0.12080***	-0.18041***	-0.10256*	-0.16012***	-0.14362**
	(0.03762)	(0.03900)	(0.05991)	(0.05864)	(0.05662)
Constant	1.29148***	1.83034***	1.24231**	1.74809***	1.58909***
	(0.35279)	(0.36723)	(0.56057)	(0.54951)	(0.53037)
Observations	716701	535510	4864030	4429294	10545535

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table 8

Graduate School

	Black Women	Black Men	White Women	White Men	Overall
Recession 1980	-0.02582**	-0.01430**	-0.03412**	-0.02527**	-0.02958**
	(0.01059)	(0.00642)	(0.01467)	(0.01023)	(0.01178)
Recession 1990	0.02158***	0.01351***	0.02788***	0.01470***	0.02045***
	(0.00554)	(0.00292)	(0.00702)	(0.00450)	(0.00546)
Recession 2001	0.00019	-0.00128	0.00175	-0.00221	0.00006
	(0.00456)	(0.00227)	(0.00667)	(0.00347)	(0.00482)
Recession 2007	-0.02806***	-0.01182***	-0.05037***	-0.02608***	-0.03589***
	(0.00748)	(0.00368)	(0.01217)	(0.00706)	(0.00908)
UE High School	-0.00085	0.00027	-0.00156	0.00065	-0.00008
	(0.00084)	(0.00041)	(0.00128)	(0.00069)	(0.00094)
Experience	0.00378***	0.00134***	0.00499***	0.00337***	0.00387***
	(0.00049)	(0.00031)	(0.00084)	(0.00065)	(0.00068)
dad_college	0.02291***	-0.00080	-0.01645***	-0.02030***	-0.01504***
	(0.00509)	(0.00245)	(0.00334)	(0.00376)	(0.00305)
mom_college	0.01720***	-0.00768***	-0.01108***	-0.01498***	-0.01202***
	(0.00332)	(0.00183)	(0.00247)	(0.00282)	(0.00227)
Log of Tuition	0.00734	-0.03056***	0.01772	-0.05123**	-0.01924
	(0.01640)	(0.01083)	(0.02707)	(0.01886)	(0.02155)
Constant	-0.04345	0.30113***	-0.10533	0.51015***	0.22035
	(0.15062)	(0.10136)	(0.24989)	(0.17610)	(0.19978)
Observations	716701	535510	4864030	4429294	10545535

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table 9
Demographics and Real Wage (2015 dollars) by Professional Occupations

	Demographics (%)					[c]Real Wages	
	Black Women	Black Men	White Women	White Men	All	Mean Wage	Median Wage
Managerial	21.21	21.65	19.55	26.06	22.44	$94,313.64	$71,248.48
STEM	3.67	8.5	3.63	11.6	7.13	$79,068.96	$70,283.34
Health	7.52	2.62	9.87	4.03	7.11	$96,679.32	$66,208.95
Education	18.2	10.53	21.49	8.62	15.61	$49,224.31	$45,836.00
[a]Other Professional Occupations	9.97	8.62	9.36	9	9.22	$78,014.14	$53,000.00
[b]Other Occupations	39.43	48.08	36.1	40.69	38.49	$67,140.67	$50,384.72

Note: [a]See appendix B for a complete list of the other professional occupations from the Professional Specialty Occupations section in Dorn (2009)
[b]Refers to all other occupations
[c]Real wages were adjusted to be more than $11,856.22, the 10% percentile for real wages in this sample.

Table 10

Overall Professional Area

	Managerial	STEM	Health	Education	Other
Recession 1980	-0.00826*	0.00720***	-0.00264	-0.01193***	-0.00611***
	(0.00409)	(0.00138)	(0.00189)	(0.00319)	(0.00181)
Recession 1990	0.00511**	0.00392***	0.00599***	0.00895**	0.00556***
	(0.00243)	(0.00085)	(0.00168)	(0.00340)	(0.00117)
Recession 2001	-0.00579	-0.00169	0.00178	0.00261	-0.00177
	(0.00381)	(0.00142)	(0.00158)	(0.00335)	(0.00159)
Recession 2007	-0.03736***	-0.00990***	-0.01326***	-0.02145***	-0.01749***
	(0.00736)	(0.00215)	(0.00230)	(0.00375)	(0.00294)
UE High School	0.00120***	-0.00018	-0.00043	-0.00202***	-0.00007
	(0.00042)	(0.00017)	(0.00026)	(0.00057)	(0.00029)
UE Census/ ACS	-0.00162**	-0.00128***	-0.00006	0.00163***	-0.00014
	(0.00068)	(0.00027)	(0.00035)	(0.00041)	(0.00041)
Experience	0.00474***	-0.00040***	0.00082***	-0.00063***	0.00007
	(0.00039)	(0.00013)	(0.00013)	(0.00022)	(0.00016)
Constant	0.11447***	0.08408***	0.07527***	0.19182***	0.07751***
	(0.00546)	(0.00315)	(0.00393)	(0.00780)	(0.00338)
Observations	3606998	3606998	3606998	3606998	3606998

