The career prospects of overeducated Americans *

Preliminary

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Abstract

In this paper we analyze career dynamics for the nearly 30% of U.S. workers who are deemed overeducated in the literature. We use data from the National Longitudinal Survey of Youth 1979 combined with the pooled 1989-1991 waves of the Current Population Survey to analyze overeducation status transitions and the corresponding effects on wages. We find that overeducation is a persistent phenomenon at the aggregate and individual levels, with 73% of workers remaining overeducated after one year. Further, the hazard rate out of overeducation drops by about 60% during the first 5 years spent overeducated. However, the estimation of a mixed proportional hazard model suggests that this is attributable to selection on unobservables rather than true duration dependence. Finally, overeducation is associated with lower current as well as future wages, which points to the existence of scarring effects.

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1 Introduction

Half of American workers have a level of education that does not match the level of education required for their job (see e.g., Leuven & Oosterbeek, 2011). Of these, a majority have more schooling than necessary, and are deemed "overeducated". As students, especially in the U.S., accumulate skyrocketing levels of college loan debt (845 billion dollars as of the second quarter of 2011, Source: NY Fed), there is a growing concern that expensive skills acquired in college may be underutilized in low-paying jobs. At the aggregate level, overeducation and undereducation could reflect skill mismatch, and be inefficient relative to an allocation of workers to jobs that require their actual level of education.[1]

In order to understand how much of a problem overeducation really is, it is crucial to go beyond the cross-sectional stylized facts and investigate longitudinal patterns. While the literature has paid relatively little attention to this dimension, analyzing transitions in overeducation status and the corresponding effects on wages is key to disentangling the role played by labor market frictions versus other factors such as selection on unobservable characteristics, compensating differentials and career mobility prospects.[2] For example, if overeducation was due to search frictions only, one would expect this type of mismatch to be transitory and concentrated early in the career. Conversely, selection on unobservables, compensating wage differentials or career mobility motives would generate persistence in the overeducation patterns.

[1]Throughout the paper, we use "matched" as a shorthand for "employed in a job that requires the level of schooling actually attained by the worker". Overeducation (respectively undereducation) spells correspond to situations where individuals have more (resp. less) schooling than required for their job. While our analysis primarily focuses on overeducation, it is worth noting that undereducation is also relatively common, in particular among individuals who have completed 14 years of education, and, as such, has the potential to account for some of the wage dispersion within this schooling category.

[2]The career mobility factor was initially investigated by Sicherman & Galor (1990). The general idea is that high-skilled workers may face higher promotion probabilities in low-skilled jobs. It follows that forward-looking individuals may find it optimal to be overeducated.

The individual persistence and duration-dependence of overeducated employment, together with the wage penalties associated with it are also important for the design of unemployment insurance and training programs. For example, encouraging early exit from unemployment may push more workers into overeducation with potentially negative long-term effect on earnings.[3]

The question of overeducation was first brought to the attention of economists and policy-makers by Freeman (1976), who argued that excess supply of college graduates was causing the decline in the college wage premium observed in the U.S. during the 1970's. Subsequent literature, recently surveyed by Leuven & Oosterbeek (2011), has produced two key results using different datasets and measures of overeducation.[4] The first finding is that around 30% of workers have more schooling than is required by their job. Second, wage returns to surplus schooling average 4.3%, which corresponds to only about half of the returns to required schooling.[5]

Little is still known about the evolution of overeducation over the life cycle, although, as argued above, dynamics are of clear interest in this context. U.S. evidence is particularly scarce.[6] A notable exception is Rubb (2003) who provides evidence from the Current Population Survey (CPS) that overeducation displays a substantial degree of persistence, with less than 20% of the individuals overeducated in year t switching to a job which matches their level of education in year $t+1$. While duration dependence and dynamic selection effects imply that these transition rates are likely to decrease over the length of the spell, the CPS panels are too short to address this question

[3]In a recent paper, Baert et al. (2013) show that accepting an overeducated job, versus staying unemployed, has the effect of postponing access to a matched job for a sample of Flemish youth.

[4]See, e.g., Hartog & Oosterbeek (1988); Verdugo & Verdugo (1989); Alba-Ramirez (1993); Kiker et al. (1997); Hartog (2000); Gottschalk & Hansen (2003) and Groeneveld & Hartog (2004).

[5]This finding is obtained by Leuven & Oosterbeek (2011) from an average of 151 studies.

[6]Using German, British, Canadian or Australian data a few studies have estimated panel wage regressions (Bauer, 2002; Frenette, 2004), dynamic random effect models of overeducation exit (Lindley & McIntosh, 2009; Mavromaras et al., 2013) or simply documented overeducation status transitions (Battu et al., 1999; Dolton & Vignoles, 2000).

adequately.

This paper fills the gap in the literature by providing the first analysis of the career dynamics of overeducated U.S workers. We use the National Longitudinal Survey of Youths 1979 (NLSY79), combined with the pooled 1989-1991 waves of the CPS, to analyze (1) the determinants of overeducation, (2) how overeducation incidence changes along the career, and (3) how wages differ across overeducated, matched or undereducated individuals, and as a function of previous overeducation and undereducation spells.

It is worth pointing out that while we borrow the wording "required" level of education from the existing literature, defining and measuring that concept is not a trivial task. In this paper we use a statistical measure, in a similar spirit as, e.g., Verdugo & Verdugo (1989) and Kiker et al. (1997). Namely, for each given occupation in the 1980 3-digit Census Occupation classification, we compute the required level of education from the 1989-1991 CPS as the mode of the distribution of schooling among the individuals of the same birth cohorts as in the NLSY79 working in that occupation. As such, while our required schooling variable is clearly correlated with the amount of schooling needed to access and perform well in an occupation, it is most cleanly interpreted as "the schooling attainment of a typical worker in one's job". Relative to alternative approaches which have been used in the literature, and in particular those measuring the required levels of education with the General Educational Development scale provided by the Dictionary of Occupational Title (see, e.g., Hartog, 1980, and Rumberger, 1987), it is arguably more transparent and has the benefit of directly generating requirements in terms of years of education. Since none of the occupations are found to require less than 12 years of schooling, we restrict our analysis to the individuals who have completed at least 12 years of education.

Depending on the aggregation level used for the educational attainment, we find

that, in our sample, between 22% and 30% of workers are overeducated. In particular, to the extent that overeducated workers earn substantially less than those holding a job which matches their educational level (around 4% less per year of overeducation), and that around half of college graduates are overeducated, this implies that overeducation accounts for a sizable portion of wage dispersion among those individuals.

Using the NLSY79, we document longitudinal patterns of overeducation up to 12 years after labor market entry. Overeducation and total mismatch (defined as under- plus overeducation) decrease somewhat as workers progress through their careers, but remain sizeable 12 years after the first job. This suggests that, while frictions may play a role, we need to bring other economic mechanisms into the fold to explain this long-term persistence. The aggregate dynamics appear particularly favorable to whites relative to blacks, even conditional on having a college degree. Overeducation is also a persistent phenomenon at the individual level, with around 73% of workers remaining overeducated after one year. Blacks are again especially likely to remain overeducated.

The hazard rate out of overeducation is also strongly decreasing, and drops by about 60% during the first five years spent overeducated. To investigate whether this reflects selection on unobservables or true duration dependence, we estimate a mixed proportional hazard model (Elbers & Ridder, 1982) of overeducation duration. While composition effects based on observables play next to no role, controlling for unobserved heterogeneity largely wipes out the duration dependence. The model identifies two groups of individuals: one-third of the sample has a very low hazard out of overeducation while rest is much more likely to exit overeducation quickly.

We then revisit the classical augmented wage regression used in the overeducation literature.[7] In particular, we stratify the procedure based on the unobserved hetero-

[7]Augmented wage regressions, pioneered by Duncan & Hoffman (1981) replace the usual years-of-schooling regressor with three terms: years of required schooling in the current occupation, years of schooling in excess of that required level and years of schooling below that required level. The

geneity types identified in the duration model. Interestingly, we show that individuals with lower propensities to exit overeducation also exhibit lower returns to schooling. We also find that even after applying the above stratification, past overeducation entails a large wage penalty for both types. This provides evidence of scarring effects, either through human capital depreciation or because past overeducation sends a negative productivity signal to employers (as in a screening model).

The remainder of the paper is organized as follows. Section 2 describes the data used in the analysis and the construction of the required schooling measure. Section 3 describes the determinants of overeducation in our sample. Section 4 documents the longitudinal patterns in the incidence of overeducation along the career. Section 5 estimates a mixed proportional hazard model of overeducation duration allowing to separate true duration dependence from dynamic selection on observed and unobserved worker attributes. Section 6 presents some results pertaining to the effect of overeducation on wages, and Section 7 concludes. Tables and Figures are collected in the Appendix.

2 Data and methodology

Our main data source is the NLSY79 which is a nationally representative sample of 12,686 young men and women who were 14-22 years old when they were first surveyed in 1979.[8] We pool the observations for the 6,111 individuals that comprise the core

corresponding coefficients are interpreted as returns to required schooling, returns to overschooling and returns to underschooling

[8]Of the 12,686 individuals interviewed in the initial 1979 wave these data provide information for respondents on a yearly basis from 1979 to 1994 and biyearly afterwards.The initial wave is comprised of a core civilian cross-section of 6,111 and an oversample of 5,295 black, Hispanic, and economically disadvantaged individuals born between January 1, 1957 and Dec. 31 1964. This is further supplemented by a military sample of 1,280 individuals born in the same period. We only keep the core cross-sectional sample of the NLSY79 in order to maintain a consistent sample between the NLSY79 and the CPS.

civilian cross section of the NLSY79, from the 1979 to the 2000 round (19 rounds), which results in 116,109 observations. We first exclude 36,666 observations from the survey waves before 1982 and after 1994.[9] Then we cut 5,947 observations with a level of education that was unreported or less than 12 years; 22,272 where the individual had not entered the labor market;[10] and 6,228 that were non-interviews. After making these cuts, we are left with a total of 44,996 observations corresponding to 4,895 distinct individuals.

The main variables of interest are the highest level of completed education, occupation, and the hourly wage at the time of each interview.[11] We also extract a set of covariates that describe the respondents and the job they occupy at the time of the interview such as ability measures, socio-demographic background, current household characteristics and non-wage job characteristics.

2.1 Measuring required schooling

The NLSY79 does not have direct measures of required schooling in the job occupied by the respondent. In this paper, we use a statistical measure for the required level of education, in a similar spirit as, e.g., Verdugo & Verdugo (1989) and Kiker et al. (1997). Namely, for each given occupation in the 1980 3-digit Census Occupation classification, we compute the required level of education from the pooled monthly samples of the

[9]Since the NLSY79 only reports 1980 Census Occupation codes annually for the 1982-1994 waves, we restrict our sample to these years. We match on the 1980 Census Occupation codes since they are both more recently revised than the 1970 codes, and are reported over a greater span of time than the 2000 codes.

[10]Individuals enter the labor market the first year where they work more than 26 weeks, have completed their highest observed level of education over the sample period, were not enrolled in high school or college as of May 1st of the survey year, and were not in the military.

[11]We adjust for inflation by reporting all wages in 2009 dollars and then drop the top and bottom 2.5% of the reported wages for every survey wave.

1989-1991 waves of the CPS.[12] In order to obtain a sample that matches the NLSY79 sample, we restrict the age range within each year of the CPS to that of the NLSY79 cohorts at that time. Required schooling in a given occupation code is then defined as the mode of the distribution of the levels of education among the individuals working in that occupation.

Relative to other approaches which have been used in the literature, and in particular those measuring the required levels of education with the General Educational Development scale (GED, see, e.g., Hartog, 1980, Rumberger, 1987), this method is more transparent and has the benefit of directly generating requirements in terms of years of education. A limitation is that it is based on the distribution of schooling attainment among employed workers in a occupation, which is an equilibrium outcome of labor supply and demand decisions. Fluctuations in demand and supply will affect that distribution even if the actual skills required to perform the job have not changed. Alternatively, one can simply think about the workers we identify as overeducated as, literally, those who have more schooling that the modal worker in their occupation (i.e. who are overeducated relative to their peers).

