The Long-Term Labor Market Consequences of Graduating from College in a Bad Economy*

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First Draft: March, 2003

Current Draft: December 22, 2008

Abstract

This paper studies the labor market experiences of white male college graduates as a function of economic conditions at time of college graduation. I use the National Longitudinal Survey of Youth whose respondents graduated from college between 1979 and 1980. I estimate the effects of both national and state economic conditions at time of college graduation on labor market outcomes for the first two decades of a career. Because timing and location of college graduation could potentially be affected by economic conditions, I also instrument for the national unemployment rate using year of birth and for the state unemployment rate using year of birth and state of residence at age 14. I find large, negative wage effects to graduating in a worse economy which persist for the entire period studied. I also find that cohorts who graduate in worse national economies are in lower level occupations, have slightly higher tenure and higher

*I am grateful for helpful comments from George Baker, Dan Benjamin, James Heckman, Caroline Hoxby, Larry Katz, Fabian Lange, Steve Levitt, Derek Neal, Chris Nosko, Emily Oster, Yona Rubenstein, Hugo Sonnenschein, Mike Waldman and seminar participants at Harvard University, the University of Chicago, Yale University, and the Midwest Economic Association 2003 annual meetings. email: lisa.kahn@yale.edu

educational attainment, while labor supply is unaffected. Taken as a whole, the results suggest that the labor market consequences of graduating from college in a bad economy are large, negative and persistent.

1 Introduction

The immediate disadvantage of graduating from college in a poor economy is apparent. Even among employed persons, those who graduate in bad economies may suffer from underemployment and are more likely to experience job mismatching since they have fewer jobs from which to choose. What is less clear is how these college graduates will fare in the long run relative to their luckier counterparts. The disadvantage might be eliminated if workers can easily shift into jobs and career paths they would have been in, had they graduated with more opportunities. However the disadvantage may persist if the importance of early labor market experience outweighs the later benefit of a better economy for factors such as promotions and training. If this is the case, we might expect to see long-run differences in labor market outcomes. A poor early economy can also affect educational attainment. If there are fewer jobs (or worse jobs) available, then the opportunity cost of staying in school is lower. Thus it is reasonable to expect that graduates in a poor economy will return to school at higher rates than graduates in a better economy.

This paper studies the long-term consequences of graduating from college in a bad economy. Specifically I examine workers who graduate before, during and after the recession of the early 1980's. Since college graduates are skilled workers, using them makes it more feasible to test different training and human capital investment models. This could potentially result in more interesting outcomes than using a group with fewer training opportunities (especially given the large scale and scope of the recession I am exploiting). In addition, studying college graduates allows for an analysis of the graduate school decision as a function of economic conditions at the time of college graduation. Prior research has linked schooling choice to decreased labor market opportunities, however, focus has been

primarily on the decision to complete high school or attend college.[1] To my knowledge no work has been done on the graduate school decision.

I use the National Longitudinal Survey of Youth (NLSY79) to study labor market outcomes and educational attainment for white males who graduated from college between 1979 and 1989. The NLSY79 allows me to follow participants for at least 17 years post college graduation, and contains a wealth of information on individuals (including an aptitude test score and year-by-year, detailed work and school information). I analyze wages, labor supply, occupation, and educational attainment as a function of economic conditions in the year an individual graduated from college. Both national unemployment rates as well as state unemployment rates are used. The state regressions include state and year fixed effects so are useful in providing variation that is independent of national trends.[2] However, these unemployment rate measures potentially suffer from an endogeneity problem: students may take into account business cycle conditions when choosing the time and place of college graduation. I thus instrument for the national unemployment rate with birth year and for the state unemployment rate with birth year and state of residence at age fourteen.

I find persistent, negative wage effects using both the national and state unemployment rates lasting for almost the entire period studied. Using national rates, both OLS and IV estimates are statistically significant and imply an initial wage loss of 6 to 8% for a 1 percentage point increase in the unemployment rate measure. This effect falls in magnitude by

[1] Gustman and Steinmeier (1981) find that higher relative wage offers reduce the probability of school enrollment for high school students and graduates. In addition, Card and Lemieux (2000) find a small positive correlation between local unemployment rates and college attendance.

[2] National unemployment rates are advantageous since the national labor market is likely the most relevant one for college graduates. However, one might worry that the national unemployment rate effect subsumes other cohort-specific factors. Cohort size is of particular importance since cohorts are getting smaller throughout the sample at the same time as the national unemployment rate is falling. Falaris and Peters (1992) find that demographic cycles can be important for labor-market outcomes and can affect timing of school exit.

approximately a quarter of a percentage point each year after college graduation. However, even 15 years after college graduation, the wage loss is 2.5% and is still statistically significant. Using state rates, the OLS results are insignificant but the IV estimates imply a 10% wage loss which persists, remaining statistically significant 15 years after college graduation. Looking at other labor market outcomes, I find that labor supply (weeks supplied per year, and the probability of being employed) is largely unaffected by economic conditions at the time of college graduation (both national and state). However, I do find both a negative correlation between the national unemployment rate and occupational attainment (measured by a prestige score) and a slight positive correlation between the national rate and tenure. This is suggestive that workers who graduate in bad economies are unable to fully shift into better jobs after the economy picks up. Lastly, years enrolled in school post college and the probability of attaining a graduate degree increase slightly for those who graduate in times of higher national unemployment.

This paper adds to previous work in several areas. A small but growing literature looks at the effects of finishing schooling during recessions and finds persistence to varying degrees. Oyer (2006a) and (2006b) look at the effects of completing an MBA or an economics Ph.D., respectively, during a recession and find persistent, negative effects in both of these niche markets. Oreopoulos, von Wachter and Heisz (2006), the closest to the current paper, study the effects of graduating from college in a recession using Canadian university-employer-employee matched data and find strong initial negative effects which remain for up to ten years before dissipating. However, though they exploit an extremely rich data set, Canada has different institutions making it difficult to determine the relevance of their work to the US labor market. For example, Murphy et al. (1998) and DiNardo and Lemieux (1997) point out that the US and Canada experienced diverging trends in wage inequality during

the 1980's and 1990's; the period both papers study. The US saw a sharper rise in wage inequality. Given a major driver of rising inequality has been a rise in residual inequality, it is reasonable to expect wage differentials across college graduation cohorts to differ across countries, both in magnitude and persistence.

This paper is also relevant to the cohort effects literature (see Baker, Gibbs and Holmstrom (1994) and Beaudry and DiNardo (1991)) which looks within firms and finds that the average starting wage of a cohort or national unemployment rate when a cohort enters is negatively correlated with wages years later.[3] Lastly, the current paper is applicable to the literature on youth unemployment, which seeks to disentangle the effects of state dependence (early unemployment) on adult outcomes from individual heterogeneity. Neumark (2002) studies this in the NLSY79, instrumenting for early job attachment with local labor market conditions at time of entry, and finds positive effects of early job stability on adult wages.[4] I find that young workers suffer persistent, negative wage effects when experiencing turmoil upon entering the labor market. This suggests that state dependence is important, supporting the previous literature.

This paper contributes new results on the long-term effects of cohort-level market shocks. It is the only paper, to my knowledge, that looks at this effect for college graduates, an important share of the labor market, in the United States. I isolate a significant shock, the 1980's recession, as well as cross-sectional state variation, and find that luck truly does

[3]However, Beaudry and DiNardo (1991) find that when they control for the lowest unemployment rate since the individual started the job, the initial unemployment rate becomes insignificant. This is not the case in my data. That is, when I control for both the national unemployment rate at college graduation and the minimum unemployment rate since college graduation, the coefficient on the college unemployment rate is still negative and significant while the coefficient on the minimum rate is insignificant. Because Beaudry and DiNardo are interested in testing implicit contract models, they do not look at the wage effect for workers who move firms. My analysis allows workers to move across firms which might be driving the difference.

[4]Unlike Neumark (2002), the previous literature in this area (e.g., Ellwood (1982) and Gardecki and Neumark (1998)) does not make a strong attempt to control for the endogeneity of early job attachment and typically finds that the effects do not last into adulthood.

matter for these workers.

The remainder of the paper is structured as follows. Section 2 reviews existing theories that can explain long lasting effects from a poor early labor market experience. Section 3 provides a brief description of data and methods, more of which can be found in the appendix. Section 4 presents results for wages, educational attainment, occupation and labor supply. Section 4 also includes two robustness checks, one addresses whether there is differential selection into college across cohorts and the other comparing these findings to an analysis of the 1990's recession using the March CPS. Section 5 discusses the results in relation to the theories outlined in section 2 and concludes.

2 Theory

Different theories lead to different expectations about the long run effects of a poor early experience in the labor market. If a person experiences initial unemployment or job mismatching and is able to switch to the "correct" job when the economy picks up, he or she will have lost only a year or two of accumulated labor market experience. This loss can potentially be overcome quite quickly if we assume diminishing marginal returns to experience. Search theory provides a possible explanation for this scenario.[5] It suggests that job shopping is beneficial to future wage growth. If job changes are common and beneficial then it is possible that an exogenous impediment to the job matching process (such as graduating from college in a bad economy) can easily be overcome. In fact, Topel and Ward (1992) find that 66% of lifetime wage growth occurs in the first ten years of a career. They largely attribute this to the fact that a similar proportion of lifetime job changes occurs in

[5] There are, of course, other scenarios which predict only short-term effects. For example, in a spot-market economy there should be no lasting effects from entering the market in a recession, as long as no productivity disparities arise.

the same period.