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table 11

Professional Area - African American Women

	Managerial	STEM	Health	Education	Other
Recession 1980	-0.01062	0.00310**	-0.00932**	-0.01202**	-0.01205***
	(0.00678)	(0.00138)	(0.00406)	(0.00513)	(0.00273)
Recession 1990	0.01355***	0.00333***	0.00248	0.01938***	0.00652**
	(0.00361)	(0.00103)	(0.00219)	(0.00384)	(0.00275)
Recession 2001	-0.00969	-0.00156	0.00694**	-0.01201*	0.00196
	(0.00842)	(0.00153)	(0.00270)	(0.00604)	(0.00297)
Recession 2007	-0.05878***	-0.01885***	-0.01194**	-0.03327***	-0.02858***
	(0.00958)	(0.00264)	(0.00508)	(0.00944)	(0.00604)
UE High School	0.00024	0.00026	-0.00003	-0.00161*	-0.00003
	(0.00111)	(0.00050)	(0.00060)	(0.00094)	(0.00076)
UE Census/ ACS	-0.00110	-0.00057	-0.00060	0.00145	-0.00088
	(0.00089)	(0.00037)	(0.00063)	(0.00088)	(0.00074)
Experience	0.00482***	-0.00013	0.00132***	0.00017	0.00025
	(0.00058)	(0.00012)	(0.00021)	(0.00040)	(0.00025)
Constant	0.09359***	0.04157***	0.06586***	0.22845***	0.07375***
	(0.01182)	(0.00568)	(0.00654)	(0.01439)	(0.00875)
Observations	169956	169956	169956	169956	169956

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table 12

Professional Area - African American Men

	Managerial	STEM	Health	Education	Other
Recession 1980	-0.01040	-0.00043	-0.00025	-0.00972*	-0.00765
	(0.00711)	(0.00324)	(0.00270)	(0.00482)	(0.00563)
Recession 1990	0.00139	0.00696*	0.00459	0.01090**	0.00504
	(0.00557)	(0.00349)	(0.00405)	(0.00420)	(0.00477)
Recession 2001	0.00085	-0.00149	-0.00058	-0.00175	-0.00815
	(0.00491)	(0.00720)	(0.00256)	(0.00447)	(0.00909)
Recession 2007	-0.04568***	-0.02123***	-0.00846***	-0.02585***	-0.02859***
	(0.00906)	(0.00464)	(0.00246)	(0.00597)	(0.00430)
UE High School	0.00114	-0.00007	-0.00030	-0.00146**	0.00187**
	(0.00121)	(0.00077)	(0.00051)	(0.00071)	(0.00086)
UE Census/ ACS	-0.00123	-0.00056	0.00029	-0.00051	0.00092
	(0.00109)	(0.00080)	(0.00051)	(0.00084)	(0.00090)
Experience	0.00473***	0.00029	0.00033***	-0.00116***	-0.00011
	(0.00049)	(0.00022)	(0.00012)	(0.00031)	(0.00027)
Constant	0.11022***	0.07311***	0.02108***	0.17423***	0.04851***
	(0.01935)	(0.01010)	(0.00733)	(0.01532)	(0.01033)
Observations	95131	95131	95131	95131	95131

