Graduates in a Cycle: Effects of Early-Career Recession on Labor Market Outcomes of College Graduates

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April 15, 2025

Abstract

This paper examines the long-term impact of economic conditions at and after college graduation on labor market outcomes, emphasizing economic trajectories over point-in-time measures. First, I modify traditional models by including a labor market trend indicator that captures whether the unemployment rate was decreasing at graduation. I find that entering during a downward trend leads to substantially stronger earnings gains than the losses experienced when graduating during an upward trend, indicating an asymmetric effect of labor market trajectories. To capture the overall severity of conditions at and after graduation, I construct an accumulated unemployment rate defined as the sum of the unemployment rate at graduation and over the following two years. Graduates facing similar unemployment rates at graduation but worse post-graduation conditions earn, on average, 1.2% less, suggesting that post-graduation dynamics play a larger role in shaping outcomes over 3–10 years of potential experience. Finally, I address selection into college by dividing cohorts based on labor market conditions at enrollment. The graduation penalty is more severe (11.5% compared to 7.7% of initial earnings) and more persistent for those who entered college during recessions. A similar pattern holds for post-graduation conditions, underscoring the importance of accounting for enrollment-time labor market exposure when estimating long-term effects.

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Introduction

Fluctuations in the business cycle play a crucial role in shaping individuals' income trajectories. New labor market entrants, particularly recent graduates, are especially vulnerable during recessions due to their lack of experience and the contraction of job opportunities. A substantial body of research documents the persistent negative impact of graduating during a recession on earnings (Schwandt and Von Wachter, 2019; Altonji et al., 2016; Oreopoulos et al., 2012; Davis and Von Wachter, 2011; Kahn, 2010). Further studies show that enrolling in college during periods of high unemployment can improve future earnings, driven more by increased effort than by sorting into higher-paying majors or advanced degrees (Bičáková et al., 2023, 2021).

However, existing literature largely focuses on economic conditions at specific points in time (graduation, college entry, or major selection) while neglecting the broader trajectory of the labor market in which these points are situated. First, focusing on a single point, studies often overlook the economic context that follows. For instance, two cohorts graduating under similar unemployment rates before and after a recession are typically treated as equivalent, despite potentially divergent long-term outcomes due to differing post-graduation trajectories.

One key mechanism underlying these differences involves job matching and career progression. Poor labor market conditions restrict early-career mobility, delaying skill acquisition and wage growth. While young workers are generally mobile and able to recover from poor matches (Topel and Ward, 1992), recessions limit transitions to better jobs, hampering human capital accumulation and long-term earnings (Acabbi et al., 2022). Downturns also reduce promotion opportunities within firms (Devereux, 2002; Moscarini and Thomsson, 2007) and increase the risk and cost of layoffs (Schmieder et al., 2023), exacerbating the long-term scarring effects. Thus, even for cohorts facing similar conditions at graduation, different economic trajectories can lead to substantially different long-term outcomes - an underexplored dimension in the literature.

Second, vast literature (Betts and McFarland, 1995; Dellas and Sakellaris, 2003; Clark, 2011; Barr and Turner, 2013, 2015; Sievertsen, 2016; Charles et al., 2018) shows that individuals are more likely to enroll in college during recessions. As a result, cohorts graduating in high-

unemployment periods may differ in underlying characteristics. Recession-era enrollees may differ systematically from those who enroll in stronger labor markets in unobserved ability, motivation, or risk tolerance. In this case, comparing outcomes across these different types of cohorts could misattribute differences in outcomes to labor market conditions rather than to selection.

In this paper, I explore how both post-graduation labor market conditions and the broader economic environment at the time of college entry shape long-term career outcomes. Using data on college graduates from the Current Population Survey (CPS), I track cohorts graduating between 1976 and 2019 and expand traditional focus on the unemployment rate at graduation by incorporating the trajectory of labor market conditions in the early career years. I also address a key limitation in prior research by accounting for selection into college during recessions and its effect on the career outcomes. This dual focus provides a more comprehensive understanding of how business cycle dynamics influence labor market outcomes over time.

The analysis proceeds in two parts. First, I focus on post-graduation conditions using several new measures. I extend traditional models by introducing a trend-based indicator that captures whether unemployment was declining at graduation, and I construct an accumulated unemployment rate defined as the sum of the unemployment rate at graduation and over the following two years. To isolate post-graduation effects, I also separately estimate the average unemployment rate in the first two years after graduation. These refinements capture variation in labor market recovery speed that prior models miss.

My findings show that accounting for post-graduation trends matters. Graduates entering during a downward trend experience an additional 8% earnings gain, regardless of the unemployment rate at graduation. A 4 percentage points decline in the unemployment rate is associated with a 3.4% increase in earnings, which is about 0.5 percentage points larger than prior estimates (Altonji et al., 2016). In contrast, those graduating during an upward trend see no significant effect beyond two years post-entry.

The accumulated unemployment rate results indicate that a 1 percentahe point increase is associated with at least a 0.3% earnings loss which translates into a 1.2% gap for otherwise similar cohorts graduating just before versus after a recession. When separating graduation-year and post-graduation unemployment rates, I find that the latter explains more variation in average earnings 3–10 years post-entry. A 1 percentage point increase in the mean unem-

ployment rate in years 1–2 after graduation leads to a 1% earnings loss suggesting an average 4% drop for recession graduates. In contrast, the graduation-year unemployment rate has no statistically significant or economically meaningful effect.

Second, I address college-entry selection by splitting the sample into cohorts that began college during periods of high vs. low unemployment, using a detrended national unemployment rate. Cohorts that began college in weak labor markets (unemployment rate above 0.1%) may include individuals induced into college by the downturn, while those starting in strong markets ("always-takers") serve as a cleaner group for estimating the true effect of graduating in a recession. Importantly, within this group, variation in graduation conditions (e.g., big recessions of 1981-1982 and 2008-2009 vs. relatively small recession of 2001) allows me to compare cohorts graduating into weak labor market with cohorts graduating with relatively strong market.

Splitting the sample by enrollment conditions confirms the importance of selection. Among "always-takers" who began college during low unemployment, I find no long-term effect on average earnings. These graduates suffer initial losses of 7.2% in earnings and 4% in wages that fade within three years. However, for those who enrolled during recessions, I find large, persistent effects: 11.5% and 9% initial losses in earnings and wages, with a 6.3% earnings penalty at average level of potential experience. Post-graduation conditions also have stronger effects in this group, with average earnings losses more than three times those of their counterparts.

This study builds on the extensive literature documenting the long-term consequences of entering the labor market during economic downturns. Prior research has consistently found that cohorts graduating during recessions suffer persistent earnings losses, often taking 10–15 years to recover (Kahn (2010); Davis and Von Wachter (2011); Oreopoulos et al. (2012); Altonji et al. (2016); Schwandt and Von Wachter (2019)). The primary mechanism behind these effects is that recession graduates are forced into lower-paying jobs, leading to weaker career progression and limited access to high-quality employers. However, existing studies primarily focus on the unemployment rate at graduation as the sole determinant of these scarring effects, implicitly assuming that post-graduation economic trends do not matter as much. My study contributes to this literature by showing that labor market conditions in the years following graduation significantly affect long-term earnings outcomes and that a cumulative measure of labor market conditions—such as the accumulated unemployment rate—provides a more

accurate predictor of long-term outcomes than the graduation-year unemployment rate alone.

This study also contributes to the broader literature on the importance of early-career conditions. Prior research has shown that early-career experiences have a long-lasting impact on earnings trajectories and that individuals who experience initial setbacks often struggle to recover (Gibbons and Waldman (2006); Wachter and Bender (2006); Arellano-Bover (2022, 2024)). Building on these studies, I consider the conditions of early labor market experiences from a macroeconomic perspective and contribute to this strand of research by demonstrating that adverse economic conditions at the start of a career have a significant negative impact on long-term career outcomes.

Beyond the focus on labor market entry, my research relates to a broader literature examining the persistence of macroeconomic shocks on labor markets. Previous studies have shown that recessions lead to long-lasting effects on employment rates and wage trajectories even after aggregate unemployment rates recover (Fernald et al. (2017); Yagan (2019); Huckfeldt (2022); Schmieder et al. (2023); Rothstein (2023)). My findings indicate that for recession graduates, the speed and strength of labor market recovery play a critical role in determining whether they can make up for initial career disadvantages. This suggests that beyond simply considering whether individuals graduate during a recession, it is crucial to examine the trajectory of the labor market in the years following graduation.

To the best of my knowledge, this is paper is the first to explore the effect of the whole trajectory of the business cycle rather than one point at a time. I find that adverse post-graduation economic conditions significantly negatively affect earnings, especially for men, and wages for both genders. By accounting for selection into college, I show that most of the negative effect of graduating during a recession is concentrated among cohorts that enrolled during periods of high unemployment. In contrast, those who began college under favorable conditions experience smaller, more transitory losses suggesting meaningful differences in composition.