Alternatively, if workers who graduate in bad economies develop disparities in human capital accumulation then they will be less productive than their luckier counterparts, even years after graduation, and we will see long-term effects. The disparity could arise through general human capital investment or some kind of specific investment.[6] Consider a matching model of the labor market (a la Jovanovic (1979a)). If a college graduate enters the labor force in a thin market then the job matching process could take longer because there are fewer options available. These individuals should have lower average wages controlling for experience (relative to graduates who entered in a thick market and may have found matches more quickly) because they have spent more time in bad matches (i.e., where they are less productive).[7] In addition, they would have spent time investing in the wrong types of human capital either through firm (Jovanovic (1979a)), career (Neal (1999)), or task-specific human capital –since workers who enter firms in downturns may initially be placed in lower-level jobs with less important tasks (Gibbons and Waldman 2003). Studies showing that early training has positive effects on future wages (e.g., Gardecki and Neumark (1997)) support this theory.[8]

[6] Becker (1967) emphasizes the importance of early investment because the individual can reap the benefits of investment over a longer period of time. Workers who graduate in bad economies will have no investment if they are initially unemployed, or might have the wrong kind of investment if they suffer job mismatching or are forced to take a lower level job. They will thus lag far behind their luckier counterparts who were probably investing heavily in the first few years. In addition, when workers do shift into the "correct" jobs it may no longer be worthwhile to train them since they are older and future benefits are lower.

[7] Evidence is mixed on whether matches are better or worse when workers enter firms in recessions. Bowlus (1995) finds employment relationships are shorter when workers enter in recessions, implying worse matches. However, Kahn (2008) finds that firms that hire in recessions have unconditionally higher turnover and, controlling for this, matches are actually longer lasting when workers enter in recessions. She also finds that these firms tend to be lower paying, on average. This is consistent with both the wage and tenure results in the current paper.

[8] Devereux (2002) presents a stigma model to explain cohort effects. If information is imperfect and employers take a worker's current wage as a signal of ability then exogenously being forced to take a lower wage (due to business cycle shocks) could have lasting effects. He shows this is true using the state unemployment rate as an exogenous source of variation in starting wages. This model does not apply to the current paper because the business-cycle shocks should be visible to employers. Thus the signalling equilibrium should shift: During negative business-cycle shocks, being unemployed or earning a lower wage should be less of a negative signal.

Thus theory is ambiguous about how long-lasting the effects of graduating in a bad economy will be. If disparities in human capital (both general and various types of specific) are important then the effects could be quite persistent. However if human capital is less important and job shopping is common then we will not see long-lasting effects. It is necessary to take this question to the data to gain more insight about the experience of these college graduates.

3 Data and Methods

The data set used in this paper is the National Longitudinal Survey of Youth (NLSY79).[9] In 1979, 12,686 youths between the ages of 14 and 22 were interviewed and followed annually until 1994 and biennially thereafter. The most recent data available is from the 2006 survey. In this paper, the sample is restricted to the cross-section white male sample because their labor supply decisions are least sensitive to external factors such as childbearing or discrimination. Starting from a sample of 2,236 individuals, I restrict attention to the 631 of these with at least a college degree. Of the 596 of these where year of college graduation can be determine, I focus on the 529 people who graduated from college between 1979 and 1989 to avoid selection issues of those who graduated before or after, a rare group.[10] Lastly, I drop 16 individuals who do not have an AFQT score, resulting in a panel of 513 individuals with labor force outcomes for a minimum of 17 years post-college graduation. Table 1 shows panel sample sizes by college graduation year.

Appendix table A1 has more details about the data construction but I briefly describe

[9] The NLSY79 survey is sponsored and directed by the U.S. Bureau of Labor Statistics and conducted by the Center for Human Resources at The Ohio State University. Interviews are conducted by the National Opinion Research Center at the University of Chicago (BLS 2008a).

[10] Restricting the sample by age at time of college degree to a resonable window (e.g., 21-25) yields very similar results.

the key dependent variables here. The wage is an NLSY79 measure of hourly rate of pay at main job and has been inflation adjusted to 2000 dollars using the Consumer Price Index. I drop observations where the worker was enrolled in school in that year and drop wage values that are less than $1 or greater than $1000 per hour. Employment is restricted to non-enrolled persons while all other dependent variables are restricted to observations with a wage.[11] Occupation is measured by a prestige score taken from the Duncan Socioeconomic Index.[12] This score is a measure ranging from approximately 0 to 100 utilizing survey responses to questions on prestige of occupations as well as the average income and education requirements of the occupations.[13] Appendix table A2 shows summary statistics for the sample.

As an indicator of the economy in the year a worker graduated from college, I use both an annual average of national monthly unemployment rates and the state unemployment rate (hereafter collectively referred to as the college unemployment rates and individually as the national rate and the state rate, respectively). Values and means for each cohort are shown in table 1. There was substantial variation in the national unemployment rate from 1979-1989, the time period in which the sample graduated from college, making this a useful measure for my purposes. However there are only 11 cohorts of college graduates which raises the possibility of other explanations for my results. For example, differences in outcomes could be driven by changes in cohort size over the sample period (Falaris and Peters (1992)), extensive deregulation that was occurring during the 1980's (Card (1997)), or changes in the wage structure (rising wage inequality) throughout the 1980's (Katz and

[11] No comparable measure of employment is available in 2000-2004 so these years are excluded from the employment analysis.

[12] Since occupation information is not comparable for 2002 onwards, these years are excluded from the occupation analysis.

[13] See Duncan (1961) for more information.

Autor (1999)).

An alternative method to gain more variation within the same sample is to look at the state rates. I can determine the state of college graduation and contemporaneous state of residence using the NLSY79 restricted-access geocodes (BLS 2008b).[14] This provides potentially fifty-one different data points (fifty states and Washington, DC) within each of ten years.[15] State unemployment rates, taken from the BLS, are measured in the state in which an individual resided in the year he graduated from college. All regressions using state rates include state and year fixed effects, providing substantial variation that is independent of the national rates.[16] In addition, when summary statistics are reported for the state rate groups, they will always have been adjusted for state and year fixed effects. It is worth noting that while the state rates are useful in providing more variation than the national rates, they may not yield as large an effect. Previous literature (e.g., Wozniak (2006)) finds that highly educated workers may be less sensitive to local labor markets since they can smooth shocks through migration.

To gain a general sense of the unemployment rate effects on future labor market outcomes, the state and national rates are categorized into three groups: high, medium and low unemployment rates. The breakdowns are chosen so that each group contains roughly a third of the sample and will be used throughout the paper. The national rate groupings (shown in table 1) are as follows: high includes 1981-1983, medium includes 1980, 1984 and 1985, and low includes 1979 and 1986-1989. The ranges for the low, medium and high

[14] When the state of college graduation is missing, I use the state from the nearest previous observation. This is done to maintain sample size, though results are not sensitive to the exclusion of these observations.

[15] In practice, these data contain 239 state-year graduation cohorts. Appendix table A3 shows the sample distribution of year and state of college graduation.

[16] With only a small number of observations in some states, it is unlikely that I have the power to identify all the state fixed effects. These states therefore would not be driving the analysis since state fixed effects absorb almost all the variation in college unemployment rates. However, results are not sensitive to the exclusion of states with fewer than 5 graduates.

state rate groups are 2.9-6.4, 6.5-8.3, and 8.4-15.6, respectively. Table A2 shows summary statistics by both state and national rate groups.

The largest problem with these data is a decreased sample size as potential experience increases. There are two reasons for this, in addition to general attrition problems. First, the most recent cohort graduated from college in 1989, giving only a maximum of 17 years of post-college observations. One cohort of college graduates drops out each year, as potential experience increases from 17 to 27. Second, the NLSY79 became a biennial survey after 1994 leaving holes in the odd years starting in 1995. I therefore restrict labor market outcomes to the first 17 years after college graduation, since all cohorts can be observed for this length of time.[17] Appendix table A4 shows the number of valid wage observations by experience year and college graduation year. It is worth noting that consistent sample sizes exist across cohorts for most of the experience years.[18]

For an individual, i, in year, t, I estimate equation 1, a standard Mincer earnings function augmented with college unemployment rate variables. The dependent variables, described above, are log wage, weeks worked per year, weeks tenure at current job, occupation prestige score, and a dummy for being employed.[19]

$$\begin{aligned} dep\ var_{it} &= \alpha_0 + \lambda_1 \text{college}_i + \lambda_2 \text{college} * Exp_{it} + \alpha AFQT_i \\ &\quad + \gamma' Y_t + \beta State_{it}^{ue} + \delta_1 Exp_{it} + \delta_2 Exp_{it}^2 + u_{it} \end{aligned} \tag{1}$$

[17] Including later experience years for older cohorts would have the benefit of bringing these cohorts into the more recent labor market where the younger cohorts are observed. Results are similar when later years are included, but I believe it is more conservative to censor the data to a consistent window of observation post-college.

[18] In addition, all regressions have been estimated with a balanced panel (only including individuals with observations where they could potentially have been observed in each of the first 17 years) with no substantial difference in the results.

