Differential Effects of Graduating during a Recession across Race and Gender

Ayako Kondo [*]

Yokohama National University

akondo@ynu.ac.jp

Abstract

This paper examines the differential effects of the unemployment rate at entry to the labor market, defined as completion of education, on subsequent wages across race and gender using the National Longitudinal Survey of Youth 79. Economic theories about implicit wage contracts, search frictions and human capital accumulation predict less persistence for disadvantaged workers and weaker effects on those with weak attachment to the labor force. Consistent with these predictions, I find that the negative effect of a recession at entry on wages fades faster for blacks, although the initial impact is stronger for them. I also find a weaker effect for women. These results are robust to controlling for endogenous timing and place of entry using an instrumental variable based on the predicted year of graduation and the residence at age 14.

[*] I would like to thank Janet Currie and Till von Wachter for their helpful suggestions on earlier draft. I also appreciate valuable comments from Brendan O'Flaherty, Claudia Olivetti, Tomohiro Machikita and participants of Applied Micro Lunch Seminar at Columbia University. Access to the geo-code data of NLSY79 requires an approval from the Bureau of Labor Statistics and is limited to researchers located in the United States. All the data analyses were done when the author was at Columbia University.

I. Introduction

Recent studies have established that entering the labor market during a recession has long-term negative effects on the person's subsequent wages and career path for white male college graduates (Kahn 2010, Genda, Kondo and Ohta 2010, Oreopoulos, von Wachter and Heizs 2012). It is also known that, in the United States, the initial impact of a recession at entry on earnings right after graduation is stronger for high school graduates than college graduates, but this negative effect fades away faster (Genda et al 2010, Hershbein 2012, Speer 2014).[1] However, there is little evidence about the long-term consequences of shocks at entry for racial minority, and limited one about that for women. Compared to white men, African Americans are more vulnerable to contemporaneous labor market conditions, and women have weaker attachment to the labor force. Therefore, the effects of the early labor market experience may be quite different for African Americans and women than white men. Thus, this paper compares the following four groups: white male, black male, white female, and black female.

There are several confound factors that can produce persistent negative effects of a recession at entry to the labor market on subsequent employment and earnings. First, nominal wage rigidity may prevent firms from cutting incumbent worker's wages even during a recession, thus a lucky person who entered the labor market during a boom may be able to

[1] Note that whether the effect of labor market entry at graduation is weaker for less educated worker depends on the institutional settings. For example, Genda et al (2010) show that the effect of high unemployment at graduation is more negative and persistent for high school graduates than college graduates in Japan, and Brunner and Kuhn (2014) also show more negative and persistent effect for blue collar workers than white collar workers in Austria. On the other hand, Raaum and Røed (2006) find that the effects of unemployment rate experienced in youth tend to be more persistent for those with advantaged backgrounds in Norway.

keep a relatively high paying job. Indeed, Beaudry and DiNardo (1991) find that incumbent workers' wages do not fall during recessions as long as the workers remain employed, and they explain this by implicit long-term wage contracts with mobile workers. This advantage of obtaining a high-wage job at entry is lost when the worker is dismissed or quits due to exogenous reasons such as marriage and childbirth. Since African Americans are more likely to lose jobs in response to the business cycle conditions, the effect of entering the labor market during a recession will be less persistent for them. Likewise, a turnover due to marriage or childbirth will make the effect of recessions at entry less persistent for women than for men.

Second, it takes time to dissolve initial matches. Oreopoulos et al (2012) find that the job turnover rate remains high for cohorts who graduated from college during a recession for over 8-10 years, suggesting that matching process takes longer for them.[2] This effect should also be less persistent for African Americans, whose involuntary job loss rate is higher, because the differences at the starting point is reset by dismissal.

Third, missing opportunities for on-the-job training due to a bad match can aggravate the negative effect of entering the labor market during a recession. Weak labor force attachment implies less incentive to invest in human capital, thus it predicts a weaker effect of a recession at entry on subsequent wages for women than for men.

Motivated by these theoretical predictions, I examine the effect of the unemployment rate in the year and state of entry to the labor market, defined by completion of education, on subsequent wages by race and gender. The main source of data is the National Longitudinal

[2] The idea to use job mobility as an indicator of job match quality goes back to Bowlus (1995).

Survey of Youth. To control for nation-wide cohort effects, I exploit variations in unemployment rates across states, with controls for time invariant state characteristics and regional differences in black-white wage gaps. I also address the endogenous determination of time and place of entry using an instrumental variable based on the predicted timing of entry and the state of residence at age 14.[3] I find a weaker effect of a recession at entry for women than for men. Also, although the initial impact is stronger for black men than for white men, the effect fades faster for black men. These findings are consistent with the prediction.

To my knowledge, this paper is the first study that analyzes the differential effect of labor market conditions at entry across race. However, this is not the first study that examines the effect on labor market conditions experienced at youth for women. Hershbein (2012) compared high school educated men and women in the United States. He finds that the long-term effects of graduating in a recession on wages are minimal for women, and young women who face bad labor market conditions temporarily reduce labor supply and substitute into home production.[4] I believe this study makes a good complement to Hershbein (2012) in the sense that, while he focuses on high school graduates and pools all races, I focus on differences across race and contrast with male of the same race.

Lastly, this study relates to the broader literature of differential effects of labor market conditions across different demographic groups. Although it is controversial whether

[3] This instrument is used in other studies using the NLSY 79, such as Kahn (2010), Speer (2014), and Mclean (2014).

[4] Relatedly, Kondo (2012) find that women who face worse labor market condition at youth tend to marry earlier, but this is just a temporary shift and the probability of having married by age 30 does not change.

an economic upturn benefits economically disadvantaged people as much as the more advantaged,[5] there is little doubt that the costs of a downturn are borne disproportionately by the disadvantaged (Cutler and Katz 1991, Hines, Hoynes and Krueger 2001, Clark and Summers 1981). The stronger effect of the contemporaneous labor market conditions for African Americans suggests, on the one hand, a stronger initial impact of a recession at entry for them. On the other hand, however, the vulnerability to aggregate shocks after entry to the labor market may reduce the persistence of a negative shock at entry.

The rest of the paper is organized as follows. The next section describes data. Section III presents initial evidence of differential effects from descriptive statistics. Section IV describes empirical models and Section V presents the results. Section VI gives concluding remarks.