Data

Individual level

This analysis is based on the Current Population Survey (CPS), which provides information on employment, earnings, and demographic characteristics, making it well-suited for analyzing the long-term effects of graduating during different phases of a recession. However, the CPS does not include the exact year of graduation for individuals. Following the literature, I proxy the graduation year as the year an individual turns 22, which is the typical age for college graduation in the United States Altonji et al. (2016). Additionally, since CPS does not record the state of graduation, I assume that individuals graduated in the same state in which they reside at the time of observation.

The sample includes college graduates (i.e., individuals with a bachelor's degree or with 4 years of college) and those with 1 to 10 years of potential experience, where potential experience is defined as the difference between the observation year and the inferred graduation year. I restrict the sample to individuals with annual earnings exceeding $1500 (in 2019 constant dollars) for the main analysis. To account for potential gender-based differences in labor force participation, I estimate separate models for men and women.

The labor market outcomes of interest include the logarithm of earnings, the logarithm of wages, employment status, full-time employment status (working at least 35 hours per week), logarithm of hours worked in the last year, and occupational attainment. Table 1 presents summary statistics for the key variables by gender.

On average, men in the sample earn $ 63,458.96 annually (in 2019 dollars), while women earn $48,124.09. The log-transformed annual income has a mean of 10.815 for men and 10.561 for women and the log-transformed wage has a mean of 3.225 for men and 3.132 for women, reflecting the gender pay gap observed in the raw income data. Employment rates are high for both groups, with 96.6% of men and 97.0% of women being employed. However, there is a notable difference in full-time employment rates, with 90.1% of men working full-time compared to 82.5% of women. The log-transformed hours worked last year also differ between gender men work on average 7.572, while women work on average 7.420. The average potential experience is 5.46 years for men and 5.28 years for women.

There is also substantial variation in economic conditions at graduation, with unemploy-

Table 1: Summary Statistics

	Men				Women			
	Mean	St Dev	Min	Max	Mean	St Dev	Min	Max
Annual Income (2019 $)	63458.96	54990.38	1500	1289685	48124.09	37854.56	1500	1186510
Log Annual Income	10.815	0.742	7.313	14.070	10.561	0.724	7.313	13.987
Log Wage	3.255	0.667	-0.825	9.257	3.132	0.653	-0.486	8.172
Employed	0.965	0.183	0	1	0.970	0.170	0	1
Full-time	0.901	0.298	0	1	0.825	0.380	0	1
Log Hours	7.572	0.486	1.946	8.527	7.420	0.609	1.946	8.527
Occupation Earnings	-0.099	0.314	-1.225	0.658	-0.079	0.292	-1.380	0.701
Potential experience	5.477	2.808	1	10	5.280	2.836	1	10
Unempl at grad, (%)	6.276	2.018	2.3	17.8	6.221	2.014	2.3	17.8
Unempl ACC (%)	18.824	5.511	7.5	46.6	18.682	5.497	7.5	46.6
Observations	81658				88891			

The primary sample consists of individuals with a Bachelor's degree or four years of college education, aged 23–32, with 1–10 years of potential experience and valid annual earnings observations (greater than $1500 in 2019 dollars). Nominal earnings are converted to real 2019 dollars using the Consumer Price Index (CPI) from the Bureau of Labor Statistics (BLS). State-level unemployment rates are sourced from the BLS Local Area Unemployment Statistics program. The unemployment rate at graduation is defined as the unemployment rate in an individual's current state of residence in the year they turned 22. The accumulated unemployment rate is calculated as the sum of the unemployment rate at graduation and the unemployment rates in the two subsequent years. Summary statistics for state unemployment rates differ by gender, as male and female graduates are unevenly distributed across graduation years and states of residence. The reported number of observations corresponds to the Earnings Sample size.

ment rates ranging from 2.3% to 17.8% and accumulated unemployment rates varying between 7.5% and 46.6%. These statistics highlight the heterogeneous macroeconomic conditions faced by graduates upon entering the labor market. After applying all sample restrictions, the final earnings dataset consists of 78,491 observations for men and 89,456 observations for women.

Economic Conditions

To measure economic conditions, I use unemployment rate data from the Bureau of Labor Statistics (BLS) at both the national and state levels. Figure 1 displays monthly national unemployment rates and college graduate unemployment rates, calculated using the Monthly CPS. The figure shows that the unemployment rate among college graduates follows the same trend as the overall unemployment rate but with lower volatility. Gray-shaded areas in 1 represent recession periods as defined by the National Bureau of Economic Research (NBER)[1]. Since

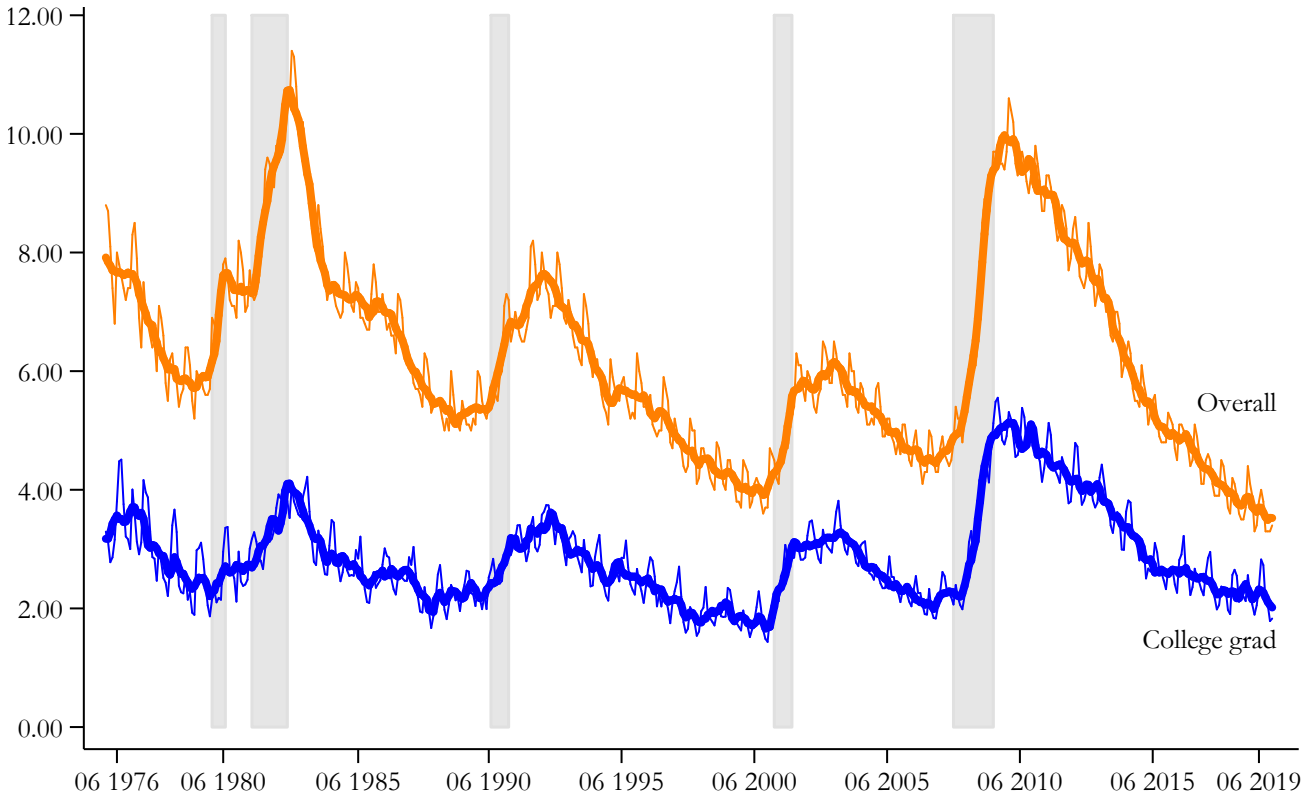

Figure 1: Monthly Unemployment Rates. Source: BLS, CPS

Note: The figure presents monthly unemployment rates for the overall population (sourced from the BLS) and for college graduates (calculated using the Monthly CPS). Thin lines depict the raw data, while thick lines represent seasonally adjusted values, following the BLS methodology, and smoothed using a three-month moving average. Gray-shaded areas indicate recession periods as defined by the NBER.

the BLS provides unemployment data on a monthly basis, I compute annual unemployment rates by taking the average of the monthly unemployment rates, following standard practice in the literature. Given my focus on early career trajectories, I construct an accumulated un-

[1] https://www.nber.org/research/data/us-business-cycle-expansions-and-contractions

employment rate, which captures economic conditions not only at graduation but also in the two subsequent years:

$$U_{s,c}^{ACC} = U_{s,c} + U_{s,c+1} + U_{s,c+2}, \tag{1}$$

where $U_{s,c}$ represents the state-level unemployment rate in the graduation year (i.e., the graduation cohort's labor market conditions), $U_{s,c+1}$ represents the state-level unemployment rate in the year following graduation year, and $U_{s,c+2}$ represents the state-level unemployment rate in two years after graduation.