[19] Regressions have also been estimated with hours worked per week and being in a professional or technical occupation as dependent variables. Results are very similar to weeks worked per year and occupation prestige score, respectively, and are thus not reported.

$AFQT$ is the age-adjusted AFQT score;[20] Exp is the number of years since college graduation (hereafter potential experience)[21]; Exp^2 is its square; $college$ is the college unemployment rate. Y is a a vector of contemporaneous year indicators and $state^{ue}$ is the state unemployment rate in individual i's state of residence in year t, when the dependent variable was measured. These variables ensure that I do not spuriously attribute the effects of a subsequent economic shock to the college unemployment rate.[22] As noted above, the state rate regressions also include year of college graduation and state of college graduation fixed effects. The relevant explanatory variables are $college$ and $college * Exp$, the interaction of the college unemployment rate with potential experience. λ_1 provides the initial effect of the unemployment rate on a labor market outcome. By interacting the unemployment rate with potential experience, λ_2 shows how the effect changes over time.[23] The error term, u, is clustered by year of college graduation in the national rate regressions and by state-year in the state rate regressions.[24]

As mentioned above, the timing and location of college graduation might be endogenous with respect to current labor market conditions. To correct for these endogeneity problems, I instrument for the college unemployment rate with indicators of exogenous timing (and location in the state case) of college graduation. I instrument for the national

[20] The Armed Forces Qualifying Test score (AFQT) is a measure of ability. In 1980, the US Departments of Defense and Military Services asked the NLSY to administer the test to its respondents so they could have a nationally representative sample to use in renorming the test. The measure used in this paper is standardized by subtracting the age-specific mean and dividing by the age-specific standard deviation.

[21] Actual labor market experience could be affected by the college unemployment rate, thus the results are measured using potential experience.

[22] In cases of missing state of residence, I impute using the state of residence in the previous year so as not to lose sample size, though results are similar when actual state is used.

[23] Here I have assumed that potential experience interacts with the college unemployment rate linearly. The results do not change substantially when I estimate nonlinear specifications, both including a quadratic interaction with potential experience and using dummy variables for each year of potential experience (or group of years) and interacting these dummies with the college unemployment rate. The linear interaction is chosen because it is the most parsimonious.

[24] In each case clustering is done at the level of variation that is identifying the college unemployment rate effect. It might also be desirable to cluster by individual, since there could be correlation across observations on the same person. Results are similar when the errors are clustered in this way. I present results clustered by year or state-year because it is a higher level of aggregation and is thus a more conservative specification.

unemployment rate with birth-year dummy variables. Most students graduate when they are approximately 22 years old, thus instrumenting here allows me to use only the predicted variation in the unemployment rate based on graduating when one "should". I use the interaction of experience and birth-year dummies as instruments for the interaction between the national unemployment rate and experience.[25]

In the state regressions I correct for the endogeneity of location of college graduation as well as the timing. Thus I instrument for the state unemployment rate with the unemployment rate in the state an individual lived at age 14 in the year he was 22, hereafter called the state proxy.[26] While a college graduate arguably has control over where he or she resides, it is unlikely that a 14 year old does. Here I instrument for the interaction between the state unemployment rate and experience by interacting experience with the state proxy. In both the first and second stages of the regressions I control for state at age 14 and birth-year fixed effects, instead of state and year of college graduation fixed effects, so that the state proxy can be properly adjusted. The reason for the difference in instruments between the national and state regressions is mainly a matter of logistics. In the national regressions, I could have instrumented for the college unemployment rate with the national unemployment rate in the year an individual was 22.[27] It is preferable to

[25] Using birth year in the first stage of the national regression implies that age is excluded in the second stage. There are many instances in which age should be important in an earnings (or other labor market outcome) regression. However, in this case, the exclusion restriction should be valid. I have restricted the sample so that everyone is fairly close in age when graduating from college. It is unlikely, in this sample of white male college graduates, that graduating a year or two older would have a significant effect on wages once experience and contemporaneous year effects are controlled for. A more important exclusion restriction in the national regression is that I cannot control for cohort effects. There could be other cohort-specific factors (such as cohort size) driving my results. This will be addressed in more detail below.

[26] For the 10 cases where state of residence at age 14 is missing, I instead use state of residence in 1979 (the earliest opportunity to observe location). All state regressions include a dummy variable indicating whether this person has an imputed age 14 state. They are included to increase sample sizes but results are not sensitive to their exclusion.

[27] Results are similar when this proxy is used. This helps address the age exclusion restriction discussed above. Since this proxy instrument is not mechanically related to age, yet results are similar to instrumenting with birth-year indicators, concerns should be alleviated.

use birth-year dummy variables because they allow for more flexibility in predicting timing of college graduation. I would ideally like to allow for the same flexibility in the state regressions, using birth-year and state of residence at age 14 dummy variables as instruments. However, this becomes an extremely cumbersome equation to estimate, especially considering that all instruments need to be interacted with potential experience in the first stage. Thus, the simplified form, assuming individuals graduate when they are 22 – the modal graduation age – in the state in which they lived at age 14 is used.

I predict that correcting for these endogeneity problems should yield effects that are larger in magnitude than the OLS estimates for two reasons. First, it is possible that endogenous timing or migration could arbitrage away the negative effects of graduating from college in a bad economy. Identifying off of people who did not exhibit this type of optimization should increase the magnitude of the college unemployment rate effect. Second, as with all survey data, there could be measurement error in the variables indicating time and place of college graduation. Instrumenting should reduce measurement error leading to effects that are larger in magnitude. It is reasonable to expect that these effects will be larger in the state regressions since youths arguably have more choice over college location than timing of completion and there is plausibly more measurement error in location than year.

Appendix table A5 summarizes the first-stage regression for each college unemployment rate measure. As can be seen, year of birth and state of birth are excellent predictors of the college unemployment rate; the F-statistics for the instruments are 57.6 and 46.7 in the national regressions and are approximately 31.1 and 95.0 in the state unemployment rate regression and its interaction with experience, respectively.

4 Results

Table 2 shows means of selected variables in the first full year after college graduation by unemployment rate group for both national and state rates. Clustered standard errors are in parentheses. Statistical significance between the high and low groups and the medium and low groups is indicated in the high and medium columns, respectively, while statistical significance between high and medium is indicated in the far-right columns. Looking first at the national rate groups, it is clear that in the first year after college graduation workers in the high and medium groups earn substantially less than those in the low unemployment rate group. The high group earns 0.35 log points less than the low group while the medium group earns 0.2 log points less and each effect is statistically significant at the 1% level. The probability of being employed does not statistically differ across groups, but weeks supplied differs significantly across all comparisons. For example, the high group works almost a month less in the first year out of school (conditional on not being enrolled in a graduate program). This suggests that workers are able to find jobs but those graduating in worse economies perhaps take longer. Both the high and medium groups are approximately twice as likely to be enrolled in school, relative to the low group one year after graduating from college (20% are enrolled in the high and medium groups, relative to 11% in the low group). The high group also suffers from lower occupational attainment. Finally, small tenure differences (approximately equal in size to the weeks-worked differences) exist but are not statistically significant. There are no outcomes with statistically significant comparisons across state unemployment rate groups. Wage exhibits somewhat sizeable point-estimate differences, though not significant; the high and medium groups each earn 0.10 log points

less than the low group.[28]

Table 2 suffers from a potential selection bias in that all of the wage and labor supply variables are restricted to individuals not enrolled in school. Since we saw that those who graduated in the medium and high national groups were more likely to be enrolled in school one year after college graduation, it is worth examining whether the enrollment differences lead to disparities in educational attainment. Table 3 reports the impact of unemployment rate group category on the probability of attaining a further degree and the number of years enrolled in school for both national and state rates.[29] Regressions control for age-adjusted AFQT score since ability is an important determinant of educational attainment. The analysis using national unemployment rates does yield significant differences in educational attainment. The high group is 7 percentage points more likely to attain a further degree and has on average a third of a year more schooling, both relative to the low group. Both differences are statistically significant at the 1% level and are important in magnitude (the base rate of attaining a further degree is 25% and the average number of years enrolled post-college is 1.5). The point-estimates for the medium group, relative to the low, are positive and actually larger in magnitude than those for the high group but are not statistically significant.[30] The second set of columns in table 3 show that the state unemployment rate at time of college graduation is not significantly correlated with educational attainment, though the estimates are quite noisy. Perhaps local labor market shocks are not large

[28] The mean unemployment rate in the high state group is approximately 10 and the mean in the low state group is 5, implying a wage loss elasticity of -0.1. This elasticity is exactly in line with the wage curve literature (see Blanchflower and Oswald (1994), e.g.).

[29] Both variables only include education obtained within 17 years of college graduation since that is the maximum length of time the youngest cohort can be followed.

[30] A possible explanation for why we see larger effects in the medium group is that the U.S. saw increasing returns to skills in the 1980's which led to increased educational attainment in the population (see for example DeLong, Goldin, and Katz (2003)). Roughly speaking, the high group graduated at the beginning of the sample and the low group graduated at the end. Thus due to secular trends, graduates in the low group may be getting more education than they otherwise would have while those in the high group may be getting less. Unfortunately the data are not rich enough to identify this time trend, so it is not possible to ascertain the importance of this hypothesis in explaining the educational attainment findings.

enough to influence the graduate school decision.