II. Data: NLSY79

The National Longitudinal Survey of Youth 1979 (NLSY) consists of a representative sample of the noninstitutionalized U.S. civilian segment of population aged 14-22 in 1979, interviewed annually from 1979 to 1994 and biennially from 1996 to present. I use the cross sectional sample of white and blacks and the supplemental samples of blacks.[6]

[5]While Cutler and Katz (1991) argue that the expansion in the mid-late 80s did not benefit the disadvantaged, Hines et al (2001) view the 1980s as an exception and conclude that the benefits from strong economic growth for the disadvantaged are at least as great as they are for the more advantaged using data spanning from the 1970s to the 2000s.

[6] I drop the military subsample because it covers only cohorts born between 1957 and 1961, and the supplemental poor whites sample because they are dropped from the survey after 1991. I also drop Hispanics because the sample size is too small for separate analysis.

The year of labor market entry is defined as the last year of enrollment, except for up to two years of enrollment in colleges after not being enrolled at least for a year and enrollment after the age of 30.[7] I drop observations that are missing information necessary to define the year and the state of entry; the detailed sample restrictions are described in the appendix. Finally, 5387 individuals remain in the sample. Table 1 summarizes the number of individuals of each race-gender group and state unemployment rates by the year of labor market entry. About 90% of the sample entered the labor market during the twelve years between 1975 and 1986, the period including the recessions in 1975 and 1982-83.

The variable for the years of schooling is "highest grade completed as of May 1", and that for enrollment is "enrollment status as of May 1". The highest degree/diploma attained, used to calculate the predicted year of entry as the instrumental variable for actual entry, is based on the following two questions "highest degree ever received" and "Does R have high school diploma or equivalent?" and *not* based on the highest grade completed.

The real wages are deflated by the consumer price index. The hourly wages in the NLSY are defined as "hourly rates of pay at current or most recent job," which is missing if the respondents did not work at all since last interview. At the same time, about 3% of respondents are currently employed but lacking wages for some unknown reason. Table 2 shows the number of observations with valid (positive) hourly wages, missing wages due to non-employment and missing wages for other reasons, for each race-gender-potential experience cell.

The proportion with missing wages due to non-employment varies across race and

[7] This definition follows Neumark (2002), who also used the NLSY to identify the effect of

gender: African Americans and women are less likely to have valid wages. Moreover, white women's labor supply patterns over potential experience are opposite that of black women. Moreover, since the expected effect of the unemployment rate at entry on subsequent wages is negative, there might be a negative effect on subsequent employment as well. If the likelihood of having a valid wage were affected by the unemployment rate at entry, it would cause a sample selection bias. Thus, I also examine the effects on employment and the likelihood of having a valid wages. As shown later, the unemployment rate at entry does not have a statistically significant negative effect on the likelihood of having a valid wage.

The state unemployment rates based on the CPS are available only from 1976. However, dropping individuals who entered the labor market before 1975 may unbalance the composition of birth-year cohorts by making older cohorts more educated on average. Thus, I used the state unemployment rates based on the Unemployment Insurance records for 1973-1975. Since the UI series tend to be lower than the CPS series, I rescaled it, multiplying by the coefficient of the CPS series in a regression of the UI series between 1976 and 1982 on the CPS series of the same year and constant.

III. Initial Evidence from Descriptive Statistics

Figure 1 plots the average log real hourly wages over potential experience (years since entry) for the four demographic groups: white men, black men, white women and black women. To see how the observed average wage profiles vary with labor market conditions at entry, I split each demographic group into two subgroups, one with higher and one with

---

early job mobility on the adult wages.

lower unemployment rates at entry. First, the upper left panel shows a gradually fading but significantly persistent wage gap for white men, as expected and consistent with the results by Oreopoulos *et al.* (2012) and Kahn (2010). For black men, the lower left panel shows a significant wage gap in the first few years, but it disappears sooner than the gap among white men.

Turning to women, the upper right panel shows a very small gap among white women. The smaller gaps for women than men are consistent with the theories which predict a weak effect on those with weak labor force attachment. Surprisingly, black women who left school during recessions earn more in their fifth year or later. This counter-intuitive positive effect may be a spurious one due to accidental positive selection on educational background, which will be shown in Table 3, or a state specific component that happened to correlate with the unemployment rates. Except for this, the observed patterns in Figure 1 agree with the expectation.

Table 3 shows summary statistics of educational background and the AFQT scores by race, gender and whether unemployment rate at entry was higher than the median of the sample. The highest grades completed are almost equal among those who entered the labor market during recessions and booms, except that black women who entered during recessions have slightly more education than black women who entered during booms. The AFQT score is the percentile score of Armed Forces Qualification Test, which was attached to the NLSY in 1981. The AFQT score is often used as a measure of ability in studies using NLSY. Again, black women in the group with high unemployment rates at entry are slightly positively selected. Except for this, there is little difference within each race and gender

group. At least, people who left during recessions are not negatively selected on education or pre-market human capital measured by the AFQT.

Table 3 also shows that black people are more likely to have graduated when the unemployment rate was low. This difference mainly comes from the difference in race compositions across states, suggesting that it is essential to control for the entry-state fixed effects. Also, timing and place of entry may be endogenous because people may try to avoid entering the labor market during recessions. The next section describes strategies to deal with these issues.

IV. Empirical Strategy

My goal is to identify the effect of the unemployment rate at labor market entry on subsequent wages for each gender and race group. To see the differences in persistence, I also allow the effect of the unemployment rate at entry to vary with potential experience (years since graduation from school).

Since the state unemployment rate may correlate with unobserved characteristics of each state, controlling for the entry-state fixed effects is essential. This is especially crucial for the comparison of blacks and whites, given the considerably different racial composition across states. Also, since less educated people entered the labor market earlier than within the same birth-year cohort, temporary macro shocks in the year of entry may be accidentally correlated with the years of schooling and cause bias. In particular, it is important to keep in mind that the majority of the sample who graduated from school during the recession in 1982-1983 are college graduates who have graduated from high school in the late 1970s.

To control for theses state fixed effects and year-of-entry effects, I include dummy variables for the state of entry and for the year of entry. The identification of the effect of high unemployment at entry relies on the variations in unemployment rates at the year- and state- level net of those fixed components. Given the strong auto-correlation of unemployment rates, I also need to control for current business cycles so that the estimated coefficients do not pick up cyclical ups and downs.