However, this measure has several drawbacks. First, it assumes the same weight of the unemployment rates at graduation and each year after graduation which might be unreasonable. Second, it doesn't allow to disentagle the impact of initial conditions (at graduation) from the post-graduation conditions. To overcome this issue, I also calculate the mean of post-graduation unemployment rates:

$$\bar{U}_{s,c+1,c+2} = \frac{U_{s,c+1} + U_{s,c+2}}{2}, \tag{2}$$

where $U_{s,c+1}$ is the state-level unemployment rate in the year following graduation year and $U_{s,c+2}$ is the state-level unemployment rate in two years after graduation.

Methodology

Post-Graduation Conditions

Same Unemployment Rate at Graduation

The first step of my estimation strategy emphasizes the importance of accounting for the trend in the unemployment rate rather than its level. To illustrate this, I compare cohorts who graduated just before and just after recessions, but who faced similar unemployment rates at the time of graduation. I define cohorts based on their graduation year and consider three major recessions: 1981–1982, 1990, and 2008–2009. Specifically, I match individuals who graduated in 1980/1985, 1989/1996, and 2007/2015. These years represent the period immediately pre-

ceding a recession and the first post-recession year when the unemployment rate returned to its pre-recession level. I exclude the 2001 recession due to its short duration and the fact that the unemployment rate did not fully recover before the onset of the Great Recession.

This comparison helps isolate the effect of labor market momentum at graduation - whether the unemployment rate was improving or worsening - despite similar unemployment levels. For the outcome period, I estimate effects for potential experience ranging from 5 to 10 years after graduation (and 5 to 8 years for the most recent cohort affected by the Great Recession, due to data limitations).

The baseline specification is:

$$y_{icst} = \beta_1 After_c + \gamma X_{icst} + \theta_s + \tau_t + \epsilon_{icst}, \tag{3}$$

where y_{icst} denotes the labor market outcome of individual i in year t, residing in state s, who graduated in year c. The variable $After_c$ is a binary indicator equal to 1 if the individual graduated after the recession (when the national unemployment rate returned to its pre-recession level), and 0 if the individual graduated just before the recession. X_{icst} is a vector of control variables. I also include state and year fixed effects to account for time-invariant state characteristics and aggregate national shocks.

Downward Trend

Expanding beyond specific recession cohorts, I estimate the long-term effects of economic conditions at graduation for the full sample of individuals who graduated between 1976 and 2019. Building on the framework of Altonji et al. (2016), I modify their approach to account not only for the level of the unemployment rate at graduation but also for its direction of change. Specifically, I investigate whether graduating during a downward trend defined as a year after which the unemployment rate declined offers a labor market advantage. The specification is:

$$y_{icst} = \beta_1 X_{icst} + \beta_2 U_{sc} + \beta_3 U_{sc} PE_{it} + \beta_4 U_{sc} PE_{it}^2 + \beta_5 DownTrend_c + \beta_6 U_{sc} DownTrend_c + \theta_s + \epsilon_{icst}, \tag{4}$$

where y_{icst} represents the labor market outcome of interest, X_{icst} is a vector of control variables (including race dummy and a cubic time trend), U_{sc} is the unemployment rate at graduation,

and PE_{it} is potential experience (the difference between the observation year and the graduation year). The variable $DownTrend_c$ is a dummy equal to one if the unemployment rate declined in the year of graduation compared to the next year. Standard errors are clustered at the state-graduation year level.

This specification allows me to distinguish between the effects of high unemployment per se and the broader trajectory of the labor market in the early career period. A positive coefficient on β_5 would indicate that graduating during a downward trend in unemployment is associated with improved long-term labor market outcomes. When $DownTrend_c = 0$, the model simplifies to the core structure of Altonji et al. (2016), with the main difference being the separation of estimates by gender.

Post-Graduation Trajectory

The main component of the first part of my analysis involves estimating how post-graduation conditions affect long-term outcomes. I begin by using the accumulated unemployment rate, as defined in Equation 1, as the key explanatory variable:

$$y_{isct} = \beta U_{sc}^{ACC} + \gamma X_{isct} + \theta_s + \tau_t + \epsilon_{isct}, \tag{5}$$

where $U^{ACC}sc$ is the accumulated unemployment rate over the period from graduation through two years post-graduation. Unlike the binary $Recovery_c$ variable, $U^{ACC}sc$ captures heterogeneity across states and recessions in both the magnitude and duration of economic fluctuations.

The coefficient β reflects the impact of adverse economic conditions in the early career years. A statistically significant negative β would indicate persistent negative effects on labor market outcomes even after controlling for conditions at graduation.

To disentangle the effects of different years post-graduation, I estimate a model in which the unemployment rate enters separately for each year:

$$y_{ict} = \alpha + \beta_1 U_{s,c} + \beta_2 U_{s,c+1} + \beta_3 U_{s,c+2} + \gamma X_{ict} + \theta_s + \tau_t + \epsilon_{ict}. \tag{6}$$

This approach allows for a more flexible trajectory and enables me to examine which specific years post-graduation exert the strongest influence on long-term outcomes. However, the high degree of correlation between these variables - 86.7% between $U_{s,c}$ and $U_{s,c+1}$, and

63% between $U_{s,c}$ and $U_{s,c+2}$ -raises concerns about multicollinearity. This could bias the interpretation of individual coefficients and inflate standard errors, reducing statistical power. I therefore report p-values from joint F-tests to assess the overall significance of these post-graduation effects.

To address these concerns and disentangle the role of graduation conditions from post-graduation dynamics more cleanly, I estimate a "combined" model that includes the unemployment rate at graduation and the mean post-graduation unemployment rate, defined in Equation 2:

$$y_{ict} = \alpha + \beta_1 U_{sc} + \beta_2 \bar{U}_{s,c+1,c+2} + \gamma X_{ict} + \theta_s + \tau_t + \epsilon_{ict}. \tag{7}$$

In this setup, $\bar{U}s, c+1, c+2$ denotes the mean unemployment rate during the first two years after graduation. This formulation reduces multicollinearity between the predictors - correlation between Usc and $\bar{U}_{s,c+1,c+2}$ is 77.8% - and allows for more precise estimation of the distinct effects of graduation vs. post-graduation conditions.

Pre- and Post-Graduation Conditions

A key concern in evaluating post-graduation effects is whether students anticipate labor market conditions at graduation during college and adjust their behavior accordingly. If they do—for instance, by choosing certain majors or internships—then the estimated effects of graduation-year conditions may be biased. To explore this, I expand the previous model by including the mean unemployment rate during the three years before graduation:

$$y_{ict} = \alpha + \beta_1 U_{sc} + \beta_2 \bar{U}_{s,c+1,c+2} + \beta_3 \bar{U}_{s,c-1,c-2,c-3} + \gamma X_{ict} + \theta_s + \tau_t + \epsilon_{ict}, \tag{8}$$

where $\bar{U}s, c-1, c-2, c-3$ is the mean unemployment rate in the three years prior to graduation. Correlation between this term and Usc is 68%, and with $\bar{U}_{s,c+1,c+2}$ it's less than 40%, so multicollinearity is unlikely to be a concern. A significant and positive β_3 would suggest that pre-graduation conditions also matter—supporting the hypothesis that students anticipate labor market dynamics before graduating.

Selection at enrollment

Evidence suggests that individuals are more likely to enroll in college during economic downturns (see), raising concerns about selection bias between cohorts. If more marginal students enroll during recessions, estimates of graduation-year effects could be biased.

Figure 2 illustrates three business cycle scenarios based on unemployment conditions at age 18:

1. Starting and graduating during low unemployment.
2. Starting with low unemployment and graduating during high unemployment.
3. Starting with high unemployment and graduating into recovery.

If selection at college entry (age 18) matters, then the estimated effects of graduation-year conditions may be biased upward due to the presence of students who would not otherwise enroll.

To address this, I divide the sample by labor market conditions at age 18. I define "good" times as a national detrended unemployment rate below 0.1%, and estimate the model from Altonji et al. (2016) separately for each subgroup:

$$y_{icst} = \beta_1 X_{icst} + \beta_2 U_{sc} + \beta_3 U_{sc} PE_{it} + \beta_4 U_{sc} PE_{it}^2 + \theta_s + \epsilon_{icst}, \tag{9}$$

where U_{sc} is the state-level unemployment rate at graduation. I omit the downward trend dummy here, since fixing the unemployment rate at age 18 implies the likely direction at graduation (e.g., high rates at 18 usually imply declining rates at 22, as recessions rarely last more than two years).

Finally, I repeat the post-graduation analysis described above to explore whether the long-term effects of graduation conditions are driven by selection into college.