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table 13

Professional Area - White Women

	Managerial	STEM	Health	Education	Other
Recession 1980	-0.00667*	0.00456***	-0.00154	-0.01529***	-0.00709***
	(0.00383)	(0.00089)	(0.00259)	(0.00389)	(0.00200)
Recession 1990	0.00493**	0.00173*	0.00768***	0.01217***	0.00518***
	(0.00201)	(0.00094)	(0.00225)	(0.00436)	(0.00120)
Recession 2001	-0.00558*	-0.00279**	0.00446*	0.00334	-0.00186
	(0.00309)	(0.00111)	(0.00235)	(0.00548)	(0.00190)
Recession 2007	-0.03704***	-0.00533***	-0.01537***	-0.03375***	-0.01613***
	(0.00701)	(0.00125)	(0.00392)	(0.00462)	(0.00258)
UE High School	0.00061	-0.00027**	-0.00104***	-0.00193**	-0.00036
	(0.00045)	(0.00012)	(0.00034)	(0.00074)	(0.00034)
UE Census/ ACS	-0.00182**	-0.00088***	0.00008	0.00156**	-0.00048
	(0.00075)	(0.00019)	(0.00050)	(0.00060)	(0.00041)
Experience	0.00297***	-0.00040***	0.00089***	0.00004	-0.00015
	(0.00035)	(0.00008)	(0.00017)	(0.00029)	(0.00017)
Constant	0.12126***	0.04637***	0.11233***	0.24880***	0.08250***
	(0.00615)	(0.00264)	(0.00590)	(0.00829)	(0.00371)
Observations	1819077	1819077	1819077	1819077	1819077

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table 14

Professional Area - White Men

	Managerial	STEM	Health	Education	Other
Recession 1980	-0.01123**	0.00998***	-0.00236	-0.00661***	-0.00429**
	(0.00474)	(0.00228)	(0.00170)	(0.00202)	(0.00176)
Recession 1990	0.00532	0.00594***	0.00533***	0.00387	0.00602***
	(0.00339)	(0.00151)	(0.00106)	(0.00241)	(0.00109)
Recession 2001	-0.00520	0.00113	-0.00309**	0.00223	-0.00189
	(0.00466)	(0.00165)	(0.00135)	(0.00211)	(0.00200)
Recession 2007	-0.03219***	-0.00940***	-0.01267***	-0.00674**	-0.01699***
	(0.00714)	(0.00290)	(0.00161)	(0.00254)	(0.00375)
UE High School	0.00148***	-0.00069**	0.00033	-0.00147***	0.00015
	(0.00047)	(0.00028)	(0.00024)	(0.00042)	(0.00028)
UE Census/ ACS	-0.00131*	-0.00154***	-0.00043	0.00139***	0.00022
	(0.00071)	(0.00038)	(0.00028)	(0.00027)	(0.00047)
Experience	0.00657***	-0.00080***	0.00097***	-0.00096***	0.00034**
	(0.00044)	(0.00019)	(0.00012)	(0.00015)	(0.00016)
Constant	0.12095***	0.14852***	0.03795***	0.10133***	0.07656***
	(0.00523)	(0.00472)	(0.00329)	(0.00567)	(0.00390)
Observations	1522834	1522834	1522834	1522834	1522834