Specifically, consider the following wage function:

$$\log w_{it\tilde{s}ys} = \beta_{(t-y)} u_{ys} + \gamma_{(t-y)} u_{t\tilde{s}} + \delta' X_{it} + \phi_t + \eta_s + \mu_y + \varepsilon_{itys} \ldots (1)$$

where $w_{it\tilde{s}ys}$ is the real hourly wage of individual *i* who left school in year *y* and in state *s* observed in calendar year *t* and state $\tilde{s}$, is the unemployment rate of the year and the state of entry into the labor market, $u_{t\tilde{s}}$ is the current unemployment rate in the state of current residence, and is other control variables including potential experience, the highest grade completed and the age adjusted AFQT score. Unobserved error components are decomposed into a calendar year fixed effect ϕ_t , an entry-state fixed effect η_s , an entry-year fixed effect μ_y and the remaining error ε_{itys} .

If the sample size were large enough, (1) could be estimated separately for each gender and race. However, some states have too few black people to include entry-state dummies in the blacks-only regressions. Therefore, I employ a parsimonious specification that pools black and whites together, while I run separate regressions for men and women. To take into account differences in the wage-experience profiles and sensitivity to aggregate labor market conditions across race groups, I allow potential experience to enter

non-parametrically as $\alpha_{(t-y),g}$ and let the coefficients of unemployment rate at entry and at present vary across race and with potential experience. Furthermore, to incorporate the difference in racial wage gaps across regions, I include dummy variables for the ten BEA regions interacted with a dummy variable for blacks, θ_{rg} . On the other hand, δ , ϕ_t , η_s and μ_y are left common to both white and black:

$$\log w_{it\tilde{s}ysg} = \alpha_{(t-y),g} + \beta_{(t-y),g} u_{ys} + \gamma_{(t-y),g} u_{t\tilde{s}} + \delta' X_{it} + \phi_t + \eta_s + \theta_{rg} + \mu_y + \varepsilon_{itysg} \ldots (2)$$

here includes a dummy variable for blacks, years of schooling and the age adjusted AFQT score. (2) is estimated separately for men and women.

A potential source of bias that is still remaining is endogeneity of labor market entry. That is, some people may determine their timing and place of entry so that they can avoid entry during recessions. In theory, a high unemployment rate may increase enrolment to schools for two reasons: the relatively low opportunity cost of not working and avoidance of entering the slack labor market. Concerned mainly with the first aspect, Card and Lemieux (2000) have shown that a temporary rise of the local unemployment rate increases high school enrollment for age 15-17, although the effect on college enrollment is weak, indecisive for men and slightly negative for women, using the Current Population Survey. A similar concern applies to the geographical mobility. Using the Census data, Wozniak (2010) reports that college graduates tend to move to states with high labor demand when they enter the labor market, although less educated people do not move as often.

To see if the unemployment rate at entry or age 18 affects the year and the state of entry, I estimate several regressions over persons (not multiple observations per person) in

the following form:

$$Dept.\text{var}_i = \beta_g u_i + \delta' X_i + FEs + \varepsilon_i \ldots(3)$$

The first column of Table 4 indicates the dependent variables and the second column indicates what stands for: the unemployment rate at actual entry, at age 18 or at predicted entry. The predicted year of graduation is calculated as follows: year of birth + 18 for those without any degree/diploma and those with high school diploma or equivalent, year of birth +20 for those with AA and year of birth + 22 for those with BA, BS, master and doctor. I use the state of residence at age 14 for the state of residence at age 18 and at predicted entry. includes the race dummy and the age adjusted AFQT score, and are the set of fixed effects appropriate for the corresponding (see the notes below Table 4). The dependent variables in rows (2)-(4) are discrete choice indices, and the estimates reported in Table 4 are from the linear probability model for the sake of intuitive grasp. The results from probit model are similar in terms of both statistical significance and marginal effects measured at the mean of the explanatory variables.

Row (1) suggests weak positive effects of the unemployment rates on years of schooling, which is consistent with the findings by Card and Lemieux (2000) who use a larger dataset, although the effect of the unemployment rates at age 18 is not statistically significant. However, the effect on the likelihood of having a college degree (row (2)) is not statistically significant, either, and seems to be economically small as well: 1% rise of the unemployment rate changes the likelihood of proceeding to college at most by 1%.[8] Even if

[8] My estimates are smaller than those in Table 6 on Kahn (2010), which also reported the effect of unemployment rate at age 18 for white men in the NLSY79. This is probably due to differences in

some people avoid entering the labor market by staying in school, it does not affect the final degree attainment, perhaps because they can postpone or hasten completion of the degree without changing the targeted degree itself. Rows (3) and (4) show no strong evidence that people avoid graduating during a recession.

Overall, the unemployment rates at actual entry is correlated with the years of schooling, but correlation between labor market conditions at age 18 and options upon graduation is very weak for this sample from the NLSY. Therefore, I correct for this potential endogeneity of entry by instrumenting for with the unemployment rate in the predicted year of graduation based on the highest degree attained (in the same manner as in Table 4) and the state of residence at age 14.[9]

Since the state of residence at age 14 is obviously exogenous in this context, the question is whether the predicted year of entry is exogenous. In theory, the decision to attain a degree is a choice and those who proceed to college during a recession might be different from those who proceed to college during a boom. Empirically, however, Kahn (2010) shows that the correlations between characteristics of college graduates and unemployment rate at age 18 are weak for white men in the NLSY 79, suggesting that such endogeneity may be practically negligible. Genda et al (2010) also show that the future earnings of college graduates, which they use as a proxy for potential productivity, are not correlated with the

---

sample selection; Kahn (2010) dropped 1957 cohort and I dropped those who disappeared from the data by age 30.

[9] Note that information on college degree is not based on the years of schooling but is directly asked, thus it does not reflect some people staying more year without obtaining additional degrees. I assign the year of birth + 18 to high school drop-outs because Card and Lemieux (2000) find positive effects of the unemployment rate on high school completion; likewise I

unemployment rate at age 18 using the CPS.

Furthermore, from a practical viewpoint, using the unemployment rate at a particular age would be difficult. First, the unemployment rates at age 18 and younger do not have strong enough predictive power strong enough to work as an instrument for college graduates. Second, unemployment rates at older ages are unlikely to be independent of the error term, since the business cycle conditions in the first few years after entry may affect subsequent wages for high school graduates.