4.1 Wages

Above we saw the negative wage effects of graduating in a bad economy in the short run. Table 4 address the long-run wage effects. Columns 1 and 2 summarize wage regression results using national rates and columns 3 and 4 summarize the state rate results. Panel A shows both OLS and IV regression coefficients for the college unemployment rate and its interaction with potential experience. Panel B shows these values fitted for 1, 5, 10 and 15 years since college graduation. Looking first at the national rate effect, I find that the college unemployment rate does indeed have a significant negative impact on log wages. The initial effect is a wage loss of 0.062 log points (in response to a 1 percentage point increase in the national rate), statistically significant at the 5% level. Each year this effect dissipates by 0.002 log points. Thus, some catch up occurs and, as panel B indicates, the fitted college unemployment rate effect is small by 15 years out (0.026), and only significant at the 10% level. However, it is large in magnitude and statistically significant at the 1% level through the tenth year after college graduation. The IV estimates are similar to the OLS but larger in magnitude; the initial effect is a 0.078 wage loss. This is consistent with the above hypothesis that the OLS estimates are biased downward in magnitude.[31]

Columns 3 and 4 in table 4 show estimates from the state regressions. These regressions are particularly stringent because the state and year fixed effects absorb most of the state-year variation. In fact the OLS results are smaller in magnitude (log wage falls by 0.024 in response to a 1 percentage point increase in the state unemployment rate) and insignificant.

[31] In my sample, lower national rates are associated with smaller cohorts, on average. Larger cohorts may fare worse in the labor market because of excess labor supply or "crowding out" effects. Thus one might worry that cohort size is driving the persistent wage effect. However, I have also estimated wage regressions which directly control for birth-cohort size and find no substantial change in the coefficients or statistical significance.

However the IV estimates are larger in magnitude and the effect is persistent. The initial effect is a wage loss of 0.106 log points and panel B indicates that the effect remains similar in magnitude and statistically significant at the 10% level or better for the full 15 years after college graduation.[32] These state rate results provide support for the national wage results. Despite the initial expectation that state labor markets should have only a small effect on educated workers (and this is indeed the pattern for the other outcomes analyzed below), we still see a significant wage loss in the IV.

Recall from table 3 that the medium and high national unemployment rate groups had slightly higher educational attainment. Increased education might be one way for workers to mitigate the effects of a poor early experience. We might expect the college unemployment rate effect to be larger in magnitude for those who did not go on to graduate school. Wage equations similar to those reported in table 4 were estimated on the restricted sample of workers with exactly a bachelor's degree. The college unemployment rate effects are similar in magnitude, significance and persistence and are thus not reported here.[33]

It is useful to calibrate these results to the observed unemployment rates in the sample. The national rates range from 5.3% to 9.7% for this sample while the state rates range from 2.9 to 15.6. The average wage loss in response to a 1 percentage point increase in the national unemployment rate for the first 17 years after college graduation is 4.4%, while the

[32] We might be surprised by the magnitude of the IV state rate results. One explanation is the IV helps reduce measurement error in the college unemployment rate as discussed above. Another explanation is that by treating the unemployment rate as endogenous, the regression estimates a local average treatment effect. Recall the instrument is the state unemployment rate in the year and state in which an individual should have graduated from college. Thus the estimate is identified off of stayers who did not endogenously alter the time or place of college graduation. We might think that this is a less-able group who would fare less well under poor economic conditions.

[33] It is worth noting that even if the wage effect were reduced by educational attainment, there could still be negative effects of graduating in a bad economy. Consider a worker who would have preferred to take a job immediately out of school if more jobs had been available but instead went back to school for a graduate degree. The degree may help mitigate earnings losses but the worker would probably not be brought back to the same lifetime utility level as if he could have chosen to take a better job right away.

average for the state rates is 2.0% (using OLS estimates to be conservative).[34] Thus the full effects of the national unemployment rate range from a wage loss of 1.3% (for the second lowest national rate) to 20% (for the highest national rate) per year (relative to the luckiest group who graduated in 1989 with an unemployment rate of 5.3%). The OLS effects for the state rate, though insignificant, range from a wage loss of 4.7% for the lowest decile to 19% wage loss for the highest decile unemployment rate (both relative to the minimum, 2.9). These calculations represent the average wage loss for *each year* for more 17 years after college graduation.

4.2 Labor Supply and Occupation

Table 5 summarizes regression results for other labor market outcomes. This table reports only OLS estimates since IV estimates yield qualitatively similar results. Turning first to labor supply, I study the probability of being employed (excluding those enrolled in school) and weeks worked per year conditional on earning a wage. The probability of being employed (shown in columns 1 and 5) is raised by approximately 0.01 in response to a 1 percentage point increase in either the national or state unemployment rate, remains fairly constant as experience accumulates and is significant for the national rate at the 10% level.[35] However, this effect is quite small in economic significance, considering the mean in the sample is 0.92. The effects for weeks worked, shown in columns 2 and 6, move around somewhat. In the first year after college graduation, the effect is half a week less work and moves to a third a week more work by 15 years out. The positive effect on labor supply could be evidence that workers who graduate in worse economies try to make up some of

[34] Average is obtained from converting the coefficient for the college unemployment rate when I do not allow the effect to vary over time to a percent. That is log wages are regressed on the college rate plus all other covariates except the interaction of the college unemployment rate and experience.

[35] Results are similar when a probit model is estimated instead of this linear probability model.

the wage difference by working more hours. However, the magnitudes are quite small, so one should not draw too much from these results.

That labor supply is only slightly affected is perhaps not surprising given the sample I analyze, white males with at least a college degree. This group is highly unlikely to be unemployed or out of the labor force. Since other demographic groups likely have more elastic labor supply, it is possible that the college unemployment rate effect for these groups would manifest itself to a greater extent through labor supply outcomes and that the wage effect would be smaller. This is an interesting empirical question that should be examined in the future.[36]

Turning next to occupation-related outcomes, I present analyses of weeks of tenure at the current employer and occupation prestige score (which ranges in value from 7 to 82 in this sample).[37] Tenure provides an indirect measure of how often each cohort changed employers. First, looking at the state results, I find a small negative tenure effect (15 weeks) that dissipates after the first 5 years. In contrast, the national rate has no initial effect on job tenure but its impact becomes positive and statistically significant starting 10 years after college graduation. The effect, which ranges from 1 to almost 15 weeks tenure gain, is modest in size considering the sample mean for tenure 15 years after college is 362 weeks. However, it seems that small differences in job tenure over the first ten years of a career accumulate and become important later on. Given that we think job changes are associated with wage growth (Topel and Ward 1992), and those who graduated in worse economies have a slight tendency to stay in their jobs, this might explain some of the wage effect. However, it is important to bear in mind that the tenure effects are small in magnitude.

[36] See Kondo (2007) for a similar analysis across across race and gender.

[37] I have also analyzed the probability of being in a professional or technical occupation. These effects are very similar to the prestige score; results are thus not included here.

Also, in a previous version of this paper I looked at job changes directly and found very little difference across college graduation cohorts.

Columns 4 and 8 show occupational prestige score results. Here there is no effect using state rates, but results are negative and statistically significant when national rates are used. In response to a 1 percentage point increase in the national rate, occupation prestige score falls by almost 1 point. This effect is modest (the sample average is 50) but statistically significant and remains fairly constant throughout the entire period studied. Thus it seems that workers who graduate from college in bad economies are unable to fully shift into better jobs, at least over the first 15 years of their careers.

4.3 Robustness Checks

4.3.1 Selection

A potential confounding factor when studying college graduates is selection that differs across cohorts. One might worry that the decision to enter college is affected by labor market conditions at time of high school completion. Since the economy moves cyclically, it is not unreasonable to think that economic conditions today and four years from today are correlated. So, if the economy induces some people to attend college who otherwise would not and these people complete college, college graduation cohorts could be differentially selected. I address this in two ways. First, I look at the probability of completing college as a function of labor market conditions at age 18. Second, I look at the difference in characteristics between college completers and non-completers to determine whether there is a differential selection across cohorts.

Table 6 shows results on the probability of completing college.[38] Columns 1 and 2 show

[38] Here I analyze the unconditional probability of completing college for the whole sample of white males.

results using the national unemployment at age 18 while columns 3 and 4 use the state. For the state results, I use the unemployment rate at age 18 in the state an individual resided at age 14 and also control for year and state fixed effects.[39] The first column in each set reports a basic specification while the second additionally controls for AFQT score. This is important since cohorts differ in ability; higher unemployment rates at age 18 are associated with lower test scores. In fact, not taking this into account yields insignificant results for both the national and state rates. However, controlling for ability, the unemployment rate at age 18 does have a small, positive effect on the probability of completing college. In response to a 1 percentage point increase in the national or state unemployment rate at age 18, the probability of completing college increases by 0.008 and 0.02, respectively. These effects are quite small, given 30% of the sample completes college, but are both significant at the 5% level.

In the data, economic conditions at time of high school completion are negatively correlated with economic conditions at time of college completion. So, those induced to attend college based on a bad economy at age 18 are more likely to have graduated from college in a better economy. In order to determine what type of bias this may cause, I look at the characteristics of college completers – relative to non-completers – across cohorts. I regress a characteristic on an indicator for whether or not the individual completed college, the unemployment rate at age 18, and the interaction of the two.[40] I also control for year of birth and state fixed effects in the state analysis and a time trend in the national analysis.