The 1989-1991 monthly CPS has a sample target of 50,000 households split into eight representative subsamples, each of which are interviewed for the first and last four months of a 16-month period. In any given month, a new sample of 6,250 households are interviewed for the first time, so the January 1989 through December of 1991 monthly CPS contains 268,750 unique households. We pool the CPS cross sections of individuals from each monthly survey and keep only the age range that corresponds to the NLSY79 cohort which amounts to 795,631 observations.Then we drop observations where an individual is unemployed or does not report a Census occupation code; has a missing level of education, did not complete their reported level of education, or are enrolled in

[12]See Yamaguchi (2012), who provides evidence based on task complexity that using occupations at the 3-digit level is key to properly capture the heterogeneity of jobs.

college.

After making these cuts, we are left with a pooled sample of 506,930 occupation and education level pairs. From this sample we compute the required level of education for each occupation as the mode of the distribution of the highest grade achieved within the occupation.[13] We then match observed occupations in the NLSY79 to their corresponding required levels of education calculated from the CPS.

2.2 Summary statistics

Table 1 presents summary statistics for a selection of variables from our sample. As one would expect given the design of the NLSY79, our sample has roughly equal proportions of men and women, and representative proportions of Black, and Hispanic respondents. Of the 44,996 observations with employment status, 84.7% are employed, 10.6% are out of the labor force, and 4.8% are unemployed.

In most of our analysis, we use a collapsed measure of years of education into four categories: 12-13 years, 14-15, 16-17, and over 18 years of completed education. While we lose some information by using this aggregate schooling measure rather than the yearly one, the main advantage of this measure is that it should mitigate concerns about classification errors. Furthermore, this classification is natural since each category corresponds to high school graduates, two-year and four-year college graduates, and graduate school. With this classification, in our sample, 66.05% are high school graduates, 12.9% have two years and 14.8% have four years of college education, and 6.25% have some graduate school experience.[14]

[13]The mode of observed education level for 125 of the 488 occupations is based on fewer than 100 observations. In order to reduce the noise in calculating the mode for these occupations, we collapse the three-digit Census occupation code into its corresponding two-digit category, and recalculate the mode for all occupations by the two-digit classification. For occupations with fewer than 100 observations, we simply replace the calculated mode with that of its corresponding two-digit category. Less than 2% of our NLSY79 observations are in such occupations.

[14]Note that these proportions are computed from the sample of individuals who have permanently

Figure 1 reflects the distribution of overeducation, generated by subtracting an individual's observed highest level of completed education, from the level of education required by their occupation. This distribution is largely consistent with previous results obtained in the literature, as nearly half of all observations have a perfect match of observed and required education, while progressively smaller fractions exhibit education level mismatch. We examine the sensitivity of the incidence of overeducation to the use of our aggregate (versus yearly) measure of schooling. Noteworthy, the distribution follows a similar pattern, with approximately half of all observations exhibiting a perfect match, and symmetric proportions of over and undereducation that fall as the intensity of mismatch increases. We further break down the overeducation status by our categorical measure of attained schooling in Table 3. It is apparent that overeducation is mechanically absent from the lowest schooling level (12 years of education) while undereducation is absent from the highest schooling level (18 years of education). Consistent with the existence of a relatively small number of jobs requiring 14 or 18 years of education, a very large fraction of the observations corresponding to those schooling levels exhibit education level mismatch. Although a larger share of jobs require 16 years of education, it is interesting to note that slightly more than half of college graduates are overeducated, typically working in a job requiring 12 years of education.

3 The determinants of overeducation

We start by documenting the cross-sectional determinants of overeducation in our sample. To do so, we use a linear probability model and regress, on the the pooled cross sec-

entered the labor market. We define the date of entry as the first survey year where (1) the individual is employed, (2) works more than 26 weeks out of the year, (3) is not enrolled in school as of May 1st of the survey year, and (4) has reached their highest level of education over the sample period 1982-1994. See Figures 2 and 3 for a distribution of this variable in the sample.

tions of respondents, the overeducation status indicator[15] on a set of socio-demographic characteristics, ability measures, current household characteristics and non-wage job characteristics. We stratify the regression by schooling level (Tables 11, 12, 13).

AFQT scores exhibit a negative and significant relationship with overeducation at all schooling attainments. This result is consistent with prior findings in the literature, mostly in the European context, of a negative relationship between different measures of ability and overeducation probability (see, e.g., Allen & Van der Velden, 2001 and Chevalier & Lindley, 2009).

Also in accordance with existing studies, female college graduates are more likely to be overeducated which may higher levels of frictions, possibly partly due to discrimination.[16] At other schooling levels, the female regressor is also either positive or insignificant. The correlation between being black and overeducation among college graduates is positive but insignificant. On the contrary, Hispanic college graduates are significantly *less* likely to be overeducated. A strong selection into college on unobservable ability is likely to explain this result for this minority group.

Workers in hazardous jobs are also more likely to be overeducated at all three levels of schooling. At first, this does not seem to provide support for a compensating wage differential story in which overeducated workers accepted low paying jobs because they present valuable non-pecuniary characteristics. As such, this result complements previous studies that have found a negative correlation between overeducation and job satisfaction.[17] However, this can arguably be reconciled with compensating wage differentials if a form of ability bias is at work, whereby, consistent with the existence of negative selection on AFQT, overeducated workers also tend to have low ability which

[15]This indicator is equal to one if an individual has a higher level of education than that required for their occupation.

[16]Those gender differences in overeducation rates, in connection with the existence of higher labor market frictions for females, are discussed in an early work by Frank (1978).

[17]See, e.g., Hersch (1991), Verhaest (2006b) and Korpi & Tåhlin (2009).

gives them access to lower levels of both pecuniary and non-pecuniary job benefits.

4 The dynamics of overeducation

We first consider below the evolution of aggregate schooling mismatch over time, before turning to the individual transitions between the overeducated, undereducated and matched states.

4.1 Aggregate incidence of schooling mismatch after labor market entry

In this section we describe how the total fraction of undereducated, matched and overeducated workers changes as years elapse after labor market entry.

We first break down the aggregate incidence of overeducation by attained schooling in Figure 5. Overall, the incidence of overeducation decreases but the incidence of undereducation increases over time. In addition, the reduction in the fraction of overeducated college graduates is small and limited to the first two years after labor market entry. After that the fraction of overeducated college graduates remains flat. It is worth noting that these patterns are not suggestive of a pure friction story in which initial mismatch is gradually resolved as workers reallocate themselves into jobs that match their level of schooling. [18]

Patterns across races are quite striking (Figure 8). The increase in the fraction of undereducated white high school graduates is around 50% faster than their black

[18]Since these figures are based on years since entry into the labor market, we lose one observation at the end of the sample period for every year a respondent delays entering the labor market. This characteristic of the sample is especially important for respondents with 18 years of education. Figures 6 and 7 describe the amount of right-censoring for the sample as a whole, and for each schooling category.

counterparts, possibly reflecting weaker career advancement prospects for the latter. Black college graduates also do not exhibit the same gradual reduction in overeducation as white college graduates. Instead, the fraction of overeducated increases over the career.

The evolution of mismatch over a worker's career appears rather favorable to women. Figure 9 shows that the fraction of female high school graduates who are undereducated is higher and increases faster than for male high school graduates. Similarly, the fraction of overeducated female college graduates is initially smaller than that of men and remains so at the end of the period. Of course, this is not a *ceteris paribus* statement. In fact, our linear probability model in section 3 suggests that women are more likely to be overeducated once we control for the observables available in our dataset. Similarly, our proportional hazard model in section 5 shows that the positive effect of being female on the probability of exiting overeducation disappears once the full set of covariates is included.

We proceed to compare the different AFQT quartiles in Figures 10 and 11. The fraction of undereducated high school graduates is increasing in the AFQT score, as one would expect if schooling can be substituted for with ability. Dynamic patterns for college graduates point to a similar story, with the lowest quartiles seeing increasing levels of overeducation when it instead decreases or remain stable for higher quartiles.

4.2 Individual annual transitions

Table 4 presents the estimated probabilities of being unemployed, undereducated, overeducated or matched conditional on the previous year's status. Overeducation is fairly persistent, with 73.4% of workers remaining overeducated after one year, while matched individuals have an 77.6% chance, and undereducated individuals a 44.3%, chance of remaining so. As another point of comparison, the unconditional incidence of overedu-

cation is 21.6%.[19] With a different measure of overeducation and using only the short CPS panels, Rubb (2003) obtains a similar persistence for overeducation (around 73%) but finds that matched individuals are more likely to remain so (88%). As we disaggregate by schooling level, we also find that among college graduates, being matched is not more persistent than being overeducated (63.0% vs. 63.2%, see Table 5), which is unlikely to be the case if most workers are involuntarily overeducated due to labor market frictions.

Transition rates are further broken down by gender and race in Tables 6 and 7. Men are slightly more likely than women to remain in an overeducated job (75.1% vs. 71.9%) though transitions from overeducation into matched jobs are similar (15.5% vs. 14.9%). Differences by race are sizeable: overeducation is more persistent among blacks relative to whites (76.6% vs. 73.1%) and overeducated blacks are almost two times less likely than whites to transition to a matched job (8.6% vs. 15.9%). Finally, as illustrated in Table 8, the persistence of overeducation decreases monotonically with AFQT scores (from 80.5% for the lowest quartile, to 69.7% for the highest one).

As a first step to investigate whether there might be an overeducation trap, we also report the hazard rates out of each state over time in Figure 4. The hazard rates out of overeducation, undereducation and matched employment decline with the length of the period considered. For example, after 2 years being overeducated, the probability of exiting that state drops from 29% to 19% only. This number drops further to 14% and 7% after 5 and 10 years respectively. Overall, these patterns are suggestive of a negative duration dependence but could also result from compositional effects (permanent heterogeneity correlated with the hazard rate out of overeducation). We attempt to tell these two effects apart in the next section.

[19]It is also worth noting that, in our data, overeducation is found to be more persistent than unemployment, with 48.3% of workers remaining unemployed after one year.

5 Duration dependence versus dynamic selection

The descriptive results discussed so far provide some suggestive evidence of duration dependence in the overeducation status, with a strongly decreasing hazard rate out of overeducation. However, in order to investigate the role played by true rather than spurious duration dependence, we need to control for dynamic selection on worker attributes. We discuss below the econometric model that we use to estimate the extent of true duration dependence.

We assume that the duration of the first overeducation spell follows a mixed proportion hazard model (see Elbers & Ridder, 1982), where the baseline duration follows a Weibull distribution.[20] Namely, the probability distribution function (pdf.) and cumulative distribution function (cdf.) of the duration of the first overeducation spell, conditional on the set of observed individual characteristics x_i and the unobserved heterogeneity ν_i, are respectively given by:

$$f\left(t|\mathbf{x}_i;\nu_i;\theta\right) = \exp\left(\mathbf{x}_i\beta\right)\alpha t^{\alpha-1}\nu_i \exp\left[-\exp\left(\mathbf{x}_i\beta\right)t^{\alpha}\nu_i\right]$$
$$F\left(t|\mathbf{x}_i;\nu_i;\theta\right) = 1-\exp\left[-\exp\left(\mathbf{x}_i\beta\right)t^{\alpha}\nu_i\right]$$

Following Heckman & Singer (1984), we assume that the unobserved heterogeneity is distributed according to a discrete distribution with R points of support. The parameters (α,β) and the unobserved heterogeneity distribution are then estimated by maximizing the log-likelihood of the data, which is given by:

[20] By definition, this model is estimated on individuals who have at least one overeducation spell, which mechanically excludes individuals with only 12 years of schooling.

$$\sum_{i=1}^{N} d_i \log f\left(t_i|\mathbf{x}_i;\theta\right) + \left(1-d_i\right)\log\left[1-F\left(T_i|\mathbf{x}_i;\theta\right)\right]$$

Where N is the sample size, t_i is the duration of the first overeducation spell, T_i is the length of time to the end of the survey and $d_i = 1$ if individual i leaves the overeducated state before the end of the survey. In practice, we consider that the overeducation spell ends when the individual starts a new employment spell in an occupation which does not require less than his level of schooling. It follows from this definition that the overeducation spell is still ongoing after a transition to unemployment. Finally, using the notations introduced above and denoting by $E_\nu(.)$ the expectation operator with respect to the distribution of ν, the pdf. (resp. cdf) of the overeducation spell duration is given by $f\left(t|\mathbf{x}_i;\theta\right) = E_\nu(f\left(t|\mathbf{x}_i;\nu_i;\theta\right))$ (resp. $F\left(t|\mathbf{x}_i;\theta\right) = E_\nu(F\left(t|\mathbf{x}_i;\nu_i;\theta\right))$).