Moreover, Table 4 shows that the probability of having a college degree does not depend on the unemployment rate at age 18 much, and Card and Lemieux (2000) also report that effects of the unemployment rate on the likelihood of proceeding to college for students in the twelfth grade are statistically insignificant and variable in sign. Thus, there is evidence that the decision to obtain a college degree is not correlated with the labor market conditions. The details of the first stage regressions are presented in the appendix; in brief, the coefficients of the instrument are around 0.5 and always statistically significant at the 1% level.

V. Results

The first two columns of Table 5 reports $\beta_{(t-y),g}$ in equation (2), the coefficients of the unemployment rate at entry interacted with race and potential experience, estimated by separate OLS regressions for men and women. Not surprisingly, there are negative effects

---

ignore graduate degrees because Kahn (2010) reports that a recession at graduation from college slightly increases the likelihood of attaining a graduate degree.

right after entry for all demographic groups. However, the negative effect disappears in 6 years for black men, while the effect remains negative (though statistically insignificant) for white men. Also, for whites, the size of the effect is smaller for women; in fact, the effect is not statistically significant for white women even right after entry. Except that the effect for black women is stronger than that for black men, these observations are basically the same as what Figure 1 suggested.

The last two columns of Table 5 report the estimates by IV in the same way as the OLS results. Here, the unemployment rate in the state and the year of actual entry is instrumented by the unemployment rate that the person would have experienced if she had stayed in the same state since she was fourteen years old and gone straight to her final degree attained. This instrumental variable should correct biases from endogenous choice of timing and place of graduation conditional on the highest degree attained. Note that instrumental variable estimators in general have larger standard errors than the corresponding OLS estimators; in fact the standard errors in the last two columns in Table 5 are much larger than those in the first two columns. The endogeneity of entry seems to bias the OLS estimates towards zero for men, although the standard errors are also boosted.

Table 5 also reports the coefficients of years of schooling and the age adjusted AFQT score for comparison reason. The coefficients of the contemporaneous unemployment rate are not statistically significant, except that those for black men are significantly negative. This confirms that black men are the most affected group by the contemporaneous labor market conditions. Each set of fixed effects is jointly statistically significant.

To grasp the result more intuitively, Figure 2a and 2b plot the coefficients of the

unemployment rate at entry over years since leaving school for each race gender group. Figure 2a compares the OLS estimates of $\beta_{g(t-y)}$ and Figure 2b compares the IV estimates of $\beta_{g(t-y)}$. The gaps between men and women are larger in Figure 2b as the graphs for men shift downward while those for women shift slightly upward from Figure 2a. Yet, the same pattern across race hold for both OLS and IV estimates. These figures confirm the basic observations: the negative effect of high unemployment at entry is stronger for men than for women, and the slope is steeper (i.e. the effect fades faster) for blacks than for whites.

If the unemployment rate at entry has a negative effect on wages, it may well have a negative effect on employment. Therefore, I estimate the effect on employment by replacing the dependent variable in equation (2). Table 6 reports the results from the linear probability model.[10] Surprisingly, the estimated coefficients are mostly *positive*, although statistically insignificant. If those who were not employed were negatively selected on their potential wages, this positive effect would cause upward bias on the estimated effect. However, it is not very plausible that those with low potential wages are more likely to be employed when there is a negative shock to wages at the cohort level. Furthermore, the estimates tend to be larger for women, suggesting that decisions on marriages and fertility may matter. Thus, the direction of potential biases is ambiguous.

In any case, recall that non-employment does not necessarily imply missing wages because respondents who have worked since last interview report wages even if they are not employed in the week of survey. Thus, to examine this issue more directly, Table 7 reports

[10]The probit estimates are similar to the corresponding OLS estimates in Tables 6 and 7, in both statistical significance and marginal effects evaluated at the mean of explanatory

the effect on the likelihood of having a valid wage. The estimated coefficients are still positive but on average smaller and noisier. Also, except for the IV estimates of black women, the estimated effects are economically small compared to the effects of years of schooling and the AFQT score. Further, I tried replacing the missing wage data with imputed wages based on several slightly different versions of wage equations with individual fixed effects, and found little differences in the estimated coefficients in the wage regressions. Therefore, I believe that, even if there are biases from non-random selection of those lacking valid wages, they will not alter the qualitative conclusions.

VI. Conclusion

I have found the following facts. First, the initial impact of a recession at entry is stronger for African Americans than for whites, but the effect fades faster. Second, the negative effect is weaker for women than for men. Also, endogeneity of entry seems to cause underestimation of the effect for men. These findings are consistent with the economic theory reviewed in Section 2: the effect of a recession at entry will be stronger for people with stronger labor force attachment and more persistent for more skilled workers who are more likely to be on stable employment contracts.

To put it the other way around, the benefit from a tight labor market at entry lasts only for white men, who are more likely to be employed in a stable job with good training opportunities. Although the lower persistence of the effect of a recession for blacks might sound like an advantage, actually it also implies that they are more vulnerable to fluctuations

---

variables.

in labor demand later in their career and thus cannot keep a good job obtained at entry. Likewise, the weaker effect for women suggests that women cannot exploit the benefit from obtaining a good job at an early stage as much as men, presumably because of intermittence for marriage and childbirths.

It is difficult to distinguish one theory from the others. Note that skill level matters for both access to stable employment in high-paying jobs and returns to training. In theory, once a worker finds a good job after entry, a recession prior to the job change no longer matters in absence of human capital accumulation through the past on-the-job training. Therefore, controlling for labor demand at the beginning of the current job will cancel out the effect of a recession at entry if the loss of training opportunity does not matter. However, it is very difficult to simultaneously include unemployment rates in the year of leaving school and in the year of beginning of the current job, because they are highly collinear. Since this colinearity amplifies bias caused by misspecification of the effect of tenure and experience, it is necessary to include many interaction terms in the regression. The required sample size is far larger than the NLSY; this remains for future work.

Appendix A: Sample Restrictions and the Definition of Entry

On the course of defining year of entry, I drop people who dropped out from the survey before turning to 30 years old. Then, I drop people with less than 6 years of schooling. The year of entry cannot be defined for people who are still in school at age 30, and those who never go to school since 1979 and miss the year of last enrollment before 1979. To merge with state unemployment rate, people have to live in the contiguous United States in

the year of entry. I used state of residence at age 14 as the state of residence at entry for those entered before 1979. I also delete people who left school before getting 16 years old and those who have ever served in the army sometime within 12 years since leaving school. Lastly, I delete people whose state of residence at entry is too small to control state fixed effects (less than 20 people): Delaware, Hawaii, Idaho, Kentucky, Maine, Nebraska, Nevada, New Hampshire, New Mexico, North Dakota, Rhode Island, South Dakota, Utah, Vermont and Wyoming. The number of people deleted and remaining is summarized in Table A1.