Table 7 reports these regression results for AFQT score and several family background

I could instead look at the probability conditional on completing high school and results are similar. Using the entire sample avoids the problem that high school completion could also be endogenous with respect to labor market conditions at a young age.

[39] To address the fact that educational attainment is increasing for the population as a whole during the sample period, I control for a linear time trend in the national analysis (since year dummies are perfectly collinear with the unemployment rate at age 18). Results are not sensitive to its exclusion, however.

[40] Again results are similar when I restrict the sample to those who have completed high school.

characteristics including age at birth for both parents, years of schooling for both parents and whether someone in the family had a library card at age 14. Panel A reports national results while panel B reports state. The main effect for college degree shows that college graduates are of course positively selected. For example, column 1 shows that the average college graduate has a higher AFQT score by almost 0.8, significant at the 1% level in both panels. The other characteristics reveal that college graduates come from positively selected families, on average. The unemployment effect is meant to control for differences in cohorts. These might be more important in the national results since there fewer birth-year cohorts but should be small in the state analysis after controlling for state and year fixed effects.

The interactions reveal whether college graduates who experienced worse economic conditions at age 18 look differentially selected above and beyond the college graduate main effect. For most characteristics, the effects are small and insignificant. There is some evidence for positive selection in that for both national and state the probability of a library card increases slightly (by 1.4 to 2 percentage points, compared to a base probability of 0.75). In addition AFQT score is 0.02 points higher for college graduates whose age 18 state unemployment rate was 1 percentage point higher. Because of the negative correlation between the economy at age 18 and the economy at college completion, the positively-selected college graduates would be graduating in good economies. This would bias me towards finding a college unemployment rate effect. However, the evidence presented here is comforting in that the differences are quite small in magnitude and few are statistically significant.

4.3.2 What About Other Recessions?

The focus of this paper has been an analysis of the early 1980's recession. The NLSY79 is ideal for this study because I can observe exactly when a person graduated from college, the same individuals can be tracked for almost 20 years and there is a wealth of information on labor market experiences and family background. However, in the NLSY79, I am restricted to these 11 cohorts and one might wonder whether the results extend to other recessions. The Current Population Survey (CPS) is a natural place to extend this research. The Annual Supplement to the March CPS consists of repeated cross-sections with demographic information and labor market experiences in the prior calendar year. In this section, I use the March CPS to see whether the subsequent recession of the early 1990's had a similar impact on workers.

Table 8 presents results using March CPS data reflecting the calendar years 1987 through 2006 (i.e., survey years 1988-2007), again restricting the sample to white males with at least a bachelor's degree.[41] Because I cannot observe the exact year in which a worker graduated from college, I employ the reduced form of my instrument and assign everyone the year he turned 22 as the graduation year. I restrict the sample to workers who turned 22 between 1986 and 1996, so that each synthetic cohort can be followed for at least 10 years post-college.[42] I estimate log wage regressions[43] similar to the specification in equation 1, controlling for a quadratic in potential experience (defined here as years since age 22), contemporaneous year and state fixed effects[44], and the contemporaneous state unemployment

[41] For most years in the CPS, this means the individual reported completing at least 4 years of college, though starting in 1992, individuals can report completing a bachelor's degree.

[42] This window was chosen to surround the 1990's recession, which saw its highest unemployment rate in 1992. Results are not sensitive to shifting these cutoffs, on either end, by a few years.

[43] Wage is total income in the previous calendar year divided by usual hours worked per week times weeks worked. It is inflation adjusted to 2000 dollars using the CPI.

[44] Because I have ample sample sizes, I include state fixed effects, while I did not in the NLSY estimates. Results are not sensitive to their exclusion.

rate. Since I cannot observe and individual's enrollment status, I restrict the sample to full-time workers.

The first column of table 8 reports results on the full sample while the second restricts the sample to a consistent window of 10 years post-"graduation". Panel B again shows the college unemployment rate effect fitted for 1, 5 and 10 years post-"graduation" (but not year 15 as it is really an out-of-sample prediction). The effect on the full sample is a wage loss of almost 3% in response to a 1 percentage point increase in the national unemployment rate at age 22. When fitted one year out of college, this effect is significant at the 1% level. The second column shows even larger effects when the sample is restricted to a narrow window, which would be expected if the effects die off over time. The initial effect is a wage loss of 4%.

These effects are slightly smaller than the national analysis in the NLSY. Further, panel B reveals that the wage effect disappears after 10 years. One reason for this could be measurement error introduced by the fact that I cannot determine the exact year of college graduation, I cannot follow the same individuals over time and I cannot control for AFQT score. It could also be driven by the fact that the recession in the 1990's was smaller. The unemployment rate reached as high as 7.5, compared to 9.7 in 1982. Hence we might expect college graduates to be hit less hard.

I take this CPS exercise as complementary evidence. It supports a robust finding that workers who graduate from college in a bad economy experience large wage losses that persist for several years post-college graduation.

5 Conclusion

The results in this paper strongly support the hypothesis that graduating from college in a bad economy has a long-run, negative impact on wages. I also find a negative effect on occupational attainment and slight increases in both educational attainment and tenure for those who graduate in worse national economies. Labor supply is essentially unaffected using both national and state unemployment rates. Wage loss ranges from 1%-20% each year, relative to the cohorts with the minimum state and national unemployment rates. Recalling that these figures, which come from OLS estimates, are lower bounds (the IV results are larger in magnitude), this is quite striking.

Given these wage findings, one might wonder if workers would be better off waiting to enter the labor market until the economy picks up. This would mean forgoing a year or two of earnings, which is possibly a smaller loss than the losses I find. It does not seem to be the case in the real world, but this can be reconciled with my findings. In equilibrium individuals who graduate in worse economies but do their best given their restricted options should not carry a negative signal since employers are informed about business-cycle conditions. If many workers waited to enter the labor market as suggested here, then in the current equilibrium, they would probably be sending a negative signal since they did not even venture into the labor market to try to find a job. How this equilibrium became established is an open question.

Section 2 outlined several theories that could potentially explain long-run, negative effects of a poor early labor market experience. General human capital differences might partially explain the wage effect using national rates since I find that workers who graduated in worse economies are in lower-level occupations, on average. However, occupation differences cannot fully account for the wage differences. I have estimated wage equations

also controlling for occupation prestige score and its square and I find that approximately one sixth of the wage effect is eliminated in the national rate regressions, but a substantial portion remains and the effect is still statistically significant. The matching models which predict wage differences because of less firm or career-specific human capital are also not sufficient to explain my findings. I find only small effects on tenure and I have also looked at career and job changes directly and find no significant differences across college graduation cohorts (although it is difficult to be conclusive here since tenure and career-change variables are notoriously noisy). In addition, controlling for tenure in a wage regression has no effect on the college unemployment rate coefficient.

Surprisingly, the wage differentials persist, both within job and within occupation. Thus a more complicated model is probably necessary to explain my findings. For example, Gibbons and Waldman (2003) present a task-specific human capital model to explain cohort effects. If a portion of skills developed on the job is only relevant to tasks pertaining to that job then after promotion, some of the worker's skills will be wasted. Entering the firm in a worse economy and starting at a lower-level job would mean more time spent investing in skills that will go unutilized later when the worker is promoted. Thus Gibbons and Waldman predict wage differences within job level, career and firm, consistent with my findings. However, it would be difficult to establish a particular theory, given the small sample size in these data.

It is worth thinking about how extrapolatable these results are to other cohorts graduating in different recessions. In all outcomes, we see more significant effects in the national regressions than in the state regressions (with the exception of the instrumented state wage regressions). As noted above this could be because college graduates are not as sensitive to local labor markets as to the national market. However, I cannot rule out the possibility

that some cohort-specific factor other than the college unemployment rate is driving the national results to some extent. In addition, the 1982 recession may have been particularly damaging since it was quite large and was followed by another important recession just ten years later. The CPS results show that the early 1990's recession may have had a smaller impact on college graduates. Lastly, Oreopoulos et al. (2006), who use Canadian data to study the effects of national and state-level recessions on college graduates, find that wage effects dissipate within ten years of leaving school. However, as noted above, several labor market institutions in Canada, as well as a more compressed wage distribution in general might ease the catching up process there, making their study less comparable with studies using US data. Also, Oyer (2006a and 2006b), who looks at the effects of national economy on specialized groups (MBA's and economics Ph.D.'s) finds long-lasting effects. Given the magnitude of my findings in the national results, the support of the state-level results and the CPS analysis, it is plausible that the wage effects to graduating from college in a bad economy would be sizeable, at least in the medium-term horizon, for most groups of college graduates.

This paper provides evidence that the business cycle effects on recent labor market entrants are significant and persistent. Further study, perhaps focusing on other demographic groups and observing cohorts for a longer period of time, will continue to illuminate business-cycle effects and help determine what policy measures (if any) are appropriate to correct for these effects.

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Table 1: Sample Sizes of College Graduation Cohorts

NLSY79 White Males with at least a BA/BS

Year College Graduation	Frequency	National UE Rate[1]	National UE Rate Group	State UE Rate[2] (Mean)
1979	19	5.8	Low	5.72
1980	44	7.1	Medium	7.04
1981	58	7.6	High	7.98
1982	64	9.7	High	10.00
1983	66	9.6	High	10.02
1984	56	7.5	Medium	7.53
1985	60	7.2	Medium	7.08
1986	73	7.0	Low	7.13
1987	43	6.2	Low	6.63
1988	18	5.5	Low	5.32
1989	12	5.3	Low	5.35
Total:	513	mean = 7.62		mean = 7.78

1. From: ftp://ftp.bls.gov/pub/suppl/empsit.cpseea1.txt.

2. From: Bureau of Labor Statistics, Local Area Unemployment Statistics.

Notes:

Sample is restricted to the cross-section, white-male sample who graduated from college between 1979 and 1989 and have valid AFQT score and state unemployment rate.

Table 2: Means of Selected Variables 1 Year After College Graduation by UE Rate Group

NLSY79 White Males with at least a BA/BS

	National				State[1]		
UE Rate Group[2]	High	Medium	Low		High	Medium	Low
Log Wage	2.317	2.44	2.647		2.755	2.785	2.893
	[0.042]**	[0.020]**	[0.041]	*	[0.223]	[0.231]	[0.244]
Currently Employed[3]	0.845	0.852	0.866		0.984	0.964	0.988
	[0.007]	[0.046]	[0.012]		[0.101]	[0.101]	[0.092]
Annual Weeks Worked[4]	44.426	46.286	47.840		53.707	51.508	53.266
	[0.852]**	[0.515]+	[0.526]	+	[2.429]	[2.258]	[2.165]
Currently Enrolled[5]	0.209	0.190	0.118		0.064	0.075	0.096
	[0.018]**	[0.063]	[0.013]		[0.104]	[0.097]	[0.092]
Occupation Prestige	42.745	45.241	45.345		46.149	45.698	45.848
	[0.180]**	[2.862]	[0.663]		[5.008]	[5.221]	[4.923]
Tenure (weeks)	56.21	55.17	60.03		28.307	31.979	34.166
	[6.687]	[8.381]	[10.344]		[25.871]	[28.113]	[30.849]

Standard errors in brackets, clustered by college graduation year or state and year

Statistical significance relative to Low indicated: + significant at 10%; * significant at 5%; ** significant at 1%.

Statistical significance between High and Medium indicated in right column.

1. Adjusted for State and Year Fixed

2. National Groups by year: High - 1981, 1982, 1983; Medium - 1980, 1984, 1985; Low - 1979, 1986, 1987, 1988, 1989. State groups by UE Rate Range: High - >8.5, Medium - 6.6-8.5, Low -<- 6.6.

3. Includes all non-enrolled persons interviewed .

4. In first full calendar year out of college if not enrolled in school then and earning a wage.

5. Includes all persons interviewed.

Notes:

Sample is restricted to the cross-section, white-male sample who graduated from college between 1979 and 1989 and have valid AFQT score and state unemployment rate. Unless otherwise specified observations are restricted to those with a valid wage who are not enrolled in school.

Table 3: Educational Attainment as a Function of the College Unemployment Rate

NLSY79 white males with at least a BA/BS in first 17 years post-college graduation

	National		State[1]	
	Grad Degree[2]	Enrolled Post-	Grad Degree[2]	Enrolled Post-
UE Rate Group (relative to low)[3]				
High UE Rate	0.073**	0.388**	0.053	0.088
	[0.023]	[0.099]	[0.076]	[0.420]
Medium UE Rate	0.134	0.703	-0.0054	0.227
	[0.099]	[0.412]	[0.058]	[0.298]
Age Adjusted AFQT	0.207**	0.746**	0.188**	0.597**
	[0.050]	[0.204]	[0.052]	[0.228]
Constant	-0.050	0.206	-0.092	-0.882
	[0.058]	[0.263]	[0.125]	[0.608]
Observations	513	513	513	513
R-Squared	0.065	0.049	0.210	0.215

Standard errors in brackets clustered by college graduation year or state and year.

+ significant at 10%; * significant at 5%; ** significant at 1%

1. Controls for state and year of college graduation fixed effects.

2. Grad Degree equals 1 if individual obtained a degree within 17 years of college graduation. This specification is a linear probability model.

3. National Groups by year: High - 1981, 1982, 1983; Medium - 1980, 1984, 1985; Low - 1979, 1986, 1987, 1988, 1989. State groups by UE Rate Range: High - >8.5, Medium - 6.6-8.5, Low -<- 6.6.

Notes:

Sample is restricted to the cross-section, white-male sample who graduated from college between 1979 and 1989 and have valid AFQT score and state unemployment rate.

Table 4: Log Wage Regression Results

NLSY79 White Males with at Least a BA/BS

	National		**State**[1]	
	1	2	5	6
	OLS[2]	IV[3]	OLS[2]	IV[3]
	A: Regression Coefficients			
College UE Rate	-0.062*	-0.078*	-0.024	-0.106+
	[0.021]	[0.032]	[0.018]	[0.059]
College*exp	0.002	0.004+	0.0004	0.001
	[0.002]	[0.002]	[0.001]	[0.002]
	B: Fitted Effects for Selected Years of Experience			
Yrs After College:				
1	-0.059	-0.074	-0.023	-0.105
	[0.020]*	[0.030]*	[0.017]	[0.058]+
5	-0.050	-0.059	-0.022	-0.103
	[0.014]**	[0.025]*	[0.016]	[0.053]+
10	-0.038	-0.040	-0.020	-0.100
	[0.010]**	[0.020]+	[0.017]	[0.048]*
15	-0.026	-0.022	-0.018	-0.097
	[0.012]+	[0.021]	[0.019]	[0.045]*
Observations	5129	5129	5129	5129
R-squared	0.162	0.162	0.203	0.143

Standard errors in brackets clustered by college graduation year or state and year
+ significant at 10%; * significant at 5%; ** significant at 1%

1. Regressions also include controls for State and Year of college graduation fixed effects.

2. Also controls for a quadratic in potential experience, age-adjusted AFQT score, contemporaneous year effects and the contemporaneous state unemployment rate.

3. National rate is instrumented for with birth-year dummy variables. State rate is instrumented using the unemployment rate in the state an individual resided at age 14 in the year he turned 22.

Notes:

Sample is restricted to the cross-section, white-male sample who graduated from college between 1979 and 1989 and have valid AFQT score and state unemployment rate. Unless otherwise specified observations are restricted to valid wage obersations within the first 17 years of college graduation who are not enrolled in school.

Table 5: Other Outcome Regression Results

NLSY79 White Males with at Least a BA/BS

	National				State[1]			
	1	2	3	4	5	6	7	8
Dependent Variable:	Emp'd[2]	Weeks Per Yr[3]	Tenure	Prestige	Emp'd[2]	Weeks Per Yr[3]	Tenure	Prestige
A: Regression Coefficients								
College UE Rate	0.011+	-0.440+	0.799	-0.962*	0.009	-0.303+	-14.940*	0.559
	[0.006]	[0.202]	[4.316]	[0.360]	[0.010]	[0.162]	[6.825]	[0.513]
College*exp	-0.00001	0.052**	0.904**	-0.021	-0.0002	0.019+	0.401	-0.0374
	[0.001]	[0.015]	[0.236]	[0.029]	[0.0004]	[0.011]	[0.381]	[0.0234]
B: Fitted Effects for Selected Years of Experience								
Yrs After College:								
1	0.011	-0.388	1.703	-0.983	0.0093	-0.284	-14.539	0.521
	[0.005]+	[0.189]+	[4.125]	[0.338]*	[0.010]	[0.154]+	[6.749]*	[0.503]
5	0.011	-0.180	5.319	-1.066	0.0087	-0.209	-12.936	0.372
	[0.005]*	[0.140]	[3.416]	[0.259]**	[0.009]	[0.130]	[6.645]+	[0.476]
10	0.080	0.0077	9.839	-1.170	0.0078	-0.116	-10.932	0.185
	[0.005]+	[0.098]	[2.738]*	[0.217]**	[0.008]	[0.120]	[6.971]	[0.467]
15	0.0111	0.340	14.359	-1.274	0.0070	-0.023	-8.928	-0.002
	[0.007]	[0.107]**	[2.471]**	[0.265]**	[0.008]	[0.133]	[7.740]	[0.487]
Observations	5106	4644	5319	5139	5106	4644	5319	5139
R-squared	0.023	0.033	0.225	0.076	0.096	0.060	0.269	0.153

Standard errors in brackets clustered by college graduation year or state and year

+ significant at 10%; * significant at 5%; ** significant at 1%

1. Regressions also include controls for State and Year of college graduation fixed effects.

2. Restricted to non-enrolled observations.

3. Restricted to observations with a valid wage in the previous year.

Notes:

Sample is restricted to the cross-section, white-male sample who graduated from college between 1979 and 1989 and have valid AFQT score and state unemployment rate. Unless otherwise specified observations are restricted to valid wage obersations within the first 17 years of college graduation who are not enrolled in school.

Table 6: The Probability of College Completion as a Function of the Economics Conditions at Age 18

NLSY79 white males cross-section sample

	Age 18 National UE Rate		Age 18 State UE Rate[1] (in age 14 residence)	
	1	2	3	4
Age 18 UE Rate	-0.001	0.0084*	0.0155	0.0206*
	[0.0050]	[0.0035]	[0.0096]	[0.0081]
Timetrend	0.0006	-0.0039		
	[0.0054]	[0.0035]		
Age Adjusted AFQT		0.2548**		0.2543**
		[0.0064]		[0.0105]
Constant	0.2956**	0.1138**	0.0805	0.0287
	[0.0290]	[0.0180]	[0.0886]	[0.0812]
Observations[2]	2105	2105	1899	1899
R-Squared	0.000	0.237	0.053	0.273

Standard errors in brackets clustered by birth year or state and year.

+ significant at 10%; * significant at 5%; ** significant at 1%

1. Controls for state at age 14 and year of birth fixed effects.

2. State-level unemployment rates did not meet BLS standards of reliability for many

excluded from the state analysis.

Notes:

Table 7: Characteristics of College Relative to Non-Completers Across Cohorts

	AFQT	Age at Birth, Mom	Age at Birth, Dad	Yrs School, Mom	Yrs School, Dad	Library Card, Age 14
A: National Unemployment Rate[1]						
College Degree	0.791**	2.297	2.932+	1.726*	1.258*	0.044
	[0.079]	[1.302]	[1.492]	[0.523]	[0.488]	[0.036]
Age 18 UE Rate	-0.041**	0.008	0.129	-0.005	-0.120**	-0.004
	[0.008]	[0.094]	[0.152]	[0.020]	[0.023]	[0.003]
UE Rate*Coll Deg	0.019	-0.155	-0.321	0.006	0.196*	0.014*
	[0.012]	[0.176]	[0.200]	[0.064]	[0.064]	[0.004]
Constant	0.478**	26.742**	28.864**	11.680**	12.483**	0.764**
	[0.057]	[0.702]	[1.067]	[0.165]	[0.190]	[0.023]
Observations	2105	1889	1838	2132	2101	2230
R-squared	0.24	0.013	0.004	0.116	0.141	0.025
B: State Unemployment Rate[2]						
College Degree	0.757**	1.238	1.418	1.963**	2.117**	-0.015
	[0.099]	[0.976]	[1.202]	[0.397]	[0.515]	[0.055]
Age 18 UE Rate	-0.040**	0.158	0.126	-0.042	-0.167*	-0.011
	[0.015]	[0.134]	[0.139]	[0.051]	[0.068]	[0.008]
UE Rate*Coll Deg	0.021+	-0.033	-0.123	-0.031	0.062	0.020**
	[0.012]	[0.111]	[0.148]	[0.050]	[0.063]	[0.007]
Constant	0.179	21.987**	26.342**	11.905**	16.963**	0.780**
	[0.184]	[1.474]	[1.390]	[0.626]	[0.718]	[0.109]
Observations[3]	1899	1703	1665	1912	1887	2003
R-squared	0.293	0.059	0.05	0.155	0.199	0.123

** p<0.01, * p<0.05, + p<0.1, Standard errors in brackets, clustered by year of birth or state at age 14 and year of birth.

1. Controls for a linear time trend.

2. Controls for state at age 14 and year of birth fixed effects.

3. State-level unemployment rates did not meet BLS standards of reliability for many states prior to 1976. Therefore the 1957 birth cohort (who turned 18 in 1975) is excluded from the state analysis.

Notes: Sample includes all white males in the cross-section sample with a value for the dependent variable listed in the column head.

Table 8: CPS Log Wage Regression Results

CPS March 1988-2007, White Males with at Least a BA/BS[1]

	National[2]	
	Full Sample	First 10 Years[3]
A: Regression Coefficients		
College UE Rate[4]	-0.028*	-0.040*
	[0.009]	[0.011]
College*exp	0.003*	0.005*
	[0.001]	[0.002]
B: Fitted Effects for Selected Years of Experience		
Yrs After College:		
1	-0.026	-0.035
	[0.008]**	[0.009]**
5	-0.015	-0.016
	[0.005]**	[0.004]**
10	-0.002	0.007
	[0.004]	[0.010]
Observations	39,009	21,576
R-squared	0.149	0.119

Standard errors in brackets clustered by year of birth.

+ significant at 10%; * significant at 5%; ** significant at 1%

1. Defined as having completed at least for years of college (in CPS years prior to 1992) or having completed a bachelor's degree (in CPS yeas 1992 onwards).

2. Regressions also include controls for a quadratic in potential experience (defined as years since age 22), contemporaneous year and state fixed effects and the contemporaneous state unemployment rate.

3. Sample is restricted to individuals who were 32 or younger in the previous calendar year.

4. Defined as the national unemployment rate in the year an individual turned 22.

Notes:

Sample is restricted to white-males with at least a college degree who turned 22 between 1986 and 1996, reported working full time in the previous calendar year and were at least 23 years old in previous calendar year.

Table A1: Data Description

Variable	NLSY Variable Description	Codes
Wage	NLSY created, hourly rate of pay at current job/job #1	CPI adjusted to 2000 dollars, coded to missing if individual is currently enrolled in school, or if wage is <$1.00 or >$1000
AFQT	The standard AFQT score measures combines sections 2 through 5 of the ASVAB in the following way: Section2 + Section3 + Section4 + .5*Section5	For the entire NLSY sample, I create means and standard deviations by birth year then standardize each score by these.
Occupation Prestige Score	Occupation at current or most recent job using 1970 3 digit census codes. 2002-2006 observation is not included because they are not comparable.	Uses Duncan SEI as defined for 1970 3 digit census codes. Restricted to nonenrolled obs w/ valid wage.
Weeks	NLSY created, weeks worked in past calendar year	Restricted to nonenrolled persons with a valid wage in the previous year's observation
Employed	NLSY created, current employment status. 2000 and 2002 are not included because no comparable question was asked.	Restricted to nonenrolled persons.
Enrolled	From survey question, "were you enrolled in May of survey year"	
Tenure	NLSY created, weeks tenure at current/main job	Restricted to nonenrolled persons with a valid wage in the current year.
Year College Graduation	Followed responses to education questions year by year	
Educational Attainment	Same as above	
State of Residence	Obtained from NLSY restricted GEO Codes Data	Determines which state to use for unemployment rate in state and year an individual graduated college.
State of Residence Age 14	Key Variable in NLSY Survey	

Table A2: Means of Selected Variables by UE Rate Group

NLSY79 white males with at least a BA/BS in first 17 years post-college graduation

		National			State[1]		
UE Rate Group[2]	**All**	**High**	**Medium**	**Low**	**High**	**Medium**	**Low**
Individual Characteristics:							
Age-Adj AFQT	1.168	1.126	1.228	1.159	0.818	0.886	0.837
	[0.006]	[0.010]	[0.011]	[0.011]	[0.047]	[0.049]	[0.047]
Age when received	23.028	22.65	22.769	23.803	23.147	23.135	23.336
College Degree	[0.021]	[0.031]	[0.034]	[0.036]	[0.148]	[0.152]	[0.148]
Years Since Grad	7.892	7.98	8.004	7.657	8.154	8.052	8.031
	[0.065]	[0.104]	[0.115]	[0.119]	[0.543]	[0.560]	[0.542]
National UE Rate	7.681	9.01	7.281	6.374	5.627	5.614	5.604
	[0.018]	[0.015]	[0.017]	[0.018]	[0.006]	[0.007]	[0.006]
State UE Rate	7.886	9.523	7.244	6.437	8.534	7.244	6.464
	[0.035]	[0.047]	[0.052]	[0.054]	[0.084]	[0.086]	[0.084]
State Proxy	7.937	8.764	7.474	7.357	8.85	8.555	8.134
	[0.033]	[0.051]	[0.056]	[0.058]	[0.180]	[0.185]	[0.180]
Outcome variables:							
Log Wage	2.91	2.873	2.920	2.946	2.921	2.925	2.959
	[0.009]	[0.014]	[0.015]	[0.016]	[0.071]	[0.073]	[0.071]
Currently Enrolled[3]	0.116	0.113	0.14	0.094	0.049	0.063	0.041
	[0.004]	[0.007]	[0.007]	[0.007]	[0.033]	[0.033]	[0.033]
Years Enrolled Post-	1.084	0.971	1.425	0.863	0.757	0.556	0.484
College	[0.024]	[0.038]	[0.042]	[0.044]	[0.185]	[0.191]	[0.185]
Further Degree	0.204	0.178	0.275	0.16	0.089	0.022	0.028
	[0.006]	[0.009]	[0.010]	[0.010]	[0.043]	[0.044]	[0.043]
Currently Employed[4]	0.931	0.934	0.94	0.916	0.749	0.747	0.766
	[0.004]	[0.006]	[0.006]	[0.007]	[0.027]	[0.028]	[0.027]
Annual Weeks Worked[5]	49.972	49.994	49.978	49.936	49.253	49.414	49.697
	[0.098]	[0.159]	[0.174]	[0.181]	[0.814]	[0.839]	[0.813]
Occupation Prestige[6]	49.435	48.841	50.949	48.521	44.825	45.681	46.07
	[0.201]	[0.316]	[0.353]	[0.383]	[1.607]	[1.660]	[1.611]
Tenure (weeks)	210.51	218.50	202.31	208.77	142.10	145.63	135.29
	[2.928]	[4.699]	[5.215]	[5.369]	[24.016]	[24.752]	[23.994]
Observations	5,129	1,980	1,635	1,514	1,836	1,552	1,741

Standard errors in brackets.

+ significant at 10%; * significant at 5%; ** significant at 1%

1. Adjusted for state and year fixed effects.

2. National Groups by year: High - 1981, 1982, 1983; Medium - 1980, 1984, 1985; Low - 1979, 1986, 1987, 1988, 1989. State groups by UE Rate Range: High - >8.5, Medium - 6.6-8.5, Low -<-6.6.

3. Includes all persons interviewed (n=6,346).

4. Includes all non-enrolled persons interviewed (n=5,106), excludes 2000-2004 since no comparable question was asked.

5. Refers to last full calendar year. Must have valid wage in observation of previous year (n=4644).

6. Excludes 2002-2006 because occupation categories are not comparable (n=4890).

Notes:

Sample is restricted to the cross-section, white-male sample who graduated from college between 1979 and 1989 and have valid AFQT score and state unemployment rate. Unless otherwise specified observations are restricted to those with a valid wage who are not enrolled in school. Observations are

Table A3: Distribution of Individuals by Year and State of College Graduation, NLSY79 White Males with at Least a BA/BS

State College	People	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Alabama	12	0	0	5	0	2	0	1	3	1	0	0
Alaska	1	0	0	0	0	0	0	1	0	0	0	0
Arizona	1	0	1	0	0	0	0	0	0	0	0	0
Arkansas	3	0	0	0	1	0	0	0	2	0	0	0
California	28	4	1	3	3	3	4	3	2	2	1	2
Colorado	12	0	2	0	2	0	1	2	3	1	0	1
Connecticut	20	0	5	1	4	2	4	0	3	0	1	0
Delaware	1	0	0	0	0	0	1	0	0	0	0	0
Florida	12	0	1	2	0	1	2	1	2	2	1	0
Georgia	13	1	3	1	5	1	1	0	0	1	0	0
Illinois	17	1	1	1		4	3	2	1	2	1	1
Indiana	23	0	5	2	4	2	2	3	1	2	1	1
Iowa	16	1	1	0	0	1	3	6	3	1	0	0
Kansas	9	0	0	0	1	2	0	0	3	2	0	1
Kentucky	1	0	0	0	0	0	0	0	0	1	0	0
Louisiana	5	0	0	1	0	1	1	1	0	1	0	0
Maryland	2	0	1	0	0	0	0	1	0	0	0	0
Massachusetts	16	2	1	3	3	0	1	1	2	2	1	0
Michigan	33	1	1	3	3	8	1	3	5	5	2	1
Minnesota	21	1	2	1	2	2	6	3	1	2	1	0
Mississippi	2	1	0	1	0	0	0	0	0	0	0	0
Missouri	13	0	0	1	2	1	2	2	3	1	1	0
Montana	6	0	2	0	0	0	0	1	2	1	0	0
Nebraska	1	0	0	0	1	0	0	0	0	0	0	0
New Hampshire	3	0	1	0	1	1	0	0	0	0	0	0
New Jersey	27	0	4	4	5	4	2	3	2	2	1	0
New Mexico	1	0	0	0	0	0	0	0	0	1	0	0
New York	37	2	3	5	1	10	5	2	5	1	3	0
North Carolina	16	0	1	1	0	3	1	3	4	2	1	0
Ohio	36	0	2	8	7	3	4	0	7	2	1	2
Oklahoma	3	0	0	1	0	1	0	1	0	0	0	0
Oregon	3	0	0	0	0	2	1	0	0	0	0	0
Pennsylvania	21	0	1	5	4	3	3	2	2	1	0	0
Rhode island	1	0	0	0	0	0	0	1	0	0	0	0
South Carolina	9	0	1	0	4	0	0	1	2	1	0	0
South Dakota	1	0	0	0	0	0	0	1	0	0	0	0
Tennessee	11	0	1	0	1	2	3	0	2	0	1	1
Texas	29	1	1	5	2	3	3	4	7	3	0	0
Utah	1	0	0	0	0	1	0	0	0	0	0	0
Vermont	1	0	0	0	0	0	0	0	1	0	0	0
Virginia	10	1	1	2	0	1	0	3	1	1	0	0
Washington	9	0	1	0	4	0	0	1	2	0	0	1
West Virginia	9	1	0	0	2	0	1	0	2	2	1	0
Wisconsin	16	2	0	2	1	2	1	7	0	0	0	1
Wyoming	1	0	0	0	1	0	0	0	0	0	0	0
	513	19	44	58	64	66	56	60	73	43	18	12

Table A4: Distribution of Person-Years with a Wage Observation by Years Since College and Year of College Graduation NLSY79 White Males with at Least a BA/BS

Years Since College	obs all	1979 (5.8)	1980 (7.1)	1981 (7.6)	1982 (9.7)	1983 (9.6)	1984 (7.5)	1985 (7.2)	1986 (7.0)	1987 (6.2)	1988 (5.5)	1989 (5.3)
1	370	12	22	40	47	51	45	45	54	33	13	8
2	364	10	18	42	44	49	44	45	53	35	15	9
3	362	10	21	38	44	50	45	40	56	34	15	8
4	376	12	22	41	47	50	47	45	58	32	14	8
5	391	11	24	48	49	48	45	49	59	32	16	10
6	360	10	27	43	48	44	41	50	51	32	14	0
7	383	10	33	42	46	49	47	53	57	35	0	11
8	358	12	31	45	45	51	47	52	60	0	15	0
9	325	12	29	41	49	53	48	50	0	33	0	10
10	290	11	26	37	47	52	44	0	58	0	15	0
11	276	12	28	34	50	52	0	56	0	34	0	10
12	251	12	27	43	50	0	44	0	61	0	14	0
13	232	12	36	41	0	50	0	54	0	30	0	9
14	208	14	33	0	50	0	43	0	56	0	12	0
15	195	13	0	41	0	49	0	52	0	30	0	10
16	191	0	34	0	49	0	41	0	53	0	14	0
17	197	14	0	41	0	50	0	52	0	31	0	9
Total	5129	187	411	617	665	698	581	643	676	391	157	103

Table A5: First Stage of Instrumental Variables Regression

NLSY79 White Males

	National[1] Full Sample			State[1] Full Sample	
	College	**College*exp**		**College**	**College*exp**
(birth1957 omitted)			State Proxy	0.342**	-2.806**
birth1958	0.110	-2.769		[0.117]	[0.743]
	[0.346]	[2.292]	State Proxy *	0.011**	0.762**
birth1959	0.888+	-3.650	Exp	[0.002]	[0.058]
	[0.437]	[2.732]	(birth1957 omitted)		
birth1960	1.347**	-6.161*	birth1958	0.194	1.668
	[0.337]	[2.290]		[0.415]	[3.416]
birth1961	0.836	-8.467*	birth1959	0.905+	6.519
	[0.782]	[2.933]		[0.531]	[4.188]
birth1962	-0.294	-9.623*	birth1960	0.59	4.089
	[0.711]	[3.631]		[0.592]	[4.634]
birth1963	-0.593	-11.059*	birth1961	0.222	1.171
	[0.841]	[4.190]		[0.596]	[4.665]
birth1964	-0.918	-11.722*	birth1962	0.136	-0.688
	[0.961]	[4.721]		[0.491]	[3.828]
(birth1957*exp omitted)			birth1963	0.151	-0.814
birth1958*exp	0.043	0.830		[0.541]	[4.228]
	[0.036]	[0.726]	birth1964	-0.063	-2.719
birth1959*exp	0.062	1.827+		[0.590]	[4.659]
	[0.042]	[0.992]	Potential	0.179*	1.373+
birth1960*exp	0.100*	2.883**	Experience	[0.069]	[0.726]
	[0.037]	[0.721]	Pot Exp	0.000005	0.128**
birth1961*exp	0.132**	2.892**	Squared	[0.001]	[0.022]
	[0.041]	[0.815]	Age	0.073	0.614
birth1962*exp	0.141*	1.894*	Adjusted	[0.167]	[1.291]
	[0.050]	[0.691]	Constant	3.260**	23.266**
birth1963*exp	0.159*	1.937*		[1.067]	[7.598]
	[0.056]	[0.671]			
birth1964*exp	0.179*	1.903*			
	[0.062]	[0.652]			
Potential	-0.042	4.388**			
Experience	[0.179]	[0.864]			
Pot Exp	0.010*	0.179**			
Squared	[0.004]	[0.032]			
Age Adjusted	0.092	0.601			
AFQT	[0.056]	[0.476]			
Constant	5.664**	0.396			
	[0.242]	[1.774]			
F-statistic for instruments	57.610	46.700	F-statistic for	31.07	94.95
Observations	5129	5129	Observations	5129	5129
R-squared	0.551	0.955	R-squared	0.616	0.891

Standard errors in brackets clustered by college graduation year or state and year
+ significant at 10%; * significant at 5%; ** significant at 1%

1. Regressions also include controls for contemporaneous year effects and contemporaneous state unemployment rate.

2. In addition to controls listed in 1, also controls for a state of college graduation fixed effects and year effects.

Notes:

Sample is restricted to the cross-section, white-male sample who graduated from college between 1979 and 1989 and have valid AFQT score and state unemployment rate. Unless otherwise specified observations are restricted to valid wage obersations within the first 17 years of college graduation who are not enrolled in school.