It is interesting to compare the estimates for $R = 1$ (i.e. without unobserved heterogeneity) and $R = 2$ (i.e. with two unobserved heterogeneity types).[21] Table 9 reports the estimation results corresponding to the case without unobserved heterogeneity with alternative sets of individual controls. The estimated α is well below one (at around 0.78), which means that the hazard out of overeducation is strongly decreasing in the duration of overeducation, even after controlling for *observed* heterogeneity.

By contrast, once we allow for unobserved heterogeneity, as evidenced in Table 10, we obtain values for α that are very close to one, signifying the absence of true duration dependence. The model identifies two groups of individuals, where the first group has a very low hazard (type 1, 33.6% of the initially overeducated in the sample) while the second group is much more likely to exit overeducation quickly (type 2, 66.4% of the sample). As type 2s exit the pool of overeducated individuals, the probability that a

[21]Note that we performed the estimation with higher number of types, but they resulted in higher BIC criteria than the model with two types while attributing similar values for the key parameters.

random individual exits overeducation declines, as she is more and more likely to be a low-hazard, type 1 individual. The stark difference in hazard rates between the two unobserved groups suggests that overeducation follows different mechanisms in each case. The ratio between the two unobserved heterogeneity parameters is $\frac{V_1}{V_2} = 0.08$ which implies that type 2s exit the sample more than 10 times as fast as type 1s. The high exit rate in group 2 is consistent with a frictional view of overeducation. For the remaining third of the sample, it could be that their aptitude is not sufficient for jobs that match their level of formal schooling. Alternatively, they may have preferences for non-pecuniary, unobserved job characteristics found in jobs that required less schooling. In the next section we explore these ideas further as we examine whether the two types differ in the wage patterns they exhibit.

The coefficients on observable characteristics are consistent across the two specifications. In particular, they allow us to complement and refine the analysis of the raw dynamics by race presented in section 4. Consistent with these results, column two, with a smaller set of controls, shows a negative (though insignificant) sign on being black. Once the full set of controls is included, however, the coefficient becomes positive and significant. This would run against the notion that discrimination keeps Blacks in jobs where they are overeducated but it could also reflect over all lower job stability. The same argument could explain why having a GED diploma positively affects the probability of exiting overeducation while being born in the U.S. affects it negatively. The coefficient on work experience is negative: this implies that individuals for whom the first spell of overeducation happens later in the career are more likely to stay overeducated for longer. Interestingly, individuals living in a standard metropolitan statistical area (SMSA) tend to have shorter overeducation spells, which could be a mechanism through which cities enhance the accumulation of human capital (see, e.g., Glaeser & Maré, 2001).

6 Effects of overeducation on wages

In this section we first show that our data exhibits returns to schooling, underschooling and overschooling that are consistent with the rest of the literature. We then stratify the canonical augmented wage regression based on the heterogeneity types identified in the duration model.

6.1 Augmented wage regression

Estimates of the returns to overeducation are typically obtained by applying simple OLS to the following log-wage equation introduced by Duncan & Hoffman (1981):

$$\log w_{it} = \alpha^r S_{it}^r + \alpha^o S_{it}^o + \alpha^u S_{it}^u + X_{it}'\beta + \varepsilon_{it}$$

where, for any given individual i in year t, S_{it}^r, S_{it}^o and S_{it}^u denote respectively the number of years of required schooling, years of overeducation[22] and years of undereducation,[23] X_{it} a vector of controls (including experience and experience squared) and ε_{it} an idiosyncratic productivity shock. This model, which nests the standard Mincerian wage regression as a special case ($\alpha^r = \alpha^o = -\alpha^u$), allows for the estimation of separate wage returns to the (i) required years of schooling, (ii) years of overeducation, and (iii) years of undereducation.

Table 14 presents the pooled OLS parameter estimates for this model using our data.The results from our sample are broadly consistent with results in prior literature. Namely, we see a return of 6.9% for each additional year of education, roughly half the rate of return (3.1%) for additional years of education over the required level for an

[22]Defined as the difference, if positive, between completed and required years of schooling, zero otherwise.

[23]Defined as the difference, if positive, between required and completed years of schooling, zero otherwise.

occupation, and substantial wage penalties for years of undereducation (-4.5% for each additional year of undereducation).

Table 14 also reveals a number of expected results. In particular, we see a gender wage gap of 14.4%, and a compensating wage differential for hazardous occupations. Likewise, increasing an individual's AFQT score by one decile is associated with an approximate 2.8% increase in wage; and we see wage premiums relative to the North Central region of 5.6% in the Northeast and 8.6% in the West, consistent with relatively higher costs of living in these regions. Lastly, measures for labor market experience all have the expected sign. Those with greater tenure, number of hours worked per year, and total labor market experience all have higher wages. Conversely, those with frequent and long unemployment spells,[24] and those frequently switching jobs during the year experience have lower wage rates, all else equal.

Finally, Table 15 presents the estimation results from a log-wage regression which is further augmented with first and second lags in overeducation status. A first interpretation of these estimates is that there are scarring effects associated with overeducation. Namely, being overeducated in the last two years implies a significant reduction in wages of 3.2% and 3.3% respectively. To the extent that, consistent with the cyclical upgrading literature (see, e.g., Bils & McLaughlin, 2001), overeducation is likely to be more frequent during recessions, these results provide a potential explanation for the scarring effects of graduating during a recession which have been recently found in the literature (Oreopoulos et al., 2012, and Altonji et al., 2013).[25] Alternatively, even though this channel is arguably mitigated through the use of cognitive and non-cognitive ability controls, these results might still partly reflect a residual correlation between past overeducation spells and unobserved characteristics that affect productivity.

[24] As measured by total unemployment experience in weeks.

[25] See also Liu et al. (2012) who provide evidence from Norway that cyclical skill mismatch is an important mechanism behind the detrimental long-term impact of graduating during a recession.

6.2 Accounting for heterogeneity types

We discuss below the estimation results corresponding to our augmented wage regression once estimated separately for each of the unobserved types identified from the mixed proportional hazard model.[26] This approach complements the characterization of the two unobserved types discussed in Section 5, by allowing in particular for heterogenous returns to required schooling, years of over- and under-education across the two types. Stratifying the regressions by heterogeneity types also mitigates the endogeneity biases affecting the estimated returns to schooling, to the extent that the types overlap with unobserved differences in productivity.[27] A limitation to be kept in mind before interpreting the estimates is that those are based on the sample used for the mixed proportional hazard model, i.e. on the individuals with at least one overeducation spell.

Estimation results, with and without lagged overeducation regressors, are reported in Tables 17 and 18. The first observation is that the types identified using only the duration data have markedly different returns to schooling. In both specification, individuals with low propensity to exit overeducation (type 1) have returns to required schooling that are twice as low as their high propensity counterparts. The wage regression constant, however, is higher for type 1s. This suggests that Type 1 individuals are more productive than Type 2 individuals, which could partly explain their lower

[26] We predict the type of each individual in the sample using the posterior type probabilities implied by the estimated likelihood and that individual's characteristics. Specifically, we consider that the individual is of a given heterogeneity type if the posterior probability of being of this type is larger than 0.5.

[27] The instrumental variables approach is especially challenging in this context since a valid instrument must be provided for required schooling in addition to the usual instrument for schooling. The fixed effect approach can also be problematic. In this setting, the returns to schooling are identified off individuals changing jobs with different required schooling levels, and, in particular, switching across matched, undereducated and overeducated jobs. These transitions are likely to be correlated with changes in unobserved wage determinants. Besides, the fixed effect estimates may not be generalizable to those who never switch overeducation status or intensity.

propensity to exit these jobs.

Another important observation is that the returns to required schooling are overall lower than in the non-stratified regressions presented earlier. This is consistent with overeducation being correlated with low ability since the sample used for the stratified regressions is composed of individuals with at least one reported overeducation spell.

In both the specification with lags and without, type 2 individuals exhibit the usual pattern whereby returns to overeducation are much lower than returns to required schooling. As for type 1 individuals, they appear to have no returns to years of overeducation: they earn the same wages as if their schooling was that required by their jobs.

The fact that all of these individuals decided to go to college in spite of the fairly high risk of being overeducated and receiving negligible (monetary) benefits to college education is consistent with the existence of a positive consumption value of college attendance (see, e.g., Carneiro et al., 2003 and D'Haultfoeuille & Maurel, 2013). Also, the stratification by types does not remove the penalty for having been overeducated in previous periods, which turns out to be even larger than without stratifying. This is particularly interesting as it suggests these penalties are not purely the reflection of unobserved ability differences between those who have and have not been previously overeducated. Rather, it appears that overeducation produces scarring effects similar to what has been identified in the case of long-term unemployment.[28]

6.3 Long-term wage dynamics

Figure 12 describes the median hourly wage among workers in our four schooling attainment categories as they progress through their career. In particular, the graph exhibits

[28]The mechanism behind the scarring effect may involve a lower rate of human capital accumulation or result from past overeducation signalling lower ability to employers. We provide in Subsection 6. 3 evidence consistent with the former story.

a median college premium which grows from around 40% to around 60% after 10 years of market experiences and then back to around 40% at 12 years. Having "some college" warrants a smaller premium of about 15%, and the median workers in the "18 years" category earn about 15% more than the median college graduate. Once we condition this figure on initial overeducation status (in addition to actual schooling), we are able to provide an interesting longitudinal picture to complement the existing results on returns to over- and undereducation (see Figure 13). While the regressions found in the literature show the correlation between current overeducation and wages, we show how initial overeducation affects wages later in the career. The striking result here is that the premia and penalties from initial undereducation and overeducation appear very persistent over time for the first three schooling categories (12, 14 and 16 years). Notably, this suggests the existence of long-lasting scarring effects of being initially overeducated, consistent with the accumulation of specific human capital.

Finally, the top two graphs in Figure 13 show that undereducation has different implications for the 12 years and 14 years schooling categories. For workers in the 12 years category, being initially undereducated does not improve wages much early in the career. However, towards the end of our panel, initially undereducated individuals receive a premium of 20 to 25% compared to their "matched" peers. This is despite the fact that many of these initially undereducated high school graduates are working in jobs requiring up to 16 years of schooling. In other words they earn more than workers with their actual education, but less than matched workers in the jobs they occupy. This is consistent with the returns to underschooling found in the literature. By contrast, individuals in the 14 years category who find themselves initially undereducated have a wage path that is similar to that of college educated individuals. That is, they do not appear to be penalized for their undereducation. In both cases, far from converging, the wages of initially undereducated individuals remain consistently higher than their

matched peers.

7 Conclusion

Although economists and policy-makers have long been concerned about the determinants and wage effects of overeducation, little is still known about its dynamics along the career, particularly in the U.S. This paper uses data from the NLSY79 combined with the pooled 1989-1991 waves of the CPS to provide some of the first evidence on this question.

Overall, we find overeducation to be a persistent phenomenon, particularly for black workers and for low-ability workers, with lasting negative effects on wages. These wage penalties are consistent with a lower rate of human capital accumulation for overeducated workers (or alternatively with a screening model) and bear similarities with the scarring effects that have been found to accompany prolonged unemployment spells. The question, left for future research, becomes whether a marginal increase in unemployment duration is more or less harmful (in terms of lifetime earnings) than entering an overeducation spell.[29] The answer has bearing on the design of unemployment insurance - should early exit be encouraged at the cost of more mismatch - and the appropriate evaluation of the performance of employment agencies.

We find that controlling for dynamic selection on unobservable characteristics is key in this context. While the exit rate from overeducation decreases over the length of the overeducation spell, the estimation of a hazard model of overeducation duration that controls for both observed and unobserved heterogeneity suggests that true duration dependence is not strong. Rather, overeducation appears to be a different phenomenon for different groups of workers. On the one hand, it appears to be transitory (while

[29]Baert et al. (2013) explore a related question, namely whether accepting an overeducated job delays access to a non-overeducated job, and find that it does in their sample.

still entailing a long-term wage loss) for about two-thirds of overeducated individuals in our sample. For the rest, overeducation is instead very persistent. This latter group of individuals also exhibit very low returns to required schooling: that is, their wage prospects are not much better in jobs that match their relatively high schooling level.

In sum, our results suggest that overeducation is a complex phenomenon that involves a number of the classical ingredients of labor economics: human capital, search frictions, ability differences and perhaps compensating wage differentials. In order to quantify the importance of each mechanism and explore the effects of unemployment insurance or schooling subsidy programs, a promising avenue would be to estimate a dynamic structural model nesting all of these different channels while allowing for unobserved heterogeneity.