Appendix B: First Stages

Table B1 is cross tabulation of age of actual and predicted entry. Many people actually enter the labor market several years after their predicted entry based on the highest degree ever received. This is partly because some people leave colleges without receiving degrees: about 24% of those with only high school diploma report one or more years in college in answer to the question on the highest grade completed. Also, about 20% of those assigned 22 as the age of predicted entry have graduate degrees. Other people simply did not go straight to their final degree. Even among those who completed exact the twelfth grade, about 10% have not finished schooling by the age of 20. For the state, the proportion of people who had moved across states since the age of 14 when they entered the labor market in each race-gender group is 13.6 % for white men, 9.6% of black men, 14.5% of white women and 11.6% of black women.

To see the correlation between the unemployment rates at actual entry and at predicted entry defined in Section 4, I estimate the following collapsed regression:

$$u_{ys} = \beta_g u_{\tilde{y}\tilde{s}} + \delta' X_i + \eta_{\tilde{s}} + \theta_{rg} + \mu_{\tilde{y}} + \varepsilon_i \ldots(5)$$

where $\tilde{y}$ is the year of predicted entry and $\tilde{s}$ is the state of residence at age 14. Equation (5) is estimated separately for men and women. β_g varies across race. includes the race dummy, the age adjusted AFQT score and years of schooling. $\eta_{\tilde{s}}$, θ_{rg}, $\mu_{\tilde{y}}$ are the fixed effects corresponding to the subscripts. The dataset consists of persons, not multiple observations per person. The upper panel of Table B2 reports estimated β_g : they are in the range of 0.37-0.51, and t-statistics are about 10. The correlation between the endogenous variable and the instrument is strong enough for all four race-gender groups.

The lower panel of Table B2 reports the coefficient of the instrument in the actual first stage regressions common to the IV estimates reported in Tables 5-7. Since the unemployment rate at entry is interacted with the four race-gender groups and the four 3-year potential experience brackets, there are sixteen pairs of endogenous variables and corresponding instruments. Therefore, there are sixteen separate first stage regressions. Table B2 reports only the coefficient of the instrument corresponding to the endogenous variable in each regression. For example, the upper right cell means that a unit increase of the instrument is associated to increase of the unemployment rate at actual entry by 0.454 for white men with 1-3 years of potential experience. The differences over potential experience are probably due to change in the composition of the sample caused by entry before 1979, which affect the group with 1-3 years of experience the most.

References

Beaudry, P. and J. DiNardo. 1991. The Effect of Implicit Contracts on the Movement of Wages over the Business Cycle: Evidence form Micro Data. Journal of Political Economy, 99 (4) 665-688.

Bowlus, A. J. 1995. Matching Workers and Jobs: Cyclical Fluctuations in Match Quality. Journal of Labor Economics, 13, 335-350.

Brunner, B. and A. Kuhn. 2014. The impact of labor market entry conditions on initial job assignment and wages, *Journal of Population Economics*, 27, 705-738.

Card, D. and T. Lemieux. 2000. Dropout and Enrollment Trends in the Post-War Period: What Went Wrong in the 1970s?. Working Paper no. 7658, National Bureau of Economic Research, Cambridge, MA.

Clark, K. and L. H. Summers. 1981. Demographic Differences in Cyclical Employment Variation. *The Journal of Human Resources,* 16 (1), 61-79.

Cutler, D. M. and L. Katz. 1993. Macroeconomic Performance of the Disadvantaged. *Brookings Papers on Economic Activity* part 2, 285-239.

Genda, Y., A. Kondo and S. Ohta. 2010. Long term effects of a recession at entry in Japan and the United States. *Journal of Human Resources,* 45 (1) 157-196.

Hershbein, B. J. 2012. Graduating High School in a Recession: Work, Education, and Home Production, *The B.E. Journal of Economic Analysis & Policy*, 12, 1-32.

Kahn, L. B. 2010. The Long-term Labor Market Consequences of Graduating College in a Bad Economy. *Labour Economics*, 17 (2) 303-316.

Kondo, A. 2012. Gender-specific labor market conditions and family formation. *Journal of Population Economics*, 25:151–174.

Maclean, J. 2014. The lasting effects of leaving school in an economic downturn on alcohol use, *Industrial and Labor Relations Review*, forthcoming.

Neumark, D. 2002. Youth Labor Markets in the United States: Shopping around vs. Staying put. *The Review of Economics and Statistics*, 84 (3) 462-482.

Oreopoulos, P., T. von Wachter and A. Heisz. 2012. The short-and long-term career effects of graduating in a recession. *American Economic Journal: Applied Economics*, 4 (1), 1-29.

Raaum, O. and K. Røed. 2006. Do Business Cycle Conditions at the Time of Labor Market Entry Affect Future Employment Prospects? *The Review of Economics and Statistics*, 88 (2), 193-210.

Speer, J.D. 2014. Wages, Hours, and the School-to-Work Transition: The Consequences of Leaving School in a Recession for Less-Educated Men, *mimeo*, University of Memphis.

Wozniak, A. 2010. Are College Graduates More Responsive to Distant Labor Market Opportunities? *Journal of Human Resources*, 45 (4), 944-970.