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

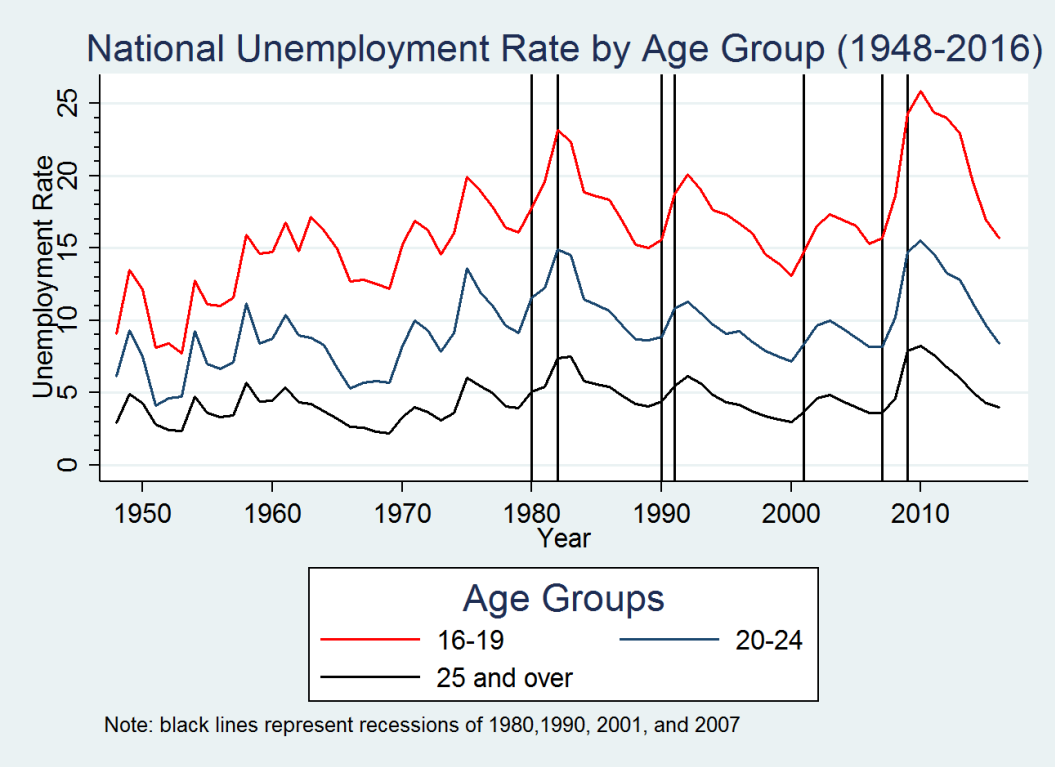

Figure 1: National unemployment rate by age group (data from BLS Beta Labs)

APPENDIX A: COMPLETE VERSIONS OF LOG OF WAGE TABLES

Table 3 (all coefficients)

Log of Wage - Graduation Year from 1979 to 1989

	Black Women	Black Men	White Women	White Men	Overall
UE High School	0.000893	0.00466	-0.00281	-0.00413**	-0.00433**
	(0.00210)	(0.00497)	(0.00168)	(0.00178)	(0.00182)
UE * Experience	0.0000941	-0.000120	0.0000220	0.000141	0.000188**
	(0.000139)	(0.000280)	(0.0000887)	(0.0000937)	(0.0000829)
UE Census/ ACS	0.0121***	0.0138***	0.0139***	0.0183***	0.0174***
	(0.00237)	(0.00395)	(0.00146)	(0.00141)	(0.000924)
Some College	0.0396**	0.0522***	0.0353***	0.0370***	0.0359***
	(0.0134)	(0.0146)	(0.00679)	(0.00586)	(0.00438)
Associate Degree	0.116***	0.101***	0.163***	0.0788***	0.109***
	(0.0158)	(0.0127)	(0.00481)	(0.00492)	(0.00405)
College Degree	0.407***	0.363***	0.409***	0.390***	0.402***
	(0.0114)	(0.0112)	(0.00616)	(0.00742)	(0.00409)
Graduate School	0.642***	0.575***	0.628***	0.573***	0.600***
	(0.0162)	(0.0215)	(0.00380)	(0.0130)	(0.00662)
Weeks Worked	0.0419***	0.0428***	0.0453***	0.0406***	0.0449***
	(0.000508)	(0.000813)	(0.000392)	(0.000269)	(0.000316)
Experience	0.0805***	0.0948***	0.0665***	0.102***	0.0733***
	(0.00358)	(0.00424)	(0.00347)	(0.00435)	(0.00397)
Experience Squared	-0.00178***	-0.00205***	-0.00142***	-0.00201***	-0.00148***
	(0.000114)	(0.000146)	(0.000109)	(0.000135)	(0.000119)
Usual Working Hours	0.0255***	0.0172***	0.0353***	0.0193***	0.0306***
	(0.000566)	(0.000574)	(0.000247)	(0.000208)	(0.000244)
Constant	6.219***	6.513***	5.857***	6.577***	6.044***
	(0.0421)	(0.0392)	(0.0311)	(0.0354)	(0.0277)
Observations	146733	96783	1086582	1060699	2390797

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table 4 (all coefficients)