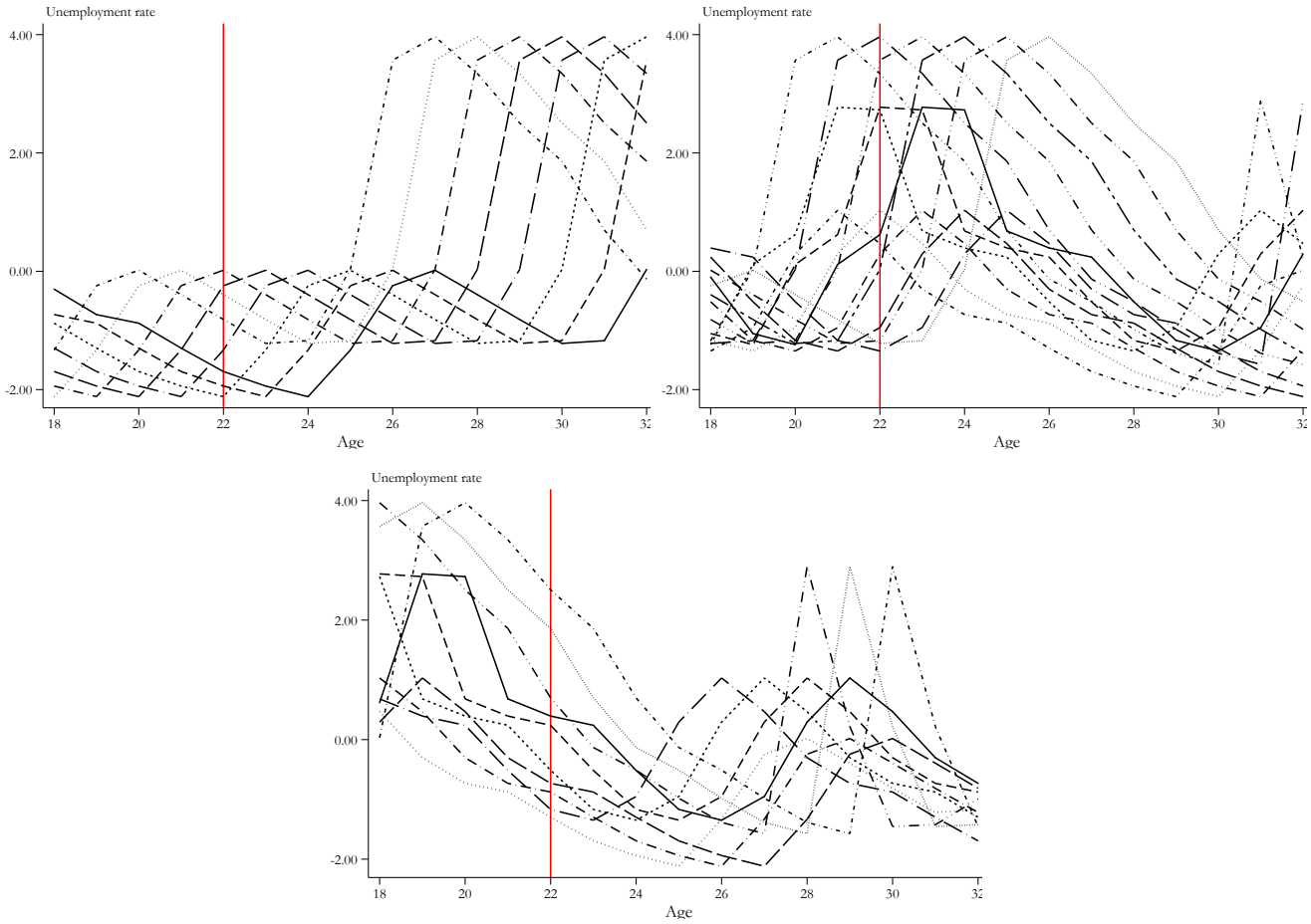

Figure 2: Detrended Unemployment Rates based on the labor market conditions at age 18. Source: BLS

Note: The figures present detrended national unemployment rates for each cohort graduated from 1980 to 2010 starting from the moment of age 18 till age 32.

Results

Post-graduation Trajectory

Same Unemployment Rate at Graduation Comparison

I start with the simple comparison of cohorts which graduated with the same unemployment rate on the different sides of the business cycle (before or after the recession). The results of this comparison, as described in Equation 3, are presented in Table 2. The analysis focuses on three recessions: 1981–1982, 1990, and 2008–2009. Appendix Table 1 provides results for each recession individually. At this stage, the sample is restricted to individuals with 6–10 years of potential experience after graduation. This restriction allows me to avoid controlling for

potential experience directly, as it aligns with the year fixed effects.

Overall, the results indicate substantial differences in labor market outcomes between cohorts. The coefficients suggest that men who graduated after a recession experienced, on average, earnings approximately 18% higher than those who graduated during periods with a similar national unemployment rate. The effect on wages is of a comparable magnitude, with post-recession male graduates earning about 16% more than those who graduated prior to the recession. Moreover, men who graduated after a recession tend to work longer hours and are employed in higher-paying occupations.

For women, the effects appear to differ notably from those observed for men. I find no statistically significant impact on earnings for women who graduated after a recession. However, the effects on wages and occupational earnings are similar to those for men, at 14% and 4%, respectively. At the same time, post-recession female graduates exhibit a higher probability of being employed, but a significantly lower probability of being employed full-time (7%) and report working fewer hours (11%).

Overall, this simple comparison highlights the importance of conducting a more thorough analysis that goes beyond the conditions of a single period. While the results provide valuable initial insights into the heterogeneity of recession effects across cohorts and genders, they also underscore the need to account for broader economic dynamics and individual-level variation across different recession contexts.

Table 2: Same Unemployment Rate at Graduation Comparison

	Log Earnings	Log Wage	Pr(Employed)	Pr(Full-Time)	Log Hours	Occupation Earnings
	(1)	(2)	(3)	(4)	(5)	(6)
	Male					
$After_c$	0.184***	0.157***	−0.004*	−0.0002	0.055***	0.037***
	(0.009)	(0.009)	(0.002)	(0.003)	(0.004)	(0.005)
Obs	5007	4786	5287	5287	4991	5283
Clusters	6	6	6	6	6	6
	Female					
$After_c$	0.007	0.144***	0.010***	−0.070***	−0.108***	0.040***
	(0.009)	(0.009)	(0.002)	(0.008)	(0.011)	(0.004)
Obs	4949	4981	5310	5310	4842	5306
Clusters	6	6	6	6	6	6
State FE	X	X	X	X	X	X
Year FE	X	X	X	X	X	X

Note: * - significant at 10%; ** - significant at 5%; *** - significant at 1%. Standard errors are in parentheses. The dependent variables are the logarithm of earnings, the logarithm of wage, an employment indicator (equal to 1 if the individual is employed), a full-time employment indicator (equal to 1 if the individual is employed full-time), logarithm of hours worked last year, and returns to occupations. The sample consists of college graduates with 6–10 years of potential experience, except for the 2008–2009 recession, where the maximum potential experience available is 8 years. Individuals in the sample were 22 years old either in the year before each recession or after the recession when the national unemployment rate returned to its pre-recession level. Sample includes graduates from all recessions under consideration: 1981–1982, 1990, and 2008–2009. The table reports the fixed effects included in each specification. All specifications control for race, and standard errors are clustered by graduation year.

Downward Trend

The second part of the analysis focuses on the full sample of college graduates with up to 10 years of potential experience and annual real earnings of at least $1,500 (in 2019 dollars). First, I estimate a model similar to that in Altonji et al. (2016), separately for men and women. I then extend their specification by including a trend dummy variable, DownTrend, which captures the slope of the unemployment rate curve at the time of graduation, as specified in Equation 5. This dummy equals 1 if the unemployment rate at graduation is lower than in the previous period and higher than in the following period.

The effect of the unemployment rate is calculated in the same way as in Altonji et al.

(2016): $\hat{\beta}_2 \times 4 + \hat{\beta}_3 \times 4 \times potexp + \hat{\beta}_4 \times 4 \times potexp^2$ in specification without Trend dummy or if $DownTrend = 0$ and $\hat{\beta}_2 \times (-4) + \hat{\beta}_3 \times (-4) \times potexp + \hat{\beta}_4 \times (-4) \times potexp^2 + \hat{\beta}_6 \times (-4)$ if $DownTrend = 1$[2]. The estimated effects are presented in Table 3, and the regression coefficients underlying the calculations are reported in Appendix Table 2.