Table 1: Number of individuals and mean unemployment rate by year of entry

Year of entry	U. rates	White men	White women	Black men	Black women	Total
1973	4.88	3	5	3	1	12
1974	5.97	12	16	9	10	47
1975	10.90	57	79	35	41	212
1976	7.39	86	116	46	48	296
1977	6.84	103	138	62	62	365
1978	6.03	116	133	76	101	426
1979	5.81	155	202	94	117	568
1980	7.41	151	183	103	121	558
1981	7.89	174	185	87	125	571
1982	10.26	155	182	94	132	563
1983	10.12	124	126	61	83	394
1984	7.61	97	110	56	66	329
1985	7.34	92	95	34	49	270
1986	7.15	81	98	28	34	241
1987	6.43	55	65	16	34	170
1988	5.67	34	41	9	17	101
1989	5.27	31	25	9	15	80
1990	5.96	16	23	8	14	61
1991	6.83	15	17	3	9	44
1992	7.61	9	8	4	6	27
1993	6.66	3	7	3	0	13
Total	7.64	1,569	1,854	840	1,085	5,348

Table 2: Number of observations with and without valid wages (% of total number of observations in the corresponding race-sex-potential experience category)

	Exp.	White men	Black men	White women	Black women
With valid wages	1-3	3,715 (88.7%)	1,666 (75.4%)	3,962 (81.6%)	1,853 (63.3%)
	4-6	4,248 (93.2%)	2,101 (85.4%)	4,418 (81.8%)	2,220 (70.0%)
	7-9	4,110 (94.7%)	2,066 (86.2%)	4,147 (80.6%)	2,288 (74.8%)
	10-12	3,603 (94.5%)	1,824 (84.8%)	3,588 (78.0%)	2,054 (74.7%)
Missing wages due to non-employment	1-3	330 (7.9%)	466 (21.1%)	744 (15.3%)	1,002 (34.2%)
	4-6	171 (3.8%)	293 (11.9%)	820 (15.2%)	885 (27.9%)
	7-9	97 (2.2%)	258 (10.8%)	854 (16.6%)	716 (23.4%)
	10-12	81 (2.1%)	255 (11.9%)	872 (19.0%)	629 (22.9%)
Missing wages though being employed	1-3	145 (3.5%)	78 (3.5%)	151 (3.1%)	71 (2.4%)
	4-6	140 (3.1%)	65 (2.6%)	161 (3.0%)	65 (2.1%)
	7-9	131 (3.0%)	74 (3.1%)	145 (2.8%)	55 (1.8%)
	10-12	130 (3.4%)	72 (3.3%)	140 (3.0%)	68 (2.5%)

Figure 1: Average wage profiles (no control for state/year)

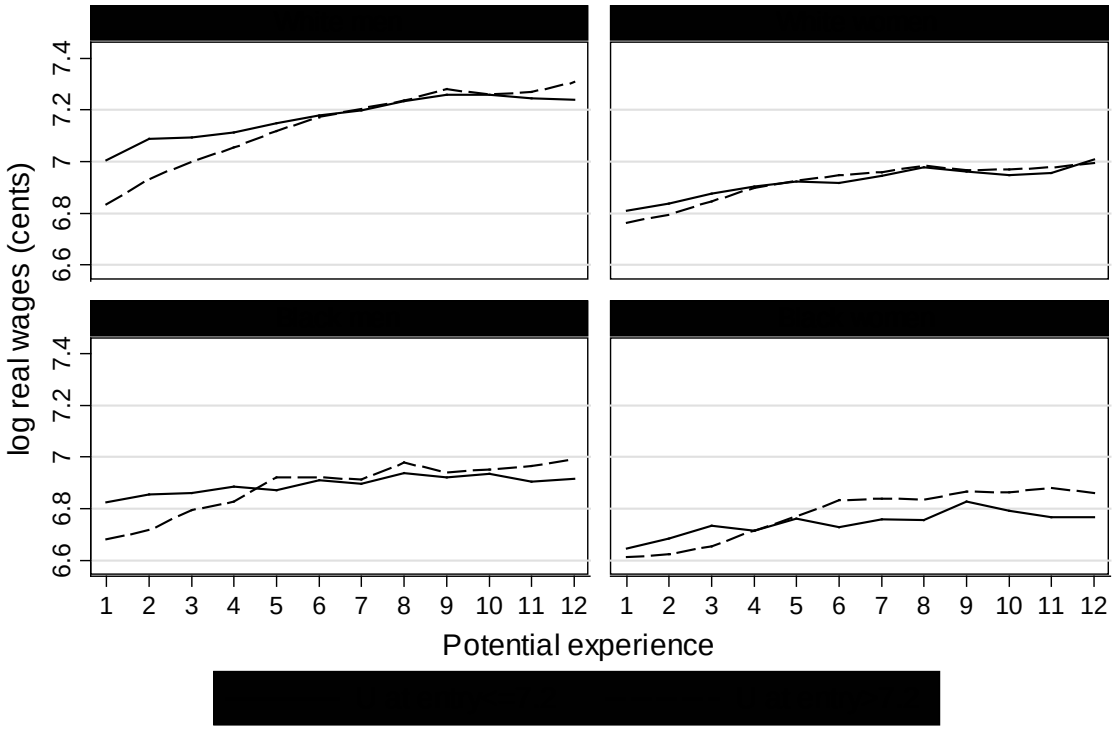

Table 3: Mean of selected predetermined variables by unemployment rate at entry

		White men	Black men	White women	Black women
Highest grades completed	U<=7.2	13.4	12.4	13.4	12.7
	U>7.2	13.4	12.3	13.4	13.0
Age adjusted AFQT score	U<=7.2	0.25	-0.93	0.16	-0.93
	U>7.2	0.27	-0.95	0.19	-0.82
# individuals	U<=7.2	778	442	938	593
	U>7.2	791	398	916	492

Note: 7.2% is the median of the unemployment rates at entry into the labor market among the entire sample (based on number of individuals).

Table 4: Correlation with unemployment rates at entry or age 18 and options upon graduation

Dependent var.	U at	White men	Black men	White women	Black women
(1) Years of schooling	Actual entry	0.024	-0.009	0.059	0.062
		[0.027]	[0.033]	[0.026]**	[0.030]**
	Age 18	0.047	0.027	-0.006	0.008
		[0.045]	[0.047]	[0.039]	[0.040]
(2) Having a college degree (AA, BA, BS)	Age 18	0.013	0.007	-0.003	-0.006
		[0.009]	[0.009]	[0.009]	[0.009]
(3) Actual entry is later than predicted entry	Predicted entry	0.011	0.009	0.013	0.021
		[0.014]	[0.014]	[0.014]	[0.015]
(4) Having changed state of residence	Actual entry	-0.003	0.004	-0.004	-0.002
		[0.006]	[0.007]	[0.005]	[0.006]

Note: OLS regressions (the linear probability model for rows (2)-(4)). The regressions on the unemployment rate at actual entry include dummies for year of entry and state of residence at entry. The regressions on the unemployment rate at age 18 include dummies for year of birth and state of residence at age 14. The regression on the unemployment rate at predicted entry includes dummies for year of predicted entry and state of residence at age 14. Standard errors are in brackets, clustered by the relevant pair of the year and the state. ***, **, * indicate statistically significant in 1%, 5% and 10%.