Log of Wage - Graduation Year from 1989 to 1999

	Black Women	Black Men	White Women	White Men	Overall
UE High School	0.00852	0.00919	-0.00252	0.00576	0.00105
	(0.00953)	(0.0159)	(0.00607)	(0.00774)	(0.00674)
UE * Experience	-0.00118	-0.00148	-0.000390	-0.000705	-0.000442
	(0.000861)	(0.00150)	(0.000670)	(0.000687)	(0.000685)
UE Census/ ACS	0.0153***	0.00480	0.0130***	0.0153***	0.0146***
	(0.00428)	(0.00665)	(0.00276)	(0.00245)	(0.00262)
Some College	0.0643***	-0.00283	0.0183***	-0.00622	0.0129*
	(0.0115)	(0.0103)	(0.00564)	(0.00780)	(0.00601)
Associate Degree	0.148***	0.0547**	0.153***	0.0566***	0.103***
	(0.0180)	(0.0176)	(0.0111)	(0.00501)	(0.00580)
College Degree	0.399***	0.270***	0.367***	0.267***	0.325***
	(0.0173)	(0.0183)	(0.0205)	(0.0195)	(0.0185)
Graduate School	0.590***	0.433***	0.536***	0.377***	0.467***
	(0.0220)	(0.0231)	(0.0222)	(0.0271)	(0.0214)
Weeks Worked	0.0434***	0.0431***	0.0422***	0.0412***	0.0426***
	(0.000562)	(0.000795)	(0.000330)	(0.000236)	(0.000245)
Experience	0.0919***	0.113***	0.0898***	0.116***	0.0969***
	(0.00612)	(0.00847)	(0.00331)	(0.00676)	(0.00412)
Experience Squared	-0.00262***	-0.00325***	-0.00253***	-0.00281***	-0.00255***
	(0.000291)	(0.000254)	(0.000168)	(0.000295)	(0.000180)
Usual Working Hours	0.0275***	0.0218***	0.0333***	0.0235***	0.0294***
	(0.00125)	(0.00152)	(0.000352)	(0.00125)	(0.000554)
Constant	6.147***	6.483***	6.076***	6.453***	6.199***
	(0.0463)	(0.0694)	(0.0222)	(0.0394)	(0.0195)
Observations	92061	57814	655525	589522	1394922

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table 5 (all coefficients)

Log of Wage - Graduation Year from 1999 to 2010

	Black Women	Black Men	White Women	White Men	Overall
UE High School	-0.0230	-0.0182	-0.0159**	-0.0146	-0.0161*
	(0.0166)	(0.0194)	(0.00597)	(0.00853)	(0.00728)
UE * Experience	0.00295	0.000986	0.00140	0.00171	0.00175
	(0.00247)	(0.00440)	(0.00103)	(0.00177)	(0.00143)
UE Census/ ACS	0.0328***	0.0130	0.0193***	0.0204***	0.0207***
	(0.00434)	(0.00750)	(0.00209)	(0.00105)	(0.00120)
Some College	0.0188	-0.00501	-0.0136	-0.0167	-0.0118
	(0.0149)	(0.0118)	(0.0107)	(0.00991)	(0.00787)
Associate Degree	0.134***	0.0566**	0.0826***	0.0582***	0.0738***
	(0.0264)	(0.0209)	(0.0104)	(0.0108)	(0.00690)
College Degree	0.309***	0.211***	0.219***	0.201***	0.217***
	(0.0162)	(0.0327)	(0.0158)	(0.0133)	(0.00577)
Graduate School	0.417***	0.279**	0.368***	0.321***	0.350***
	(0.0423)	(0.0870)	(0.0158)	(0.0145)	(0.00632)
Weeks Worked	0.0450***	0.0464***	0.0415***	0.0421***	0.0422***
	(0.000360)	(0.000889)	(0.000169)	(0.000183)	(0.000128)
Experience	0.0178	0.0484	0.0530***	0.0595***	0.0530**
	(0.0211)	(0.0353)	(0.0141)	(0.0176)	(0.0161)
Experience Squared	0.00416*	0.00170	0.00179	0.00143	0.00172
	(0.00187)	(0.00291)	(0.00120)	(0.00140)	(0.00128)
Usual Working Hours	0.0350***	0.0294***	0.0354***	0.0315***	0.0337***
	(0.00103)	(0.00109)	(0.000312)	(0.000543)	(0.000382)
Constant	5.967***	6.218***	6.121***	6.270***	6.161***
	(0.112)	(0.159)	(0.0557)	(0.0761)	(0.0678)
Observations	23709	14888	195210	157833	391640

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table 6 (all coefficients)