Table 3: Whole Sample. The effect of an increase (decrease) unemployment rate at graduation by 4 p.p.

	ln Earnings		ln Wage		Pr(Empl)		Pr(Full time)		ln Hours		Occupation Earnings	
	Male											
Average effect 1-10 PE	−0.029***		−0.038***		0.007***		0.001		0.007		0.005	
	(0.010)		(0.009)		(0.002)		(0.004)		(0.006)		(0.004)	
Potential Exp = 1	−0.084***		−0.055***		−0.001		−0.024***		−0.026*		−0.005	
	(0.020)		(0.016)		(0.004)		(0.008)		(0.015)		(0.007)	
Potential Exp = 3	−0.046***		−0.046***		0.005**		−0.006		−0.002		0.002	
	(0.011)		(0.009)		(0.003)		(0.004)		(0.007)		(0.004)	
Potential Exp = 7	−0.021**		−0.025***		0.005**		0.003		0.003		0.004	
	(0.009)		(0.009)		(0.002)		(0.004)		(0.006)		(0.004)	
	Down=0	Down=1	Down=0	Down=1	Down=0	Down=1	Down=0	Down=1	Down=0	Down=1	Down=0	Down=1
Average effect 1-10 PE	−0.003	0.034***	−0.012	0.041***	−0.005	−0.010***	0.001	−0.001	0.010	−0.002	0.011**	−0.001
	(0.014)	(0.012)	(0.012)	(0.011)	(0.003)	(0.003)	(0.006)	(0.004)	(0.008)	(0.007)	(0.005)	(0.005)
Potential Exp = 1	−0.057**	0.088***	−0.028	0.057***	−0.004	−0.002	−0.024***	0.023***	−0.023	0.031**	0.002	0.009
	(0.023)	(0.021)	(0.018)	(0.017)	(0.005)	(0.005)	(0.009)	(0.008)	(0.017)	(0.015)	(0.008)	(0.008)
Potential Exp = 3	−0.019	0.051***	−0.019	0.048***	0.003	−0.008***	−0.006	0.006	0.001	0.006	−0.009	0.002
	(0.015)	(0.012)	(0.012)	(0.011)	(0.003)	(0.003)	(0.006)	(0.005)	(0.009)	(0.008)	(0.005)	(0.005)
Potential Exp = 7	0.005	0.027**	−0.001	0.028**	0.003	−0.008***	0.003	−0.003	0.006	0.002	0.010**	0.0004
	(0.013)	(0.012)	(0.011)	(0.012)	(0.003)	(0.003)	(0.006)	(0.005)	(0.008)	(0.007)	(0.005)	(0.005)
	Female											
Average effect 1-10 PE	−0.031***		−0.035***		0.007***		0.006		0.007		0.001	
	(0.010)		(0.009)		(0.002)		(0.005)		(0.008)		(0.004)	
Potential Exp = 1	−0.077***		−0.073***		−0.003		−0.017*		−0.007		−0.008	
	(0.017)		(0.014)		(0.004)		(0.009)		(0.013)		(0.006)	
Potential Exp = 3	−0.047***		−0.049***		0.004**		−0.002		0.004		−0.001	
	(0.011)		(0.009)		(0.002)		(0.005)		(0.008)		(0.004)	
Potential Exp = 7	−0.016*		−0.017*		0.007***		0.011**		0.005		−0.002	
	(0.010)		(0.009)		(0.002)		(0.005)		(0.009)		(0.004)	
	Down=0	Down=1	Down=0	Down=1	Down=0	Down=1	Down=0	Down=1	Down=0	Down=1	Down=0	Down=1
Average effect 1-10 PE	−0.030***	0.027**	−0.023*	0.034***	0.003	−0.010***	0.001	−0.008	0.001	−0.008	0.004	−0.002
	(0.011)	(0.014)	(0.012)	(0.011)	(0.002)	(0.002)	(0.012)	(0.009)	(0.012)	(0.009)	(0.005)	(0.005)
Potential Exp = 1	−0.075***	0.073***	−0.061***	0.073***	−0.007*	0.001	−0.022**	0.016	−0.013	0.007	−0.004	0.007
	(0.018)	(0.020)	(0.015)	(0.016)	(0.004)	(0.004)	(0.010)	(0.010)	(0.015)	(0.015)	(0.007)	(0.007)
Potential Exp = 3	−0.046***	0.043***	−0.037***	0.049***	−0.0002	−0.007***	−0.007	0.001	0.002	−0.004	0.002	0.0001
	(0.012)	(0.014)	(0.011)	(0.011)	(0.003)	(0.002)	(0.007)	(0.007)	(0.011)	(0.009)	(0.005)	(0.005)
Potential Exp = 7	−0.015	0.012	−0.005	0.017	0.003	−0.010***	0.006	−0.012*	0.001	−0.005	0.001	0.002
	(0.012)	(0.013)	(0.012)	(0.011)	(0.002)	(0.002)	(0.007)	(0.006)	(0.013)	(0.010)	(0.005)	(0.005)

Note: * - significant at 10%; ** - significant at 5%; *** - significant at 1%. Standard errors are in parentheses.
The sample consists of college graduates with potential experience from 1 to 10 years who turned 22 between 1976 and 2019. The graduation unemployment rate is the state unemployment rate at age 22. The contols include race dummy, cubic time trend, and state fixed effects. Standard errors are clustered by state-graduation year. The results of the underlying regressions as defined in 4 are presented in Appendix Table 2. The upper panels show the effects based on the estimation of the model as in Altonji et al. (2016). The estimates are derived through formula $\hat{\beta}_2 \times 4 + \hat{\beta}_3 \times 4 \times potexp + \hat{\beta}_4 \times 4 \times potexp^2$ if $DownTrend = 0$ and $\hat{\beta}_2 \times (-4) + \hat{\beta}_3 \times (-4) \times potexp + \hat{\beta}_4 \times (-4) \times potexp^2 + \hat{\beta}_6 \times (-4)$ if $DownTrend = 1$.

[2]I multiply coefficients by (-4) in the specification, where $DownTrend = 1$ because DownTrend implies that unemployment rate is decreasing.

For the model without the Trend dummy, I find that the effect of the unemployment rate at the time of graduation on male earnings is consistent with prior literature. Specifically, a 4 percentage point increase in the unemployment rate is associated with an approximate 2.9% decline in earnings. This effect is slightly larger than the average estimates reported by Altonji et al. (2016) and Oreopoulos et al. (2012), who find an average decline of around 2.2% for a similar increase in unemployment during a large recession, based on the average potential experience of 4.5 years.[3] Consequently, a 4 p.p. decrease in the unemployment rate in the model without the DownTrend variable would correspond to an average increase in earnings of about 2.9%. A similar effect is observed for women, suggesting that the negative impact of graduating into a weak labor market is comparable across genders.

Accounting for the trend yields notably different results. I find a statistically significant positive effect of graduating during a recovery on both earnings and wages for men, and this effect is larger in magnitude than that found in the model without the Trend dummy. Interestingly, there is no significant effect on earnings at the average level of potential experience when $DownTrend = 0$, i.e., when men graduate into a recession. The negative effect appears only immediately after graduation (at potential experience = 1) and fades after two years. In contrast, the positive effect for individuals graduating during a Downward Trend (i.e., a recovery period) persists for at least seven years post-graduation, suggesting that the effect estimated in the model without the Trend dummy reflects a composition of two distinct forces. A similar pattern is observed for wages: the estimated effect in the specification without the Trend dummy is largely driven by men graduating during the recovery period. I also find a significant negative effect on the probability of employment for individuals graduating during a recovery, which emerges three years after graduation. Effects on full-time employment and hours worked disappear after one year of potential experience.

For women, the results in the specification with $DownTrend = 0$ closely resemble those from the model without the trend dummy. The difference in the effect on earnings between the two trend values is relatively small: only about 0.3%. However, the wage effects show more divergence: I estimate a 2.3% loss for women graduating into a recession and a 3.4% gain for those graduating during a recovery. Despite this asymmetry of roughly 1%, both effects dissipate around six years after graduation. I also find a negative effect on the probability of

[3] Average potential experience is taken as 4.5 following Altonji et al. (2016).

employment for women graduating during a period of declining unemployment, similar to the pattern observed for men, but no other significant effects on employment or hours.

Overall, the results reveal a clear asymmetry between the effects of graduating into a recession (rising unemployment) versus a recovery (falling unemployment), with the gains from graduating during a recovery being larger in magnitude. This finding underscores the importance of considering broader labor market trends when studying the long-term effects of initial labor market conditions. It also raises questions about potential selection biases between these two groups of graduates.

Post-Graduation Trajectory

In the previous sections, I showed that accounting for the broader trend of the business cycle is important when considering the unemployment rate at graduation. I now explicitly introduce the accumulated unemployment rate, defined in Equation 1, and estimate the model presented in Equation 6, which incorporates this variable. This allows me to account for the labor market conditions experienced by individuals after graduation. The results are reported in Table 4.

Table 4: Whole Sample. Effect of the Accumulated Unemployment Rate

	ln Earnings	ln Wage	Pr(Empl)	Pr(Full Time)	ln Hours	Occupation Earnings	ln Earnings	ln Wage	Pr(Empl)	Pr(Full Time)	ln Hours	Occupation Earnings
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Male						Female					
U_c^{ACC}	−0.004***	−0.002***	−0.0001	−0.0004	−0.001**	0.0002	−0.002**	−0.002**	0.0003*	0.0004	−0.00003	−0.001*
	(0.001)	(0.001)	(0.0002)	(0.0004)	(0.001)	(0.0004)	(0.001)	(0.001)	(0.0002)	(0.0005)	(0.001)	(0.0003)
Obs	65941	63012	69561	69561	65456	69490	69354	65020	73729	73729	67374	73649
Clusters	2142	2142	2142	2142	2142	2142	2141	2141	2141	2142	2141	2142
State FE	X	X	X	X	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X	X	X	X	X
Pot Exp FE	X	X	X	X	X	X	X	X	X	X	X	X
U_c^{ACC} at PE=3	−0.009**	−0.005	0.00002	−0.003**	−0.004*	−0.001	−0.001	0.001	0.0002	−0.001	−0.001	−0.002
	(0.004)	(0.003)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)	(0.001)	(0.002)	(0.002)	(0.001)
U_c^{ACC} at PE=5	−0.009***	−0.011***	−0.001	−0.001	0.003	0.002	−0.004	−0.005*	0.0004	−0.001	0.001	−0.002
	(0.003)	(0.003)	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)	(0.003)	(0.001)	(0.002)	(0.003)	(0.001)
U_c^{ACC} at PE=7	−0.001	−0.005	0.001	0.002	0.001	0.001	−0.005	−0.001	0.001	0.0002	−0.003	0.001
	(0.003)	(0.003)	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)	(0.003)	(0.001)	(0.002)	(0.003)	(0.001)
State FE	X	X	X	X	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X	X	X	X	X

Note: * - significant at 10%; ** - significant at 5%; *** - significant at 1%. Standard errors are in parentheses.
The sample consists of college graduates with 3–10 years of potential experience who turned 22 between 1976 and 2017. The table presents the estimation results of Equation 5, which uses the accumulated unemployment rate as the primary explanatory variable, defined as in Equation 1. The table indicates the fixed effects included in each specification. All specifications control for race, and standard errors are clustered by state-graduation year.

The results indicate a clear negative effect of the accumulated unemployment rate on both earnings and wages for men and women. Specifically, a one percentage point increase in the accumulated unemployment rate is associated with an average decrease of 0.4% in earnings

for men and 0.2% for women over the 3-10 years after graduation.

For context, the national accumulated unemployment rate increased from 19.65 for the 2007 graduation cohort to 27.83 for the 2009 cohort. This 8.18 percentage point increase corresponds to an estimated average earnings loss of approximately 2.5% over the 3-10 years of potential experience. Notably, this estimate excludes the immediate post-graduation years (potential experience = 1-2), where the largest losses are captured in the model using the unemployment rate at graduation. Looking specifically by years of potential experience, the same increase in the accumulated unemployment rate implies earnings losses of approximately 7.4% at three and five years of potential experience. For comparison, the specification in Altonji et al. (2016) estimates losses at those years to be roughly half as large for men.

In terms of wages, the average effect is smaller: about a 0.2% decline for both men and women per one-point increase in accumulated unemployment. At five years of potential experience, the estimated wage losses amount to 1.1% for men and 0.5% for women with an increase by 1 p.p in accumulated unemployment rate. I also find a small negative average effect of 0.1% on hours worked for men, which is statistically significant at three years of potential experience. Finally, the analysis shows a significant negative effect on occupational earnings for women, suggesting that accumulated labor market exposure may also influence occupational sorting.

To understand which portion of the observed effect is driven by the unemployment rate at graduation versus that driven by post-graduation conditions, I estimate models that separately include these unemployment rates, as described in Equations 6 and 7. Due to the correlation between consecutive unemployment rates, standard errors may be inflated. Therefore, I report F-tests for both specifications. The results are presented in Table 5.

In the specifications with separate unemployment rates, most individual coefficients are statistically insignificant, as expected. However, for both men and women, the F-tests reveal that the unemployment rates are jointly significant for earnings and wage outcomes. Comparing the coefficient magnitudes, the unemployment rate at graduation has the smallest effect in the man's sample. In the women's sample, the coefficients in the earnings specification are significant; however, the unemployment rate one year after graduation is positive, which may reflect multicollinearity in the model. For wages, the only significant and largest effect corresponds to the unemployment rate in the second year after graduation.

Table 5: Whole Sample. Effect of the separate unemployment rates

	ln Earnings	ln Wage	Pr(Empl)	Pr(Full Time)	ln Hours	Occupation Earnings	ln Earnings	ln Wage	Pr(Empl)	Pr(Full Time)	ln Hours	Occupation Earnings
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Male						Female					
U_{sc}	−0.0002	0.003	−0.001	−0.001	−0.002	0.002	−0.010**	−0.006	0.0001	0.0004	−0.001	−0.002
	(0.004)	(0.004)	(0.001)	(0.002)	(0.003)	(0.002)	(0.004)	(0.004)	(0.001)	(0.002)	(0.004)	(0.002)
$U_{s,c+1}$	−0.006	−0.004	0.003*	0.002	−0.001	0.0001	0.012**	0.008	0.0004	−0.001	0.002	0.002
	(0.006)	(0.005)	(0.002)	(0.002)	(0.004)	(0.003)	(0.006)	(0.005)	(0.001)	(0.003)	(0.005)	(0.002)
$U_{s,c+2}$	−0.005	−0.005	−0.002**	−0.002	0.001	−0.002	−0.011**	−0.010***	0.0005	0.002	−0.001	−0.003
	(0.004)	(0.004)	(0.001)	(0.002)	(0.003)	(0.002)	(0.004)	(0.004)	(0.001)	(0.002)	(0.004)	(0.002)
F-test (p-value)	0.0004***	0.004***	0.22	0.36	0.16	0.09*	0.02**	0.02**	0.34	0.71	0.98	0.17
U_{sc}	−0.0005	0.003	0.0004	0.0002	−0.003	0.003**	−0.003	−0.0003	0.0001	−0.0005	−0.001	−0.0001
	(0.003)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)	(0.003)	(0.001)	(0.002)	(0.003)	(0.001)
$\bar{U}_{s,c+1,c+2}$	−0.010***	−0.009***	−0.001	−0.001	−0.0004	−0.002*	−0.003	−0.005*	0.001	0.002	0.001	−0.002
	(0.003)	(0.003)	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)	(0.003)	(0.001)	(0.002)	(0.003)	(0.001)
F test (p-value)	0.0001***	0.001***	0.81	0.35	0.08*	0.048**	0.12	0.12	0.19	0.58	0.97	0.18
Obs	65941	63012	69561	69561	65456	69490	69354	65020	73729	73729	67374	73649
Clusters	2142	2142	2142	2142	2142	2142	2141	2141	2142	2142	2141	2142
State FE	X	X	X	X	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X	X	X	X	X
Pot Exp FE	X	X	X	X	X	X	X	X	X	X	X	X

Note: * - significant at 10%; ** - significant at 5%; *** - significant at 1%. Standard errors are in parentheses.
The sample consists of college graduates with 3–10 years of potential experience who turned 22 between 1976 and 2017. The table presents the estimation results of Equation 6 (upper panel) and Equation 7 (lower panel). The lower panel uses two main explanatory variables: unemployment rate at 22 (graduation) and mean of unemploymnet rates in two years after graduation as defined in Equation 2 The unemployment rate is defined as the unemployment rate in the year the individual turned 22 in the state of their current residence. The table indicates the fixed effects included in each specification. All specifications control for race, and standard errors are clustered by state-graduation year.

In the model that includes the mean post-graduation unemployment rate (Equation 7), the issue of multicollinearity is mitigated. Yet, the unemployment rate at graduation remains statistically insignificant and very small in magnitude for both earnings and wages in the male sample. However, the average post-graduation unemployment rate has a significant negative effect, suggesting that a 4 percentage point increase (e.g., comparing graduates from 2007 to those graduating during recovery in 2015) would result in average earnings losses of approximately 4% over 3 - 10 years of potential experience. For women, the only significant effect is observed in the wage specification, where the same increase in the post-graduation unemployment rate corresponds to a 2% earnings loss. No other statistically significant effects are found, except in the occupation attainment outcome for men, which shows a positive association with the unemployment rate at graduation and a negative one with post-graduation conditions.

In conclusion, these results underscore the importance of the broader business cycle trajectory following entry into the labor market. I find a significant and negative effect of accumulated unemployment rates on both earnings and wages for men and women. The magnitude of these effects is larger than those reported by Altonji et al. (2016). By distinguishing between

unemployment rates at graduation and post-graduation, I find that the adverse effects of post-graduation conditions are both statistically significant and larger in magnitude than the effects of the unemployment rate at the point of labor market entry.

Pre-graduation

Based on the findings presented in the previous section, it is natural to ask when labor market conditions matter most for long-term career outcomes. So far, my results suggest that the unemployment rate following graduation plays the most substantial role in shaping these outcomes. However, if students choose their majors based on prevailing labor market trends (Blom et al., 2021), or put more effort into their studies after enrolling during economic downturns (Bičáková et al., 2021), then labor market conditions prior to graduation might also be important. To explore this possibility, I include the average unemployment rate during the three years preceding graduation in the model, estimating it as described in Equation 8.

Table 6: Whole Sample. Effect of the pre-graduation unemployment rates.

	Male						Female					
	ln Earnings	ln Wage	Pr(Empl)	Pr(Full Time)	ln Hours	Occupation Earnings	ln Earnings	ln Wage	Pr(Empl)	Pr(Full Time)	ln Hours	Occupation Earnings
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\bar{U}_{s,c-1..c-3}$	0.003	0.004	−0.0002	0.00003	−0.0002	0.00004	0.002	0.004	0.0004	−0.001	−0.001	0.001
	(0.003)	(0.003)	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)	(0.003)	(0.001)	(0.002)	(0.003)	(0.001)
U_{sc}	0.0003	0.001	0.001	0.001	−0.002	0.004**	−0.003	−0.003	−0.0002	0.001	0.001	−0.001
	(0.004)	(0.003)	(0.001)	(0.001)	(0.002)	(0.002)	(0.004)	(0.003)	(0.001)	(0.002)	(0.003)	(0.002)
$\bar{U}_{s,c+1,c+2}$	−0.012***	−0.008***	−0.001	−0.003**	−0.002	−0.004**	−0.004	−0.004	0.001*	0.0001	−0.002	−0.002*
	(0.004)	(0.003)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)	(0.001)	(0.002)	(0.003)	(0.001)
F test (p-value)	0.0001***	0.002***	0.73	0.13	0.16	0.02**	0.07*	0.03**	0.19	0.88	0.89	0.02**
Obs	61642	58931	64922	64922	61108	64859	65673	61644	69745	69745	63811	69668
Clusters	1989	1989	1989	1989	1989	1989	1988	1988	1989	1989	1988	1989
State FE	X	X	X	X	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X	X	X	X	X
Pot Exp FE	X	X	X	X	X	X	X	X	X	X	X	X

Note: * - significant at 10%; ** - significant at 5%; *** - significant at 1%. Standard errors are in parentheses.
The sample consists of college graduates with 3–10 years of potential experience who turned 22 between 1976 and 2017. The table presents the estimation results of Equation 8. The lower panel uses three main explanatiry variables: unemployment rate at 22 (graduation), mean of unemployment rates in two years after graduation as defined in Equation 2, and mean of unemployment rates in three years before graduation. The unemployment rate is defined as the unemployment rate in the year the individual turned 22 in the state of their current residence. The table indicates the fixed effects included in each specification. All specifications control for race, and standard errors are clustered by state-graduation year.

Table 6 presents the results. While the unemployment rates are jointly significant, individual coefficients of mean unemployment rate before graduation are not statistically significant for any outcome. Similarly, the unemployment rate at the time of graduation remains insignificant across most outcomes, with the exception of a positive effect on occupational attainment—consistent with the findings from Table 5. In contrast, the average post-graduation

unemployment rate continues to show a robust and statistically significant negative impact on earnings and wages, with magnitudes similar to those previously observed. Additionally, I find that post-graduation labor market conditions reduce the likelihood of full-time employment for men and have an economically small, positive effect on the probability of employment for women.

To sum up, the results of this section highlight that labor market conditions in the years following graduation are critical for determining career success. While pre-graduation and graduation-year conditions may influence students' decisions and behavior, they do not appear to have a direct and measurable long-term impact on labor market outcomes once post-graduation conditions are accounted for. These findings emphasize the importance of the post-graduation economic environment in shaping individuals' early career trajectories.

Selection at enrollment

So far, I have shown that in evaluating the effects of labor market conditions, it is essential to consider the entire trajectory rather than focusing on a single point in time. However, empirical evidence suggests that during periods of high unemployment, individuals are more likely to enroll in college. As a result, when estimating the effect of a recession - whether at enrollment, graduation, or after graduation—using the full sample, we may be comparing fundamentally different cohorts that are not directly comparable. These cohorts differ in their composition due to selection into college that is itself influenced by prevailing labor market conditions.

To address this selection problem, I fix the enrollment conditions and estimate the effect of the unemployment rate at graduation and post-graduation within those more homogeneous groups. Specifically, I divide the sample into two groups based on the detrended national unemployment rate at age 18 (U_{c18}): (1) cohorts who started college under high unemployment conditions ($U_{c18} > 0.1$), and (2) those who started under low unemployment conditions ($U_{c18} \leq 0.1$). I then estimate the model described in Altonji et al. (2016) (Equation 9) separately for each group.

The group with low unemployment at college entry represents the "always-takers"—individuals who would have enrolled in college regardless of economic conditions at enrollment. Importantly, this group still displays meaningful variation in labor market conditions at and after

graduation (see Figure 2), making it suitable for isolating the effect of graduating into a recession.

The estimated effects, based on the formula $\hat{\beta}_2 \times 4 + \hat{\beta}_3 \times 4 \times potexp + \hat{\beta}_4 \times 4 \times potexp^2$, are summarized in Table 7, with underlying regression results presented in Appendix Table 3.

Table 7: Fixing Enrollment Conditions. Effect of a 4 p.p increase in Unemployment rate at Graduation

	High U_{c18}						Low U_{c18}					
	ln Earnings	ln Wage	Pr(Empl)	Pr(Full time)	ln Hours	Occupation Earnings	ln Earnings	ln Wage	Pr(Empl)	Pr(Full time)	ln Hours	Occupation Earnings
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Average effect 1-10 PE	−0.063***	−0.071***	0.010**	0.006	0.006	0.001	−0.013	−0.023**	0.006*	−0.003	0.006	0.005
	(0.023)	(0.017)	(0.004)	(0.007)	(0.012)	(0.009)	(0.011)	(0.011)	(0.003)	(0.005)	(0.007)	(0.005)
Potential Exp = 1	−0.115***	−0.093***	−0.001	−0.025*	−0.008	−0.016	−0.072**	−0.040*	0.0002	−0.026**	−0.035*	−0.005
	(0.035)	(0.028)	0.008	(0.015)	(0.024)	(0.015)	(0.028)	(0.021)	(0.006)	(0.010)	(0.020)	(0.009)
Potential Exp = 3	−0.082***	−0.081***	0.008*	−0.002	0.002	−0.004	−0.031**	−0.030**	0.005	−0.010*	−0.005	0.002
	(0.020)	(0.016)	(0.004)	(0.008)	(0.013)	(0.009)	(0.015)	(0.012)	(0.004)	(0.005)	(0.009)	(0.005)
Potential Exp = 7	−0.045**	−0.051***	0.0002	0.001	0.006	0.002	−0.008	−0.011	0.005	−0.00005	0.002	0.005
	(0.019)	(0.018)	(0.004)	(0.007)	(0.011)	(0.008)	(0.012)	(0.010)	(0.003)	(0.005)	(0.008)	(0.005)

Note: * - significant at 10%; ** - significant at 5%; *** - significant at 1%. Standard errors are in parentheses.
The sample consists of college graduates with potential experience from 1 to 10 years who turned 22 between 1976 and 2019. High U_{c18} defines the cohorts for which detrended national unemployment rate at 18 (college enrollment) was higher than 0.1%. Low U_{c18} defines the cohorts for which detrended national unemployment rate at 18 (college enrollment) was lower than 0.1%. The graduation unemployment rate is the state unemployment rate at age 22. The contols include race dummy, cubic time trend, and state fixed effects. Standard errors are clustered by state and graduation year. The results of the underlying regressions as defined in Equation 9 are presented in Appendix Table 3. The estimates are derived through formula $\hat{\beta}_2 \times 4 + \hat{\beta}_3 \times 4 \times potexp + \hat{\beta}_4 \times 4 \times potexp^2$.

The results suggest that the primary effect documented in the literature is driven by individuals who enrolled in college during periods of high unemployment. For this group, a 4 percentage point increase in the unemployment rate at graduation leads to an average earnings loss of 6.3% and a wage loss of 7.1% for the average level of potential experience. These figures are roughly three times larger than those reported in pooled samples and twice as large as the effects I previously estimated for individuals graduating during a downward trend. The initial losses for this group are approximately 12% (earnings) and 9% (wages), and these effects persist even after a decade.

By contrast, graduates who started college under low unemployment conditions also experience initial earnings and wage losses of 7% and 4% respectively in the first year following graduation, but these effects largely dissipate by year four. Both groups show a short-term decline in the probability of full-time employment, while a temporary reduction in hours worked is observed only for the low-U_{c18} group, disappearing after two years.

These findings highlight a critical distinction between cohorts: those who began college during high unemployment periods not only persist in the labor market but accept significantly lower wages. This may reflect higher risk aversion or differences in ability, given that

such cohorts likely include individuals who would not have pursued higher education under more favorable economic conditions. Further research is needed to understand the mechanisms driving these differences.

Next, I repeat my analysis of post-graduation trajectories by estimating Equation 5 on samples divided into two groups based on labor market conditions at the time of college enrollment. The results, presented in Table 8, are broadly consistent with those from the pooled

Table 8: Fixing Enrollment Conditions. Effect of the accumulated unemployment rate

	High $U_{c_{18}}$						Low $U_{c_{18}}$					
	ln Earnings	ln Wage	Pr(Empl)	Pr(Full Time)	ln Hours	Occupation Earnings	ln Earnings	ln Wage	Pr(Empl)	Pr(Full Time)	ln Hours	Occupation Earnings
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
U_{sc}^{ACC}	−0.003*	−0.002	−0.001*	−0.001	−0.001	0.0004	−0.003**	−0.001	0.00004	−0.001	−0.001*	0.00005
	(0.002)	(0.002)	(0.0004)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.0003)	(0.001)	(0.001)	(0.001)
Obs	24385	23329	25573	25573	24141	25561	35746	34178	37716	37716	35448	37668
Clusters	867	867	867	867	867	867	1071	1071	1071	1071	1071	1071
State FE	X	X	X	X	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X	X	X	X	X
Pot Exp FE	X	X	X	X	X	X	X	X	X	X	X	X
U_c^{ACC} at potexp=3	−0.003	0.0005	−0.001	−0.005**	−0.007*	−0.001	−0.011**	−0.008	0.001	−0.003	−0.002	−0.001
	(0.006)	(0.005)	(0.001)	(0.002)	(0.004)	(0.003)	(0.006)	(0.005)	(0.001)	(0.002)	(0.003)	(0.002)
U_c^{ACC} at potexp=5	−0.012**	−0.014***	−0.001	−0.003*	0.003	−0.001	−0.006	−0.008*	−0.0001	0.002	0.002	0.0004
	(0.005)	(0.005)	(0.001)	(0.002)	(0.003)	(0.002)	(0.005)	(0.005)	(0.001)	(0.002)	(0.003)	(0.002)
U_c^{ACC} at potexp=7	0.003	−0.003	0.001	0.004**	0.004	0.004	−0.0002	−0.001	0.0004	0.0002	−0.003	−0.001
	(0.005)	(0.005)	(0.001)	(0.002)	(0.003)	(0.002)	(0.004)	(0.004)	(0.001)	(0.002)	(0.002)	(0.002)
State FE	X	X	X	X	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X	X	X	X	X

Note: * - significant at 10%; ** - significant at 5%; *** - significant at 1%. Standard errors are in parentheses.
The sample consists of college graduates with 3–10 years of potential experience who turned 22 between 1976 and 2017. High U_{c18} defines the cohorts for which detrended national unemployment rate at 18 (college enrollment) was higher than 0.1%. Low U_{c18} defines the cohorts for which detrended national unemployment rate at 18 (college enrollment) was lower than 0.1%. The table presents the estimation results of Equation 5, which uses the accumulated unemployment rate as the primary explanatory variable, defined as in Equation 1. The table indicates the fixed effects included in each specification. All specifications control for race, and standard errors are clustered by state-graduation year.

sample. On average, a one percentage point increase in the accumulated unemployment rate leads to a 0.3% decline in earnings over 3-10 years of potential experience in both groups. However, the timing of the effect differs: for individuals in the high $U_{c_{18}}$ group, the earnings loss becomes statistically significant at five years of potential experience, while for those in the low $U_{c_{18}}$ group, a similarly sized effect is present at three years of potential experience and disappears afterwards. I do not find significant average effects on wages in either group. There is, however, a small negative effect on the probability of employment for the high $U_{c_{18}}$ group, and a similarly small negative effect on hours worked for the low $U_{c_{18}}$ group.

Lastly, I estimate the model using separate measures for the unemployment rate at graduation and the average unemployment rate during the two years following graduation. The results are reported in Table 9. Once again, I find a significant negative effect of post-graduation

Table 9: Fixing Enrollment Conditions. Effect of separate unemployment rates

	High $U_{c_{18}}$						Low $U_{c_{18}}$					
	ln Earnings	ln Wage	Pr(Empl)	Pr(Full Time)	ln Hours	Occupation Earnings	ln Earnings	ln Wage	Pr(Empl)	Pr(Full Time)	ln Hours	Occupation Earnings
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$U_{s,c}$	0.014**	0.012**	0.0004	0.002	0.002	0.010***	0.001	0.003	0.001	0.001	−0.003	0.004***
	(0.007)	(0.006)	(0.003)	(0.002)	(0.004)	(0.003)	(0.003)	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)
$\bar{U}_{s,c+1,c+2}$	−0.025***	−0.017***	−0.003	−0.004	−0.006	−0.010**	−0.007*	−0.006*	−0.0005	−0.003**	−0.001	−0.004**
	(0.007)	(0.006)	(0.002)	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)	(0.001)	(0.001)	(0.002)	(0.002)
Obs	24385	23329	25573	25573	24141	25561	35746	34178	37716	37716	35448	37668
Clusters	867	867	867	867	867	867	1071	1071	1071	1071	1071	1071
State FE	X	X	X	X	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X	X	X	X	X
Pot Exp FE	X	X	X	X	X	X	X	X	X	X	X	X

Note: * - significant at 10%; ** - significant at 5%; *** - significant at 1%. Standard errors are in parentheses.
The sample consists of college graduates with 3–10 years of potential experience who turned 22 between 1976 and 2017. The table presents the estimation results of Equation 7. High U_{c18} defines the cohorts for which detrended national unemployment rate at 18 (college enrollment) was higher than 0.1%. Low U_{c18} defines the cohorts for which detrended national unemployment rate at 18 (college enrollment) was lower than 0.1%. The model uses two main explanatory variables: unemployment rate at 22 (graduation) and mean of unemployment rates in two years after graduation as defined in Equation 2. The unemployment rate is defined as the unemployment rate in the year the individual turned 22 in the state of their current residence. The table indicates the fixed effects included in each specification. All specifications control for race, and standard errors are clustered by state-graduation year.

labor market conditions on early career outcomes, but the magnitude of this effect varies markedly depending on the conditions at the time of college enrollment.

For individuals in the high $U_{c_{18}}$ group—those who faced elevated unemployment rates when they enrolled in college—a one percentage point increase in the average post-graduation unemployment rate is associated with a 2.5% decline in earnings. This is more than twice the effect observed in the pooled sample in the previous section. In contrast, for individuals in the low $U_{c_{18}}$ group, the estimated effect is much smaller—around 0.7%—and closely aligns with the estimates obtained from the pooled analysis. A similar pattern holds for wages and occupational earnings, suggesting that poor labor market conditions after graduation weigh more heavily on those who already entered college during an economic downturn.

Interestingly, the estimated coefficients on the unemployment rate at the time of graduation are positive and statistically significant for the high $U_{c_{18}}$ group, particularly for earnings, wages, and occupational earnings. This stands in contrast to the pooled estimates, where the effect of graduation-year unemployment was either negligible or insignificant. For the low $U_{c_{18}}$ group, the effect of graduation-year unemployment remains statistically insignificant across all outcomes, consistent with earlier findings.

Taken together, these results underscore the importance of accounting for selection into college during periods of economic distress. The conditions at graduation do matter, but their impact appears to be shaped by the labor market environment individuals faced when they began their postsecondary education. Ignoring this initial selection could lead to an incom-

plete or misleading understanding of how early career trajectories are shaped by economic fluctuations.

Conclusion

This study provides new insights into the importance of the unemployment rate trajectory for estimating long-term career outcomes. Rather than focusing solely on labor market conditions at a single point in time, I examine the broader picture, spanning from college enrollment through two years post-graduation. This approach allows me to decompose previously reported effects in the literature (Kahn, 2010; Oreopoulos et al., 2012; Altonji et al., 2016; Schwandt and Von Wachter, 2019) into several underlying forces.

First, I introduce a "DownTrend" dummy variable to identify cohorts that graduated during periods of economic recovery, defined by declining unemployment rates. The findings show that graduating during a recovery yields larger earnings and wage gains than the losses experienced from graduating into a recession. Specifically, a 4 percentage point decline in the unemployment rate during the recovery period is associated with a 3.4% increase in earnings and a 4.1% increase in wages for men with average potential experience, and a more substantial 8.8% and 5.7% increase in initial earnings and wages, respectively. By contrast, graduating into a recession results in a 5.7% initial earnings loss that disappears after two years in the labor market. These findings are consistent with the literature on job mobility and wage growth over the life cycle, which highlights early-career transitions as a key channel for earnings progression (Topel and Ward, 1992; Neal, 1999). During periods of recovery, expanding job opportunities facilitate better job matching. However, I find no comparable benefit for women, indicating that gender disparities in job mobility and advancement may persist even during economic upswings.

To capture the broader early-career environment, I construct an accumulated unemployment rate variable, which reflects labor market conditions at the time of graduation and during the two years immediately following graduation. This measure reveals a statistically significant negative impact on both earnings and wages for both men and women. A one percentage point increase in this accumulated unemployment rate leads to a 0.3% decline in earnings for men and a 0.2% decline for women. For example, a man graduating in 2007 faces an average

earnings penalty of 1.2% over the subsequent eight years, compared to a counterpart from the 2015 cohort who entered a more stable post-recession labor market, despite similar unemployment rates at graduation.

To disentangle the effect of graduating into a weak labor market from the impact of working in one during the early career period, I include both the unemployment rate at graduation and the average unemployment rate over the following two years in the model. The results show that, for workers in their 3–10 years of potential experience, the post-graduation labor market plays a more critical role. Specifically, men experience average earnings and wage losses of around 3% due to high post-graduation unemployment, underscoring the persistent influence of early labor market conditions.

Given existing evidence that college enrollment rises during recessions, I further examine the role of labor market conditions at the time of college entry. I split the sample into two groups based on the level of detrended national unemployment at college enrollment and estimate the impact of graduating during a recession for each group, following the approach of Altonji et al. (2016). The findings reveal that most of the negative effects are concentrated among those who began college during periods of high unemployment. For this group, graduating during a recession results in initial earnings losses of approximately 12%