Table 5: The effect of the unemployment rate at entry on wages

	OLS		IV	
	Men	Women	Men	Women
U at entry				
White exp = 1-3	-0.016 [0.006]**	-0.008 [0.006]	-0.030 [0.016]*	0.006 [0.015]
White exp = 4-6	-0.011 [0.006]*	-0.006 [0.006]	-0.027 [0.011]**	-0.002 [0.011]
White exp = 7-9	-0.008 [0.006]	-0.003 [0.006]	-0.019 [0.012]	-0.002 [0.011]
White exp = 10-12	-0.007 [0.006]	-0.005 [0.007]	-0.029 [0.012]**	-0.004 [0.014]
Black exp = 1-3	-0.019 [0.008]**	-0.025 [0.007]***	-0.051 [0.023]**	-0.034 [0.028]
Black exp = 4-6	-0.013 [0.009]	-0.014 [0.007]**	-0.049 [0.019]**	-0.015 [0.019]
Black exp = 7-9	0.000 [0.009]	-0.007 [0.007]	-0.034 [0.020]*	0.003 [0.018]
Black exp = 10-12	0.008 [0.009]	-0.001 [0.007]	-0.028 [0.023]	0.024 [0.018]
Highest grade completed	0.062 [0.005]***	0.080 [0.004]***	0.057 [0.005]***	0.077 [0.005]***
Age adjusted AFQT score	0.104 [0.010]***	0.105 [0.010]***	0.108 [0.010]***	0.108 [0.011]***
Observations	22947	24233	22333	23404
R-squared	0.30	0.30	0.30	0.29

Note: The dependent variable is log real hourly wages (cents). Constant, current unemployment rates interacted with race and the three-year experience brackets, a race dummy, non-linear controls for potential experience differentiated by race are also included in the regressions though omitted from the table. OLS regressions include dummies for year of entry, state of residence at entry and year of the survey; IV regressions include dummies for year of predicted entry, state of residence at age 14 and year of the survey. Standard errors are in brackets, clustered by the year and the state of entry (predicted entry for IV). ***, **, * indicate statistically significant in 1%, 5% and 10%.

Figure 2a: Coeffcients of U at entry; OLS
(Taken from Table 5)

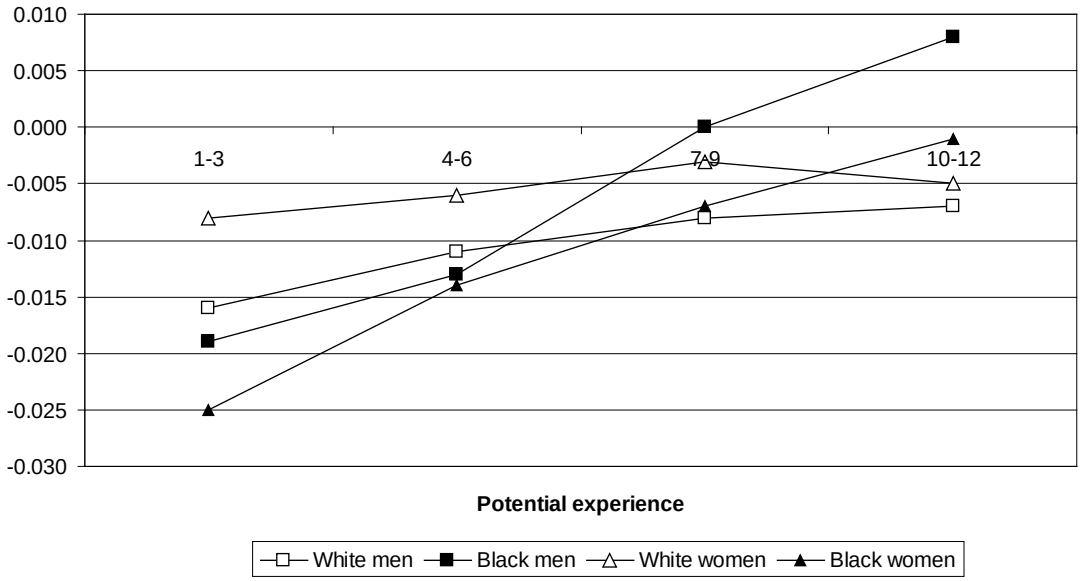

Figure 2b: Coeffcients of U at entry; IV
(Taken from Table 5)