Log of Real Wage - Effect of Each Recession

	Black Women	Black Men	White Women	White Men	Overall
Recession 1980	-0.01584*	-0.00357	-0.01181*	-0.01622**	-0.01625***
	(0.00847)	(0.00798)	(0.00635)	(0.00589)	(0.00529)
Recession 1990	0.01320	-0.00306	0.02169**	0.01912*	0.01719*
	(0.01028)	(0.01627)	(0.01033)	(0.01072)	(0.00961)
Recession 2001	-0.04561**	-0.07720***	-0.01610	-0.04477***	-0.02991***
	(0.02131)	(0.01523)	(0.00968)	(0.01053)	(0.00872)
Recession 2007	-0.10590***	-0.20083***	-0.08076***	-0.17500***	-0.11391***
	(0.02204)	(0.02706)	(0.01245)	(0.01658)	(0.01332)
UE High School	-0.01597***	-0.01196**	-0.01278***	-0.00970***	-0.01172***
	(0.00388)	(0.00526)	(0.00205)	(0.00289)	(0.00220)
UE * Experience	0.00088***	0.00064**	0.00048***	0.00043**	0.00056***
	(0.00020)	(0.00029)	(0.00010)	(0.00016)	(0.00011)
UE Census/ ACS	0.01696***	0.01124***	0.01408***	0.01785***	0.01668***
	(0.00243)	(0.00357)	(0.00162)	(0.00141)	(0.00136)
Some College	0.03799***	0.01032	0.01721***	0.00184	0.01496**
	(0.00922)	(0.01012)	(0.00574)	(0.00800)	(0.00572)
Associate Degree	0.12184***	0.06731***	0.14782***	0.06269***	0.09974***
	(0.01061)	(0.01067)	(0.00781)	(0.00582)	(0.00512)
College Degree	0.39286***	0.30777***	0.37465***	0.32158***	0.35586***
	(0.01034)	(0.01411)	(0.01295)	(0.01678)	(0.01306)
Graduate School	0.60752***	0.49756***	0.57658***	0.48336***	0.53806***
	(0.01505)	(0.02156)	(0.01428)	(0.02324)	(0.01706)
Weeks Worked	0.04334***	0.04423***	0.04345***	0.04162***	0.04355***
	(0.00038)	(0.00058)	(0.00040)	(0.00017)	(0.00029)
Experience	0.06967***	0.08433***	0.06657***	0.09594***	0.07368***
	(0.00307)	(0.00353)	(0.00280)	(0.00265)	(0.00281)
Experience Squared	-0.00173***	-0.00200***	-0.00156***	-0.00198***	-0.00161***
	(0.00011)	(0.00013)	(0.00010)	(0.00010)	(0.00010)
Usual Working Hours	0.02815***	0.02127***	0.03493***	0.02312***	0.03089***
	(0.00082)	(0.00099)	(0.00027)	(0.00092)	(0.00035)
Constant	6.24194***	6.52100***	6.05382***	6.51438***	6.18484***
	(0.04807)	(0.05529)	(0.02511)	(0.03500)	(0.02151)
Observations	243268	157097	1792688	1678944	3871997

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

APPENDIX B: PROFESSIONAL OCCUPATIONS BASED ON DORN (2011)

Managerial Occupations

Chief executives, public administrators, and legislators
Financial managers
Human resources and labor relations managers
Managers and specialists in marketing, advertisement
Managers in education and related fields
Managers of medicine and health occupations
Managers of properties and real estate
Funeral directors
Managers and administrators
Accountants and auditors
Insurance underwriters
Other financial specialists
Management analysts
Personnel, HR, training, and labor related specialists
Purchasing agents and buyers of farm products
Buyers, wholesale and retail trade
Purchasing managers, agents, and buyers,
Business and promotion agents
Construction inspectors
Inspectors and compliance officers, outside
Management support occupations

STEM

Architects
Aerospace engineers
Metallurgical and materials engineers
Petroleum, mining, and geological engineers
Chemical engineers
Civil engineers
Electrical engineers
Industrial engineers
Mechanical engineers
Engineers and other professionals
Computer systems analysts and computer scientists
Operations and systems researchers and analysts
Actuaries
Mathematicians and statisticians
Physicists and astronomists
Chemists
Atmospheric and space scientists
Geologists
Physical scientists
Agricultural and food scientists
Biological scientists
Foresters and conservation scientists
Medical scientists

Health

Physicians
Dentists
Veterinarians
Optometrists
Podiatrists x
Other health and therapy occupations
Registered nurses
Pharmacists
Dieticians and nutritionists
Respiratory therapists
Occupational therapists
Physical therapists
Speech therapists
Therapists
Physicians' assistants

Education

Subject instructors, college 1

Kindergarten and earlier school teachers
Primary school teachers
Secondary school teachers
Special education teachers
Teachers
Vocational and educational counselors

Other Professional Specialty Occupations

Librarians
Archivists and curators
Economists, market and survey researchers
Psychologists
Social scientists and sociologists
Urban and regional planners
Social workers
Clergy and religious workers
Welfare service workers
Lawyers and judges
Writers and authors
Technical writers
Designers
Musicians and composers
Actors, directors, and producers
Painters, sculptors, craft-artists, and print-makers
Photographers
Dancers
Art/entertainment performers and related occupations
Editors and reporters
Announcers x
Athletes, sports instructors, and officials