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A Tables and Figures

Table 1: Summary Statistics: Pooled Cross Section 1982-1994

Variable	Mean	(Std. Dev.)	Min.	Max.	N
Black	0.112	(0.315)	0	1	44,996
Hispanic	0.058	(0.233)	0	1	44,996
Female	0.514	(0.5)	0	1	44,996
Age	27.503	(3.904)	17	37	44,996
AFQT	0.503	(0.274)	0.01	0.99	43,052
North Central	0.304	(0.46)	0	1	44,748
Northeast	0.194	(0.395)	0	1	44,748
South	0.331	(0.471)	0	1	44,748
West	0.171	(0.377)	0	1	44,748
Urban	0.785	(0.411)	0	1	43,828
Unemployment Rate	6.814	(1.374)	4.058	11.083	44,748
Born in The United States	0.963	(0.189)	0	1	44,996
Mother's Edu. (Yrs., 1979)	11.965	(3.387)	0	20	41,395
Father's Edu. (Yrs., 1979)	11.714	(2.557)	0	20	43,102
Lived With Both Parents	0.673	(0.469)	0	1	44,996
Number of Children Ever Born	0.879	(1.09)	0	7	44,996
Married, Spouse Present	0.534	(0.499)	0	1	44,992
Expected Education Level (Yrs.)	14.028	(2.096)	7	18	44,800
Age at End of Education	20.628	(2.614)	16	37	44,996
Has GED (No HS Diploma)	0.09	(0.286)	0	1	44,996
Rotter Scale in 1979	8.44	(2.371)	4	16	44,669
Sociability in 1985	2.894	(0.669)	1	4	43,897
Highest Grade Completed (Collapsed)	13.225	(1.906)	12	18	44,996
Employed	0.847	(0.36)	0	1	44,996
Out of Labor Force	0.106	(0.307)	0	1	44,996
Unemployed	0.048	(0.213)	0	1	44,996
Weeks Unemployed	2.291	(7.991)	0	384	44,275
Weeks out of Labor Force	6.962	(16.938)	0	323	44,275
Individual Income (Year 2009 Dollars)	26,459	(19,368)	343	126,598	38,571
Hourly Wage (Year 2009 Dollars)	12.717	(6.158)	0	45.494	38,717
Family Poverty Status	0.08	(0.271)	0	1	39,878
Overeducation (Yrs.)	0.472	(1.84)	−6	6	37,028
Required Education (Yrs.)	12.87	(1.751)	10	18	34,535
Occupational Hazards	−0.138	(0.952)	−0.700	2.861	37,889

Table 2: Overeducation Status Proportions

	Continuous	Categories
Undereducated	16.7%	16.4%
Matched	53.8%	62.0%
Overeducated	29.6%	21.7%

Note: Comparison based on a continuous measure of observed education and a measure collapsed into four educational levels.

Table 3: Overeducation Status Proportions by Education

	12	14	16	18
Undereducated	6.9%	22.0%	4.1%	
Matched	93.1%	0.7%	44.8%	23.4%
Overeducated		77.3%	51.1%	76.7%

Note: Comparison based on a continuous measure of observed education and a measure collapsed into four educational levels.

Table 4: Transition Matrix

			t	
$t-1$	OE	UE	Matched	Unemp.
Overeducated	73.4%	6.0%	15.2%	5.3%
Undereducated	15.7%	44.3%	35.0%	4.9%
Matched	6.1%	5.0%	77.6%	11.2%
Unemployed	8.2%	3.1%	40.4%	48.3%
Total	21.6%	9.7%	52.4%	16.3%

Note: Sample has completed education.

Table 5: Transition Matrix by Education

(12 Years)			t	
$t-1$	OE	UE	Matched	Unemp.
Overeducated				
Undereducated		42.6%	52.3%	5.1%
Matched		5.4%	81.4%	13.2%
Unemployed		2.3%	49.0%	48.7%
Total		9.2%	69.9%	20.9%
(16 Years)			t	
$t-1$	OE	UE	Matched	Unemp.
Overeducated	63.0%	2.6%	29.2%	5.1%
Undereducated	28.1%	31.9%	34.8%	5.2%
Matched	29.4%	3.8%	63.2%	3.5%
Unemployed	31.9%	2.2%	23.1%	42.9%
Total	44.7%	4.9%	42.6%	7.8%

Note: Sample has completed education.

Table 6: Transition Matrix by Gender

(Male)			t	
$t-1$	OE	UE	Matched	Unemp.
Overeducated	75.1%	5.2%	15.5%	4.3%
Undereducated	18.6%	45.3%	32.5%	3.6%
Matched	6.5%	3.4%	80.9%	9.1%
Unemployed	10.1%	3.2%	56.0%	30.7%
Total	23.8%	7.9%	57.4%	10.9%
(Female)			t	
$t-1$	OE	UE	Matched	Unemp.
Overeducated	71.9%	6.9%	14.9%	6.4%
Undereducated	14.1%	43.8%	36.4%	5.7%
Matched	5.8%	6.5%	74.5%	13.2%
Unemployed	7.1%	3.0%	31.2%	58.7%
Total	19.9%	11.1%	48.3%	20.8%

Note: Sample has completed education.

Table 7: Transition Matrix by Race

(White) $t-1$	OE	UE	t Matched	Unemp.
Overeducated	73.1%	5.8%	15.9%	5.2%
Undereducated	15.1%	44.5%	35.3%	5.1%
Matched	6.1%	4.8%	75.1%	10.3%
Unemployed	8.1%	3.1%	41.1%	47.7%
Total	21.8%	9.7%	52.8%	15.7%
(Black) $t-1$	OE	UE	t Matched	Unemp.
Overeducated	76.6%	8.1%	8.6%	6.8%
Undereducated	21.4%	42.9%	32.1%	3.6%
Matched	4.3%	5.5%	74.8%	15.3%
Unemployed	9.1%	3.2%	36.1%	51.6%
Total	20.5%	9.7%	49.0%	20.9%

Note: Sample has completed education.

Table 8: Transition Matrix by AFQT Quartile

(1st) $t-1$	OE	UE	t Matched	Unemp.
Overeducated	80.5%	10.7%	2.5%	6.3%
Undereducated	14.1%	38.0%	43.8%	4.2%
Matched	0.7%	3.5%	78.9%	16.8%
Unemployed	3.0%	2.3%	46.5%	48.2%
Total	8.2%	6.7%	61.7%	23.4%
(2nd) $t-1$	OE	UE	t Matched	Unemp.
Overeducated	77.7%	6.7%	9.1%	6.5%
Undereducated	12.5%	46.3%	35.2%	6.0%
Matched	2.3%	5.0%	79.2%	13.5%
Unemployed	5.2%	2.1%	41.2%	51.5%
Total	14.1%	9.5%	56.1%	20.3%
(3rd) $t-1$	OE	UE	t Matched	Unemp.
Overeducated	74.6%	5.7%	13.8%	6.0%
Undereducated	16.5%	41.6%	36.1%	5.7%
Matched	7.6%	6.3%	78.4%	7.8%
Unemployed	13.4%	5.0%	39.6%	41.9%
Total	26.5%	11.3%	49.8%	12.4%
(4th) $t-1$	OE	UE	t Matched	Unemp.
Overeducated	69.7%	5.1%	21.0%	4.2%
Undereducated	20.5%	49.2%	27.2%	3.0%
Matched	17.7%	5.9%	71.4%	5.0%
Unemployed	17.3%	5.1%	30.8%	46.8%
Total	37.3%	11.0%	42.5%	9.2%

Note: Sample has completed education.

Table 9: Proportional Hazard Model (Out of Overeducation)

	1		2		3	
α	0.781***	(0.0289)	0.764***	(0.0289)	0.728***	(0.0290)
Constant	−3.414***	(0.2737)	−3.462***	(0.1497)	−3.537***	(0.0960)
Black	0.187**	(0.0581)	−0.217	(0.1361)		
Hispanic	−0.187	(0.1456)	0.224	(0.1611)		
Female	0.270	(0.1692)	0.159*	(0.0671)		
14 Years of Edu.	−0.628***	(0.0816)	−0.752***	(0.0778)		
18 Years of Edu.	−1.370***	(0.1063)	−1.241***	(0.1047)		
Age†	0.073	(0.0718)	0.101*	(0.0408)		
AFQT‡	−0.076	(0.2002)	0.395*	(0.1464)		
Northeast	0.015	(0.1005)				
South	0.129	(0.0877)				
West	−0.159	(0.1097)				
Urban	0.007	(0.1038)				
Unemployment Rate†	0.014	(0.1020)				
Born in The United States	−0.291*	(0.1212)				
HH in SMSA, Central City	−0.173*	(0.0852)				
HH in SMSA, Not Central City	−0.064	(0.0380)				
HH not in SMSA	−0.935*	(0.4371)				
Tenure (1k Wks.)	−0.034	(0.0381)				
Hours Worked (1k Hrs./Yr.)†	0.039	(0.0342)				
Number of Jobs (SLI)†	−0.037	(0.0523)				
Work Experience (1k Hrs.)†	−0.170**	(0.0522)				
Total Unemp. (Wks.)†	0.027	(0.0410)				
Mother's Edu. (Yrs., 1979)†	0.056	(0.0409)				
Father's Edu. (Yrs., 1979)†	0.112	(0.0793)				
Lived With Both Parents	0.126	(0.2614)				
Has GED (No HS Diploma)	0.407*	(0.1562)				
Rotter Scale in 1979†	0.021	(0.0358)				
Rotter Score^2	−0.027	(0.0249)				
Sociability in 1985†	0.045	(0.0344)				
Occupational Hazards	−0.156**	(0.0532)				
LL		4,918.8		4,952.1		5,064.1
Observations		1,731		1,731		1,731

Standard errors in parentheses
† Values converted to Z-scores
‡ Unit interval
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10: Mixed Proportional Hazard Model (Out of Overeducation)

	1		2		3	
α	0.968	(0.0636)	0.954	(0.0394)	1.098	(0.0500)
$P(V_1)$	0.336∗	(0.1224)	0.285∗∗	(0.0652)	0.555∗∗	(0.0444)
$P(V_2)$	0.664∗∗	(0.1224)	0.715∗∗	(0.0652)	0.445∗∗	(0.0444)
V_1	0.120∗∗	(0.0725)	0.055∗∗	(0.0457)	0.116∗∗	(0.0245)
V_2	1.446	(0.2706)	1.377∗∗	(0.1233)	2.104∗∗	(0.1723)
Constant	−3.812∗∗	(0.4107)	−4.070∗∗	(0.2089)	−4.345∗∗	(0.1405)
Black	0.212∗	(0.1010)	−0.146	(0.2007)		
Hispanic	−0.157	(0.1947)	0.404	(0.2175)		
Female	0.328	(0.2722)	0.278∗∗	(0.0922)		
14 Years of Edu.	−0.927∗∗	(0.1416)	−1.035∗∗	(0.1209)		
18 Years of Edu.	−1.733∗∗	(0.1416)	−1.619∗∗	(0.1543)		
Age†	0.243∗	(0.1034)	0.115∗	(0.0422)		
AFQT‡	−0.211	(0.2988)	0.718∗∗	(0.2355)		
Northeast	0.006	(0.1413)				
South	0.220	(0.1392)				
West	−0.077	(0.1512)				
Urban	0.004	(0.1643)				
Unemployment Rate†	−0.067	(0.1566)				
Born in The United States	−0.367	(0.1889)				
HH in SMSA, Central City	−0.208	(0.1423)				
HH in SMSA, Not Central City	−0.070	(0.0603)				
HH not in SMSA	−1.143	(0.6140)				
Tenure (1k Wks.)	−0.023	(0.0617)				
Hours Worked (1k Hrs./Yr.)†	0.004	(0.0561)				
Number of Jobs (SLI)†	−0.056	(0.0786)				
Work Experience (1k Hrs.)†	−0.177∗	(0.0700)				
Total Unemp. (Wks.)†	0.028	(0.0673)				
Mother's Edu. (Yrs., 1979)†	0.056	(0.0629)				
Father's Edu. (Yrs., 1979)†	0.036	(0.1250)				
Lived With Both Parents	0.241	(0.3427)				
Has GED (No HS Diploma)	0.704∗∗	(0.2428)				
Rotter Scale in 1979†	0.018	(0.0522)				
Rotter Score^2	−0.012	(0.0438)				
Sociability in 1985†	0.014	(0.0562)				
Occupational Hazards	−0.154∗	(0.0665)				
LL		4,892.3		4,912.3		5,008.1
Observations		1,731		1,731		1,731

Standard errors in parentheses
† Values converted to Z-scores
‡ Unit interval
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 11: Determinants of Overeducation (14 Years of Education)

	$\mathbb{1}\{Overeducated\}$	
Black	0.037	(0.0270)
Hispanic	0.023	(0.0297)
Female	−0.033	(0.0168)
Age	−0.015***	(0.0034)
AFQT‡	−0.228***	(0.0341)
Northeast	0.037	(0.0230)
South	0.040*	(0.0186)
West	0.049*	(0.0218)
Urban	0.047	(0.0261)
Unemployment Rate	0.008	(0.0059)
Born in The United States	0.065	(0.0511)
HH in SMSA, Central City	0.097***	(0.0247)
HH in SMSA, Not Central City	0.023	(0.0180)
HH Not in SMSA	0.073**	(0.0275)
Tenure (1k Wks.)	0.145**	(0.0495)
Hours Worked (1k Hrs./Yr.)	−0.009	(0.0101)
Number of Jobs (SLI)	0.011	(0.0097)
Work Experience (1k Hrs.)	0.004**	(0.0015)
Total Unemp. (Wks.)	0.001***	(0.0003)
Mother's Edu. (Yrs., 1979)	−0.008**	(0.0025)
Father's Edu. (Yrs., 1979)	0.002	(0.0035)
Lived With Both Parents	−0.001	(0.0170)
Has GED (No HS Diploma)	−0.069	(0.0418)
Rotter Scale in 1979	0.041*	(0.0192)
Rotter Scale^2	−0.002	(0.0011)
Sociability in 1985	−0.027*	(0.0111)
Occupational Hazards	0.043***	(0.0093)
Constant	1.146***	(0.1502)
Adjusted R^2		0.191
F		20.225
Observations		3,096

Standard errors in parentheses

Model includes controls for industry. Estimates not reported.

‡ Unit interval

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 12: Determinants of Overeducation (16 Years of Education)

	$\mathbb{1}\{Overeducated\}$	
Black	0.033	(0.0300)
Hispanic	−0.102*	(0.0419)
Female	0.054***	(0.0156)
Age	−0.010*	(0.0044)
AFQT‡	−0.233***	(0.0402)
Northeast	0.051*	(0.0210)
South	−0.007	(0.0184)
West	0.014	(0.0237)
Urban	−0.080**	(0.0282)
Unemployment Rate	0.011	(0.0059)
Born in The United States	−0.030	(0.0400)
HH in SMSA, Central City	0.026	(0.0223)
HH in SMSA, Not Central City	−0.003	(0.0179)
HH Not in SMSA	−0.031	(0.0296)
Tenure (1k Wks.)	0.115*	(0.0533)
Hours Worked (1k Hrs./Yr.)	−0.028**	(0.0107)
Number of Jobs (SLI)	0.032**	(0.0105)
Work Experience (1k Hrs.)	0.004*	(0.0019)
Total Unemp. (Wks.)	0.001	(0.0004)
Mother's Edu. (Yrs., 1979)	−0.001	(0.0027)
Father's Edu. (Yrs., 1979)	−0.002	(0.0036)
Lived With Both Parents	−0.048*	(0.0191)
Has GED (No HS Diploma)	−0.193	(0.1375)
Rotter Scale in 1979	−0.036	(0.0214)
Rotter Scale^2	0.002	(0.0013)
Sociability in 1985	−0.002	(0.0116)
Occupational Hazards	0.221***	(0.0141)
Constant	1.570***	(0.1712)
Adjusted R^2		0.221
F		31.066
Observations		4,025

Standard errors in parentheses

Model includes controls for industry. Estimates not reported.

‡ Unit interval

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 13: Determinants of Overeducation (18 Years of Education)

	$\mathbb{1}\{Overeducated\}$	
Black	−0.019	(0.0435)
Hispanic	0.016	(0.0594)
Female	0.068***	(0.0196)
Age	−0.031***	(0.0050)
AFQT‡	−0.281***	(0.0581)
Northeast	0.005	(0.0268)
South	0.027	(0.0244)
West	−0.017	(0.0266)
Urban	0.011	(0.0353)
Unemployment Rate	−0.014	(0.0081)
Born in The United States	0.076	(0.0494)
HH in SMSA, Central City	0.011	(0.0269)
HH in SMSA, Not Central City	0.047*	(0.0224)
HH Not in SMSA	0.024	(0.0338)
Tenure (1k Wks.)	0.337***	(0.0692)
Hours Worked (1k Hrs./Yr.)	−0.074***	(0.0119)
Number of Jobs (SLI)	−0.020	(0.0134)
Work Experience (1k Hrs.)	0.006**	(0.0021)
Total Unemp. (Wks.)	0.003***	(0.0007)
Mother's Edu. (Yrs., 1979)	0.000	(0.0033)
Father's Edu. (Yrs., 1979)	−0.013**	(0.0046)
Lived With Both Parents	0.031	(0.0225)
Has GED (No HS Diploma)	−0.198	(0.2588)
Rotter Scale in 1979	−0.062**	(0.0228)
Rotter Scale^2	0.004**	(0.0014)
Sociability in 1985	0.050***	(0.0145)
Occupational Hazards	0.043*	(0.0202)
Constant	2.193***	(0.1916)
Adjusted R^2		0.229
F		14.663
Observations		1,749

Standard errors in parentheses

Model includes controls for industry. Estimates not reported.

‡ Unit interval

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 14: Augmented log-wage regression

	$\ln(HourlyWage)$	
Years of Overeducation (Positive)	0.031^{***}	(0.0021)
Years of Undereducation (Positive)	-0.045^{***}	(0.0034)
Required Education (Yrs.)	0.069^{***}	(0.0021)
Black	0.005	(0.0105)
Hispanic	0.046^{***}	(0.0133)
Female	-0.144^{***}	(0.0060)
Age	−0.002	(0.0013)
AFQT‡	0.283^{***}	(0.0131)
Northeast	0.056^{***}	(0.0081)
South	-0.017^{*}	(0.0069)
West	0.086^{***}	(0.0084)
Urban	0.033^{***}	(0.0088)
Unemployment Rate	-0.014^{***}	(0.0022)
Born in The United States	-0.067^{***}	(0.0153)
HH in SMSA, Central City	0.048^{***}	(0.0095)
HH in SMSA, Not Central City	0.045^{***}	(0.0069)
HH Not in SMSA	-0.105^{***}	(0.0097)
Tenure (1k Wks.)	0.271^{***}	(0.0186)
Hours Worked (1k Hrs./Yr.)	−0.003	(0.0041)
Number of Jobs (SLI)	-0.062^{***}	(0.0043)
Work Experience (1k Hrs.)	0.014^{***}	(0.0006)
Total Unemp. (Wks.)	-0.001^{***}	(0.0001)
Mother's Edu. (Yrs., 1979)	0.003^{**}	(0.0010)
Father's Edu. (Yrs., 1979)	−0.000	(0.0014)
Lived With Both Parents	−0.001	(0.0063)
Has GED (No HS Diploma)	0.017	(0.0120)
Rotter Scale in 1979	−0.011	(0.0069)
Rotter Scale^2	0.000	(0.0004)
Sociability in 1985	0.007	(0.0042)
Occupational Hazards	0.036^{***}	(0.0032)
Constant	1.493^{***}	(0.0580)
Adjusted R^2		0.368
F		367.8
Observations		18,923

Standard errors in parentheses

‡ Unit interval

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 15: Augmented log-wage regression with lagged overeducation status

	$\ln(HourlyWage)$	
Years of Overeducation (Positive)	0.047***	(0.0039)
Years of Undereducation (Positive)	−0.059***	(0.0047)
Required Education (Yrs.)	0.072***	(0.0027)
Overeducated (t-1)	−0.032*	(0.0154)
Undereducated (t-1)	0.052***	(0.0156)
Overeducated (t-2)	−0.033*	(0.0144)
Undereducated (t-2)	0.035*	(0.0151)
Black	0.007	(0.0135)
Hispanic	0.038*	(0.0167)
Female	−0.158***	(0.0076)
Age	−0.003	(0.0017)
AFQT‡	0.301***	(0.0166)
Northeast	0.058***	(0.0102)
South	−0.017	(0.0087)
West	0.088***	(0.0107)
Urban	0.038***	(0.0110)
Unemployment Rate	−0.014***	(0.0035)
Born in The United States	−0.088***	(0.0198)
HH in SMSA, Central City	0.050***	(0.0124)
HH in SMSA, Not Central City	0.052***	(0.0086)
HH Not in SMSA	−0.109***	(0.0122)
Tenure (1k Wks.)	0.192***	(0.0221)
Hours Worked (1k Hrs./Yr.)	−0.012*	(0.0054)
Number of Jobs (SLI)	−0.068***	(0.0063)
Work Experience (1k Hrs.)	0.014***	(0.0008)
Total Unemp. (Wks.)	−0.000**	(0.0001)
Mother's Edu. (Yrs., 1979)	0.004**	(0.0013)
Father's Edu. (Yrs., 1979)	−0.002	(0.0018)
Lived With Both Parents	0.003	(0.0080)
Has GED (No HS Diploma)	0.041*	(0.0170)
Rotter Scale in 1979	−0.018*	(0.0089)
Rotter Scale^2	0.001	(0.0005)
Sociability in 1985	0.006	(0.0053)
Occupational Hazards	0.030***	(0.0040)
Constant	1.621***	(0.0735)
Adjusted R^2		0.333
F		175.9
Observations		11,917

Standard errors in parentheses

‡ Unit interval

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 16: Wage Growth With Intermediate States

	M to M			M to OE			OE to M			OE to OE		
	Direct	non-CPS	Unemp.	Direct	non-CPS	Unemp.	Direct	non-CPS	Unemp.	Direct	non-CPS	Unemp.
$(\infty, -10\%)$	14.2%	16.7%	25.6%	16.5%	23.6%	33.3%	10.7%	12.1%	0.0%	14.1%	17.9%	26.7%
$[-10\%, 5\%)$	25.9%	14.0%	14.3%	18.9%	10.1%	16.7%	22.4%	8.1%	0.0%	22.0%	13.4%	13.3%
$[5\%, 20\%)$	23.0%	16.3%	14.8%	24.0%	16.9%	0.0%	29.4%	12.9%	22.2%	25.7%	14.4%	16.7%
$[20\%, 35\%)$	13.9%	12.9%	13.5%	15.3%	12.4%	16.7%	11.7%	16.9%	33.3%	15.0%	15.0%	8.9%
$[35\%, \infty)$	23.0%	40.1%	31.8%	25.4%	37.1%	33.3%	25.8%	50.0%	44.4%	23.1%	39.3%	34.4%
Women												
$(\infty, -10\%)$	13.7%	14.9%	29.0%	18.2%	20.0%	50.0%	7.7%	10.7%	0.0%	14.7%	17.1%	27.5%
$[-10\%, 5\%)$	25.4%	15.9%	13.8%	21.6%	12.5%	0.0%	25.0%	9.3%	0.0%	22.3%	16.7%	13.7%
$[5\%, 20\%)$	24.3%	19.3%	12.4%	25.7%	15.0%	0.0%	29.2%	14.7%	0.0%	25.1%	11.7%	21.6%
$[20\%, 35\%)$	14.1%	15.0%	12.9%	9.5%	12.5%	0.0%	13.1%	14.7%	42.9%	13.1%	16.0%	9.8%
$[35\%, \infty)$	22.5%	34.8%	31.8%	25.0%	40.0%	50.0%	25.0%	50.7%	57.1%	24.8%	38.5%	27.5%
Men												
$(\infty, -10\%)$	14.6%	17.9%	21.4%	15.1%	26.5%	25.0%	13.9%	14.3%	0.0%	13.7%	18.6%	25.6%
$[-10\%, 5\%)$	26.2%	12.8%	14.8%	16.7%	8.2%	25.0%	19.6%	6.1%	0.0%	21.8%	10.2%	12.8%
$[5\%, 20\%)$	22.2%	14.4%	17.6%	22.6%	18.4%	0.0%	29.7%	10.2%	100.0%	26.2%	17.0%	10.3%
$[20\%, 35\%)$	13.7%	11.6%	14.3%	19.9%	12.2%	25.0%	10.1%	20.4%	0.0%	16.7%	14.0%	7.7%
$[35\%, \infty)$	23.4%	43.4%	31.9%	25.8%	34.7%	25.0%	26.6%	49.0%	0.0%	21.7%	40.2%	43.6%
16 Yrs. Edu.												
$(\infty, -10\%)$	9.3%	9.1%	12.5%	17.4%	26.3%	40.0%	10.9%	13.3%	0.0%	17.1%	23.4%	42.3%
$[-10\%, 5\%)$	21.7%	9.1%	25.0%	18.6%	9.2%	0.0%	20.7%	8.6%	0.0%	16.9%	13.6%	3.8%
$[5\%, 20\%)$	28.8%	18.2%	12.5%	22.0%	19.7%	0.0%	29.7%	8.6%	12.5%	22.2%	10.4%	19.2%
$[20\%, 35\%)$	15.6%	15.6%	37.5%	15.5%	10.5%	20.0%	11.2%	16.2%	37.5%	16.2%	20.1%	3.8%
$[35\%, \infty)$	24.6%	48.1%	12.5%	26.5%	34.2%	40.0%	27.5%	53.3%	50.0%	27.6%	32.5%	30.8%

Note: Sample has completed education.

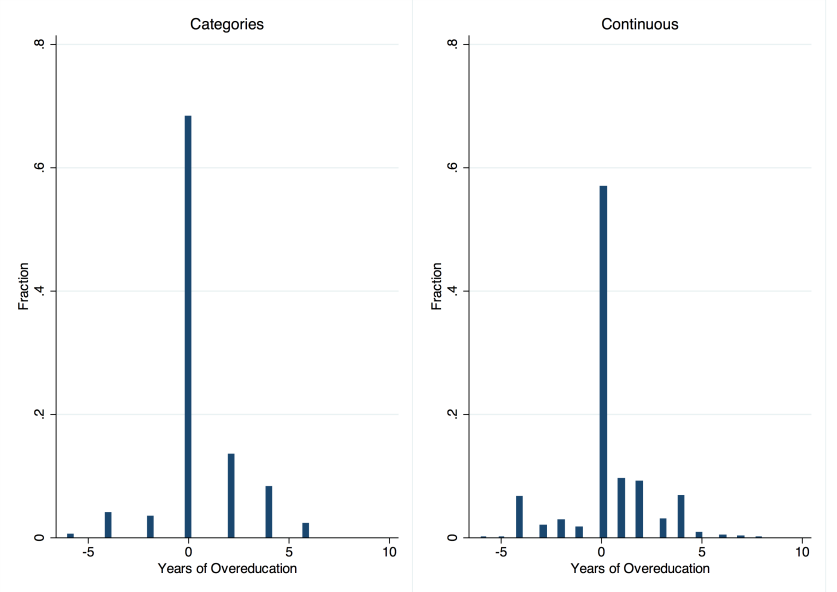

Figure 1: Distribution of Overeducation

Table 17: Augmented log-wage regression with unobserved types

	(Type 1) $\ln(HourlyWage)$		(Type 2) $\ln(HourlyWage)$	
Years of Overeducation (Positive)	0.004	(0.0053)	0.012*	(0.0059)
Years of Undereducation (Positive)	−0.055***	(0.0093)	−0.040*	(0.0187)
Required Education (Yrs.)	0.042***	(0.0047)	0.060***	(0.0054)
Black	−0.016	(0.0250)	0.074**	(0.0279)
Hispanic	−0.018	(0.0289)	0.144***	(0.0399)
Female	−0.109***	(0.0132)	−0.109***	(0.0161)
Age	0.011***	(0.0032)	−0.003	(0.0040)
AFQT‡	0.309***	(0.0327)	0.327***	(0.0381)
Northeast	0.066***	(0.0185)	0.073**	(0.0223)
South	−0.060***	(0.0160)	0.049**	(0.0189)
West	0.020	(0.0195)	0.116***	(0.0220)
Urban	0.023	(0.0251)	0.057*	(0.0262)
Unemployment Rate	−0.025***	(0.0052)	−0.019**	(0.0061)
Born in The United States	−0.094*	(0.0385)	−0.140**	(0.0426)
HH in SMSA, Central City	0.071***	(0.0199)	0.025	(0.0233)
HH in SMSA, Not Central City	0.086***	(0.0149)	0.072***	(0.0188)
HH Not in SMSA	−0.110***	(0.0257)	−0.070*	(0.0274)
Tenure (1k Wks.)	0.183***	(0.0475)	0.120*	(0.0505)
Hours Worked (1k Hrs./Yr.)	−0.011	(0.0096)	−0.031**	(0.0109)
Number of Jobs (SLI)	−0.060***	(0.0097)	−0.099***	(0.0115)
Work Experience (1k Hrs.)	0.013***	(0.0014)	0.015***	(0.0017)
Total Unemp. (Wks.)	−0.002***	(0.0003)	0.001*	(0.0004)
Mother's Edu. (Yrs., 1979)	0.001	(0.0023)	−0.003	(0.0026)
Father's Edu. (Yrs., 1979)	−0.001	(0.0031)	0.012**	(0.0037)
Lived With Both Parents	−0.021	(0.0158)	0.043*	(0.0181)
Has GED (No HS Diploma)	−0.075	(0.0526)	0.033	(0.0917)
Rotter Scale in 1979	−0.017	(0.0179)	−0.012	(0.0186)
Rotter Scale^2	0.001	(0.0011)	0.000	(0.0011)
Sociability in 1985	0.017	(0.0099)	0.019	(0.0119)
Occupational Hazards	−0.002	(0.0110)	0.048***	(0.0092)
Constant	1.790***	(0.1438)	1.669***	(0.1629)
Adjusted R^2		0.320		0.270
F		59.0		37.9
Observations		3,704		2,998

Standard errors in parentheses

‡ Unit interval

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 18: Augmented log-wage regression with unobserved types

	(Type 1) $\ln(HourlyWage)$		(Type 2) $\ln(HourlyWage)$	
Years of Overeducation (Positive)	0.002	(0.0069)	0.021**	(0.0078)
Years of Undereducation (Positive)	−0.026	(0.0137)	−0.076*	(0.0325)
Required Education (Yrs.)	0.018**	(0.0061)	0.055***	(0.0074)
Overeducated (t-1)	−0.116***	(0.0207)	−0.089*	(0.0403)
Undereducated (t-1)	−0.097**	(0.0326)	0.020	(0.0789)
Overeducated (t-2)	−0.127***	(0.0198)	−0.087*	(0.0398)
Undereducated (t-2)	−0.078*	(0.0305)	−0.030	(0.0734)
Black	−0.020	(0.0305)	0.069	(0.0370)
Hispanic	−0.040	(0.0355)	0.112*	(0.0520)
Female	−0.121***	(0.0167)	−0.102***	(0.0215)
Age	0.005	(0.0043)	−0.015**	(0.0055)
AFQT‡	0.292***	(0.0417)	0.352***	(0.0502)
Northeast	0.095***	(0.0234)	0.061*	(0.0290)
South	−0.060**	(0.0202)	0.057*	(0.0246)
West	0.027	(0.0250)	0.145***	(0.0289)
Urban	0.011	(0.0322)	0.089**	(0.0331)
Unemployment Rate	−0.001	(0.0080)	−0.020*	(0.0097)
Born in The United States	−0.094	(0.0493)	−0.250***	(0.0607)
HH in SMSA, Central City	0.084**	(0.0257)	0.030	(0.0313)
HH in SMSA, Not Central City	0.107***	(0.0185)	0.088***	(0.0244)
HH Not in SMSA	−0.098**	(0.0332)	−0.045	(0.0354)
Tenure (1k Wks.)	0.142*	(0.0569)	0.035	(0.0613)
Hours Worked (1k Hrs./Yr.)	−0.020	(0.0129)	−0.061***	(0.0152)
Number of Jobs (SLI)	−0.024	(0.0146)	−0.101***	(0.0179)
Work Experience (1k Hrs.)	0.014***	(0.0019)	0.019***	(0.0023)
Total Unemp. (Wks.)	−0.002***	(0.0005)	0.002**	(0.0006)
Mother's Edu. (Yrs., 1979)	0.000	(0.0029)	−0.004	(0.0035)
Father's Edu. (Yrs., 1979)	−0.003	(0.0040)	0.015**	(0.0049)
Lived With Both Parents	−0.037	(0.0204)	0.035	(0.0235)
Has GED (No HS Diploma)	−0.026	(0.0718)	0.122	(0.1417)
Rotter Scale in 1979	−0.022	(0.0232)	−0.011	(0.0244)
Rotter Scale^2	0.001	(0.0015)	0.000	(0.0014)
Sociability in 1985	−0.000	(0.0124)	0.017	(0.0156)
Occupational Hazards	0.005	(0.0145)	0.054***	(0.0120)
Constant	2.414***	(0.1875)	2.317***	(0.2190)
Adjusted R^2	46	0.291		0.231
F		28.6		17.7
Observations		2,286		1,887

Standard errors in parentheses

‡ Unit interval

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

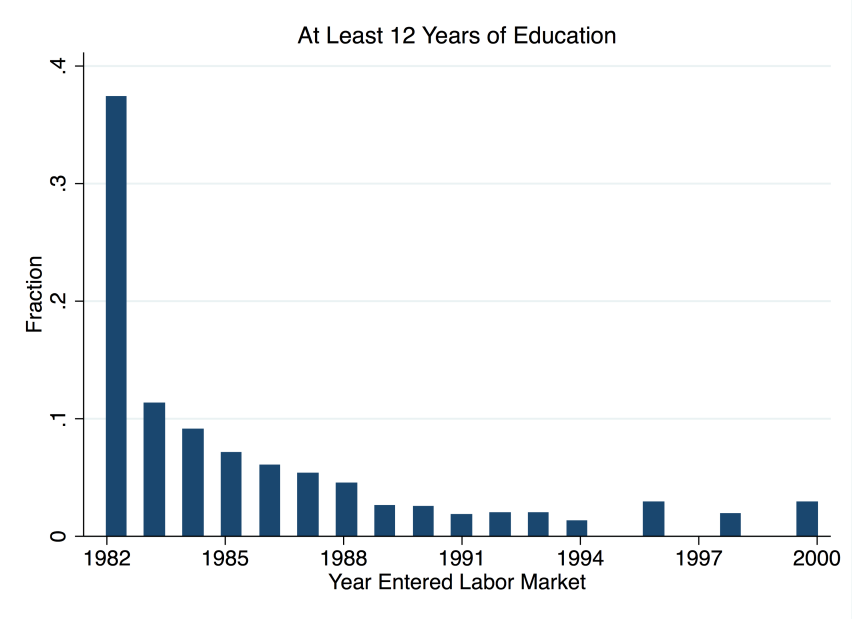

Figure 2: Distribution of Labor Market Entry

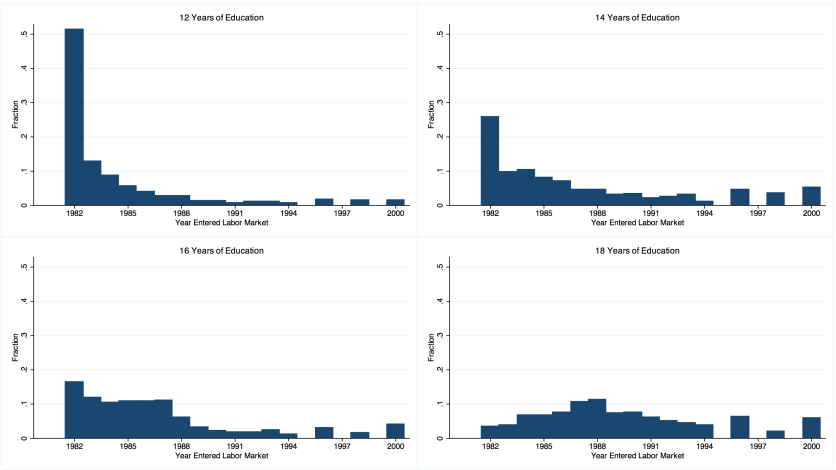

Figure 3: Distribution of Labor Market Entry

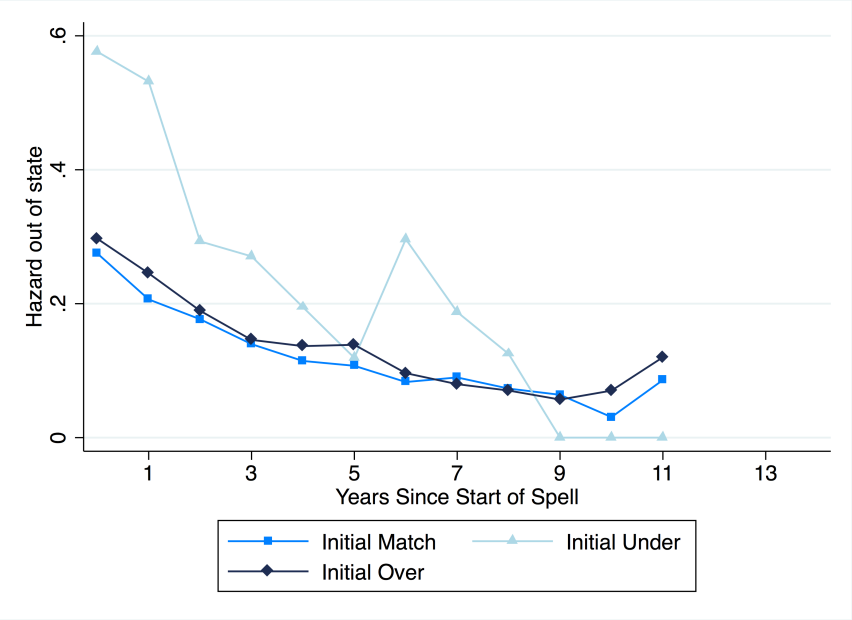

Figure 4: Hazard out of Over- and Under-education

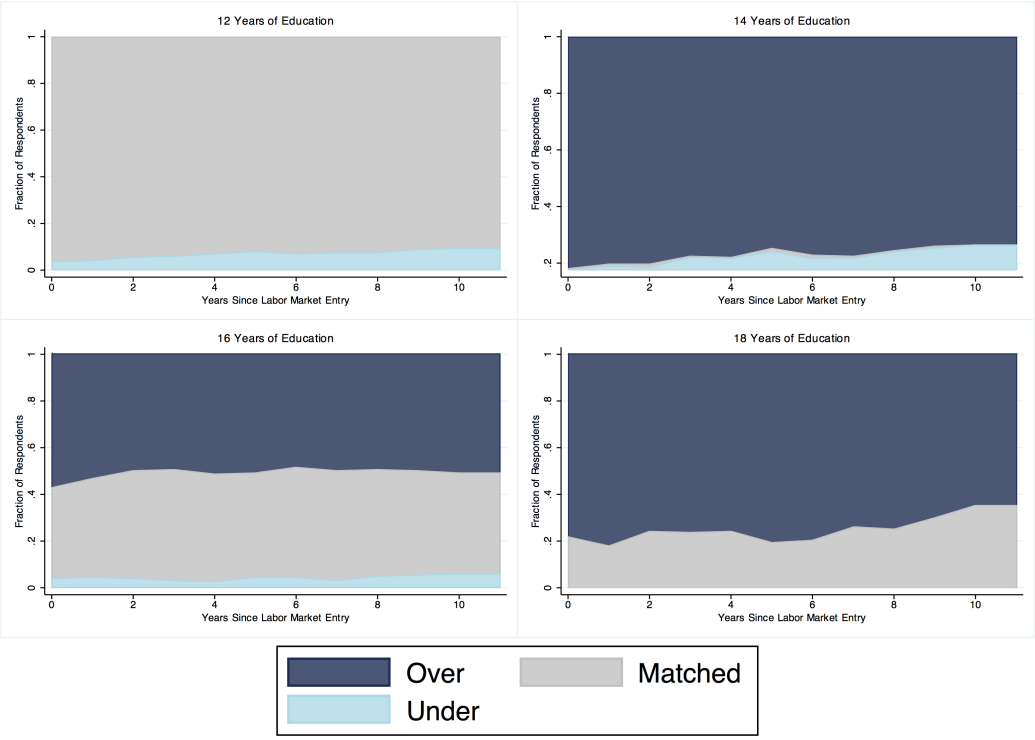

Figure 5: Aggregate incidence of Overeducation by Education Level (Fraction of Respondents)

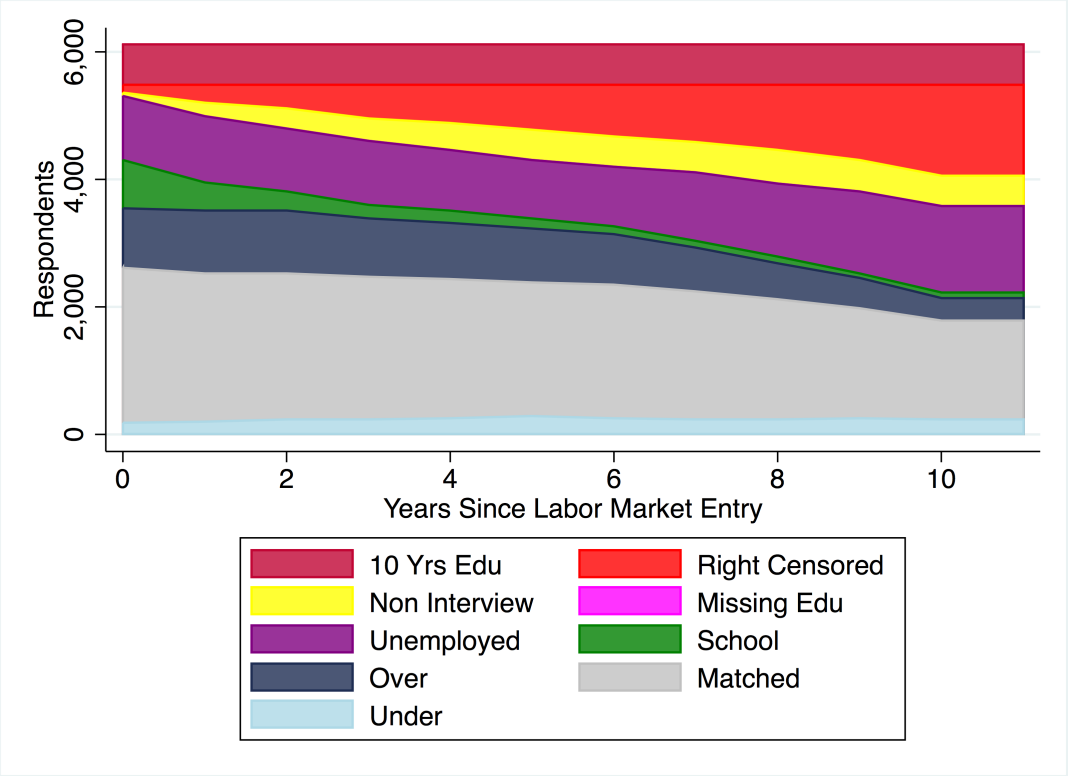

Figure 6: Aggregate incidence of Overeducation (Number of Respondents)

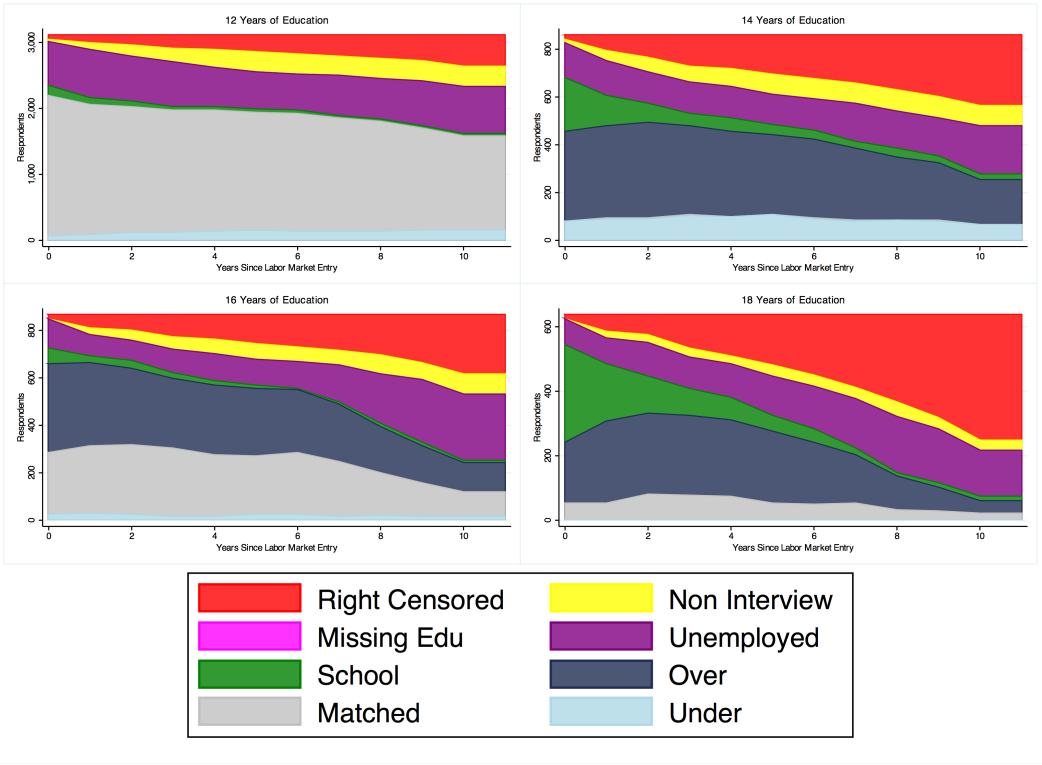

Figure 7: Aggregate incidence of Overeducation by Education Level (Number of Respondents)

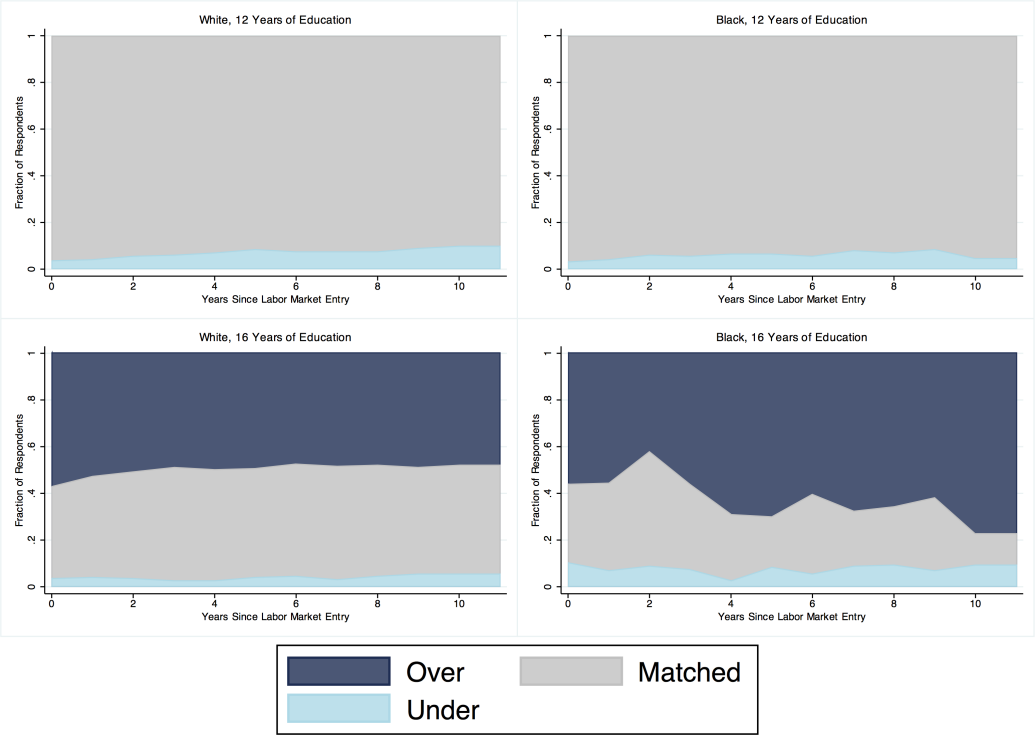

Figure 8: Aggregate incidence of Overeducation by Race (Fraction of Respondents)

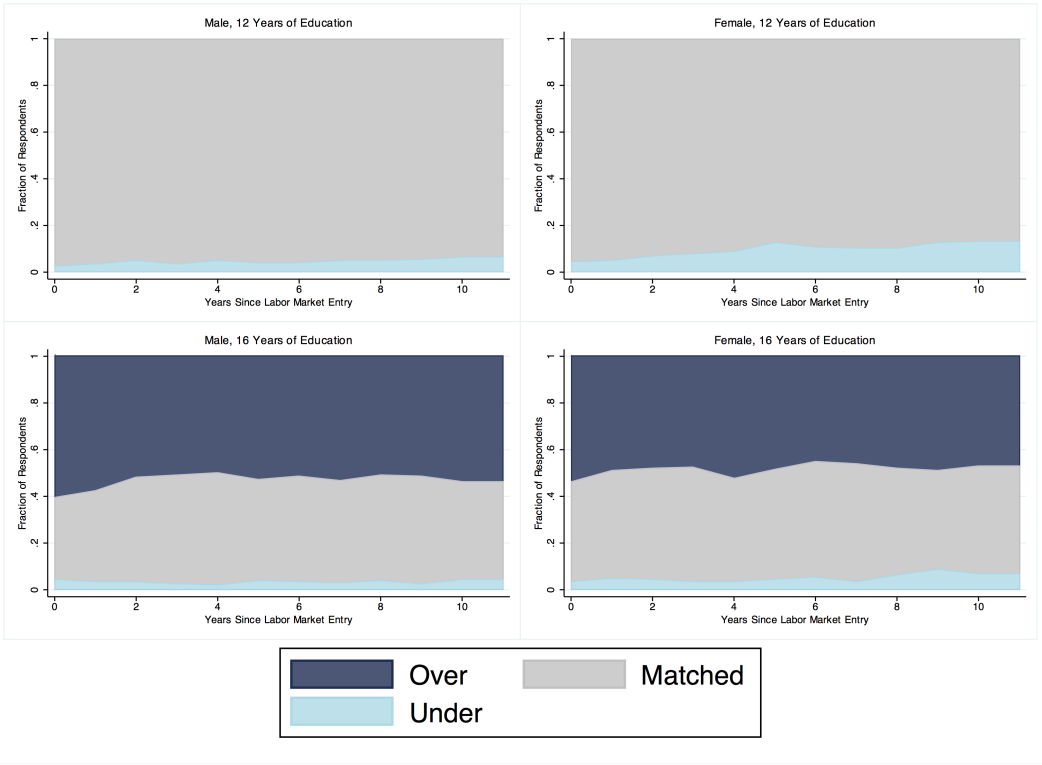

Figure 9: Aggregate incidence of Overeducation by Gender (Fraction of Respondents)

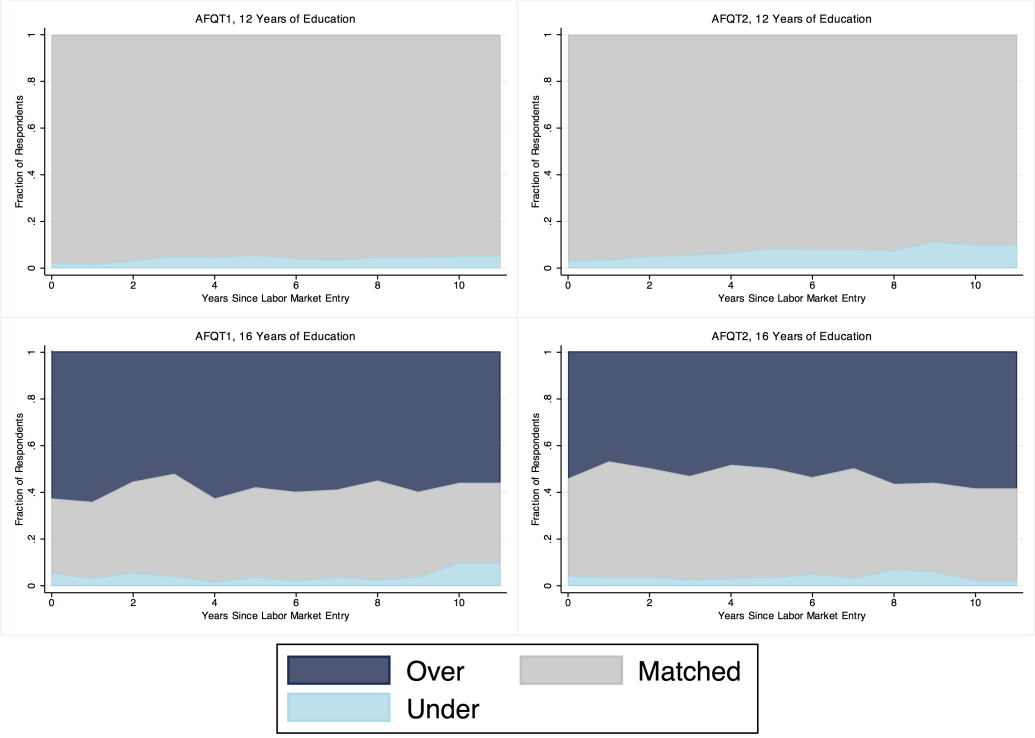

Figure 10: Aggregate incidence of Overeducation by AFQT (Fraction of Respondents)

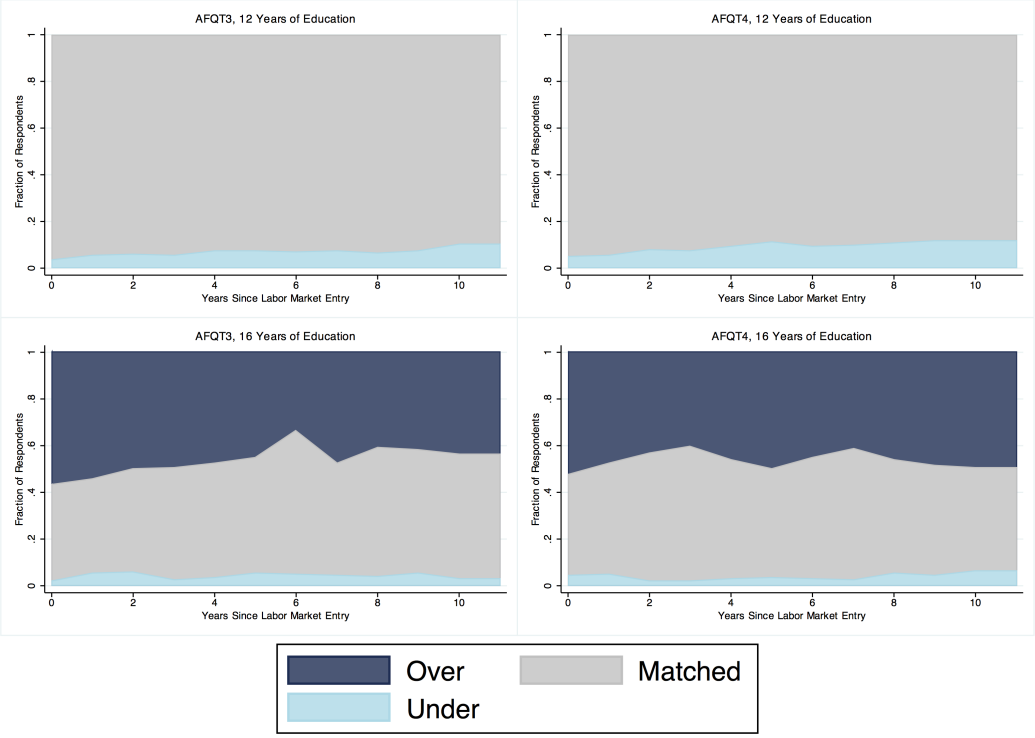

Figure 11: Aggregate incidence of Overeducation by AFQT (Fraction of Respondents)

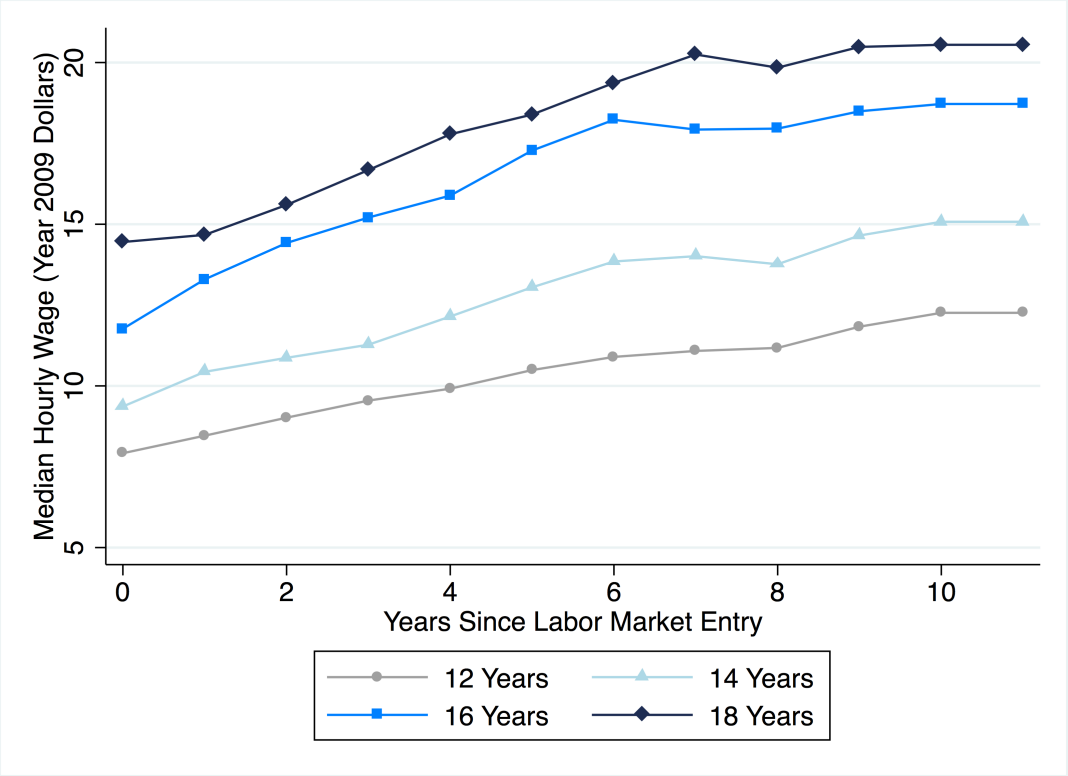

Figure 12: Path of Median Hourly Wage

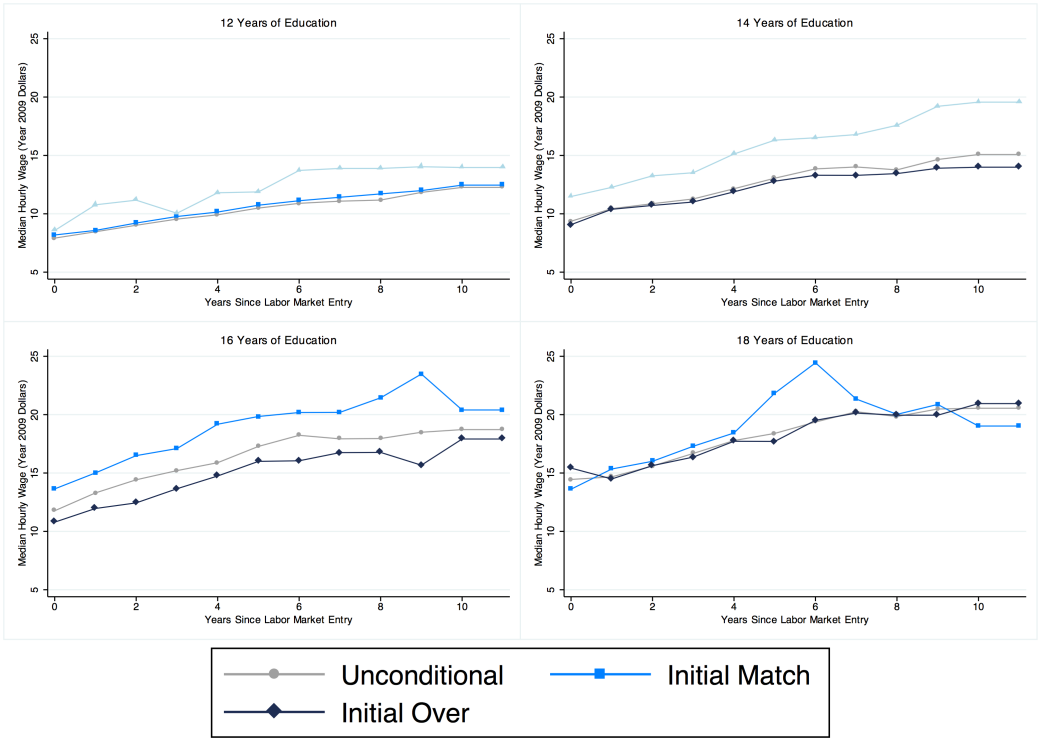

Figure 13: Path of Median Hourly Wage