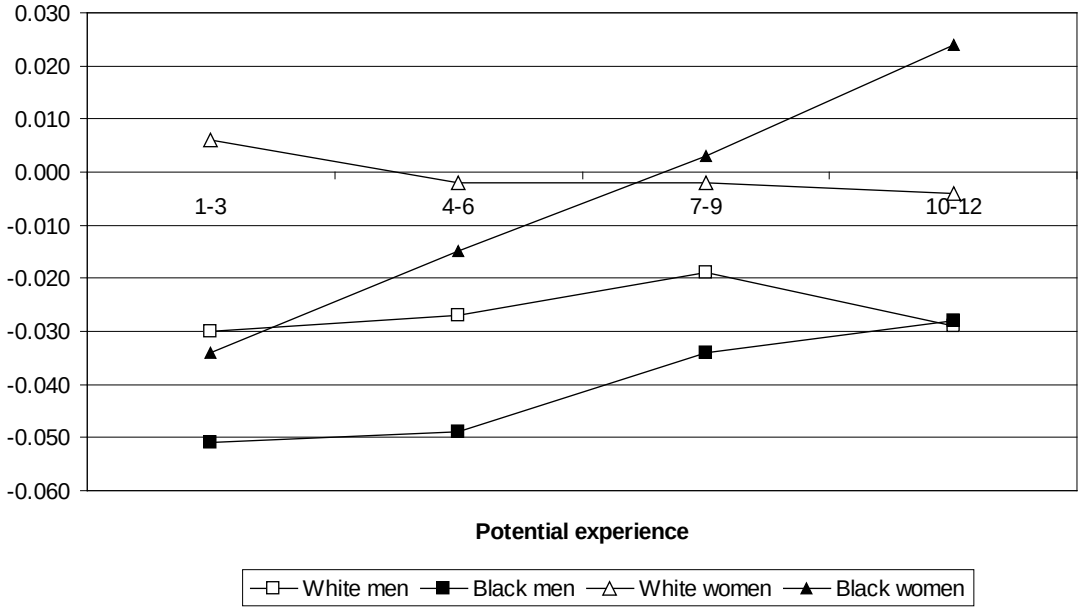

Table 6: The effect of the unemployment rate at entry on employment

	OLS		IV	
	Men	Women	Men	Women
U at entry				
White	0.000	0.009	-0.002	0.003
exp = 1-3	[0.005]	[0.004]*	[0.011]	[0.012]
White	0.000	0.002	0.002	0.004
exp = 4-6	[0.004]	[0.004]	[0.007]	[0.009]
White	0.003	0.005	0.006	0.007
exp = 7-9	[0.004]	[0.005]	[0.007]	[0.009]
White	0.004	0.005	0.001	0.008
exp = 10-12	[0.004]	[0.005]	[0.008]	[0.010]
Black	0.002	0.001	-0.003	0.033
exp = 1-3	[0.007]	[0.007]	[0.017]	[0.022]
Black	0.005	-0.001	0.005	0.010
exp = 4-6	[0.006]	[0.007]	[0.013]	[0.015]
Black	0.010	0.005	0.003	-0.003
exp = 7-9	[0.006]	[0.006]	[0.014]	[0.016]
Black	0.012	0.011	-0.008	-0.011
exp = 10-12	[0.006]*	[0.007]	[0.015]	[0.016]
Highest grade	0.023	0.045	0.023	0.047
completed	[0.002]***	[0.003]***	[0.003]***	[0.003]***
Age adjusted	0.035	0.043	0.037	0.051
AFQT score	[0.006]***	[0.008]***	[0.006]***	[0.008]***
Observations	25688	31460	24992	30430
R-squared	0.13	0.13	0.13	0.13

Notes: The dependent variable takes 1 if the respondent is employed. Linear probability model with the same right hand side variables as the OLS regressions in Table 5; see notes for Table 5.

Table 7: The effect of the unemployment rate at entry on likelihood of having a valid wage

	OLS		IV	
	Men	Women	Men	Women
U at entry				
White exp = 1-3	0.002 [0.004]	0.004 [0.004]	0.008 [0.009]	-0.002 [0.011]
White exp = 4-6	0.000 [0.003]	0.005 [0.004]	0.004 [0.006]	0.007 [0.008]
White exp = 7-9	0.002 [0.003]	0.007 [0.004]*	0.005 [0.006]	0.009 [0.008]
White exp = 10-12	-0.001 [0.003]	0.006 [0.005]	0.004 [0.006]	0.007 [0.009]
Black exp = 1-3	0.000 [0.006]	0.009 [0.007]	-0.01 [0.016]	0.047 [0.021]**
Black exp = 4-6	0.002 [0.005]	0.009 [0.007]	0.002 [0.011]	0.016 [0.014]
Black exp = 7-9	0.008 [0.005]	0.008 [0.006]	0.000 [0.011]	0.008 [0.014]
Black exp = 10-12	0.004 [0.005]	0.008 [0.006]	-0.015 [0.012]	-0.015 [0.015]
Highest grade completed	0.007 [0.002]***	0.034 [0.003]***	0.007 [0.003]***	0.035 [0.003]***
Age adjusted AFQT score	0.026 [0.005]***	0.035 [0.007]***	0.026 [0.005]***	0.041 [0.008]***
Observations	25,688	31,460	24,992	30,430
R-squared	0.09	0.13	0.09	0.13

Notes: The dependent variable takes 1 if the observation has a valid (positive) wage. Linear probability model with the same right hand side variables as the OLS regressions in Table 5; see notes for Table 5.

Table A1: Sample restrictions and sample size (number of individuals)

	Deleted	Remaining
Original NLSY 79 sample		12,686
Keep cross sectional white and black and supplemental black samples only; delete Hispanics, poor white and military sample	4,847	7,839
Dropped out from the survey before age 30	1,837	6,002
Highest grade completed at age 30 < 6	6	5,996
Enrolled at age 30 (except for two year college)	125	5,871
Not enrolled in 79 and missing last enrollment	46	5,825
State of residence at entry is missing	90	5,735
Age at entry <16	50	5,685
Served in the army sometime within 12 years since leaving school	293	5,392
State of residence at entry was too small (w/ <20 people in sample)	44	5,348

Table B1: Age of predicted entry and actual entry

	White men			White women		
	Age of predicted entry			Age of predicted entry		
Age of actual entry	18	20	22	18	20	22
16	54	0	0	68	0	0
17	61	1	0	99	0	0
18	368	7	1	474	9	3
19	244	6	2	211	16	4
20	82	17	3	97	26	11
21	45	15	13	36	24	19
22	31	9	125	33	14	189
23	29	11	105	27	21	83
24	18	9	57	25	12	46
25-30	63	20	129	88	35	114
Total	995	95	435	1,158	157	469
	Black men			Black women		
	Age of predicted entry			Age of predicted entry		
Age of actual entry	18	20	22	18	20	22
16	28	0	0	31	0	0
17	67	0	0	58	1	0
18	172	4	1	241	2	0
19	188	3	0	176	6	0
20	96	5	2	88	16	4
21	39	7	2	80	16	13
22	28	7	22	46	12	36
23	13	5	24	29	9	30
24	15	2	17	21	5	12
25-30	33	7	28	64	21	39
Total	679	40	96	834	88	134

Table B2: Coefficients of instruments in the first stage regressions

	White men	Black men	White women	Black women
Collapsed regressions	0.503	0.455	0.508	0.378
	[0.042]***	[0.054]***	[0.043]***	[0.047]***
Actual first stage (16 separate regressions)				
Potential Exp = 1-3	0.454	0.441	0.455	0.316
	[0.006]***	[0.006]***	[0.006]***	[0.006]***
Potential Exp = 4-6	0.574	0.523	0.589	0.404
	[0.007]***	[0.007]***	[0.006]***	[0.006]***
Potential Exp = 7-9	0.562	0.508	0.588	0.428
	[0.007]***	[0.007]***	[0.006]***	[0.006]***
Potential Exp = 10-12	0.557	0.534	0.589	0.454
	[0.006]***	[0.006]***	[0.006]***	[0.006]***

Note: See Appendix B for the detail. Standard errors are in brackets, clustered by the year of predicted entry and the state of residence at age 14. ***, **, * indicate statistically significant in 1%, 5% and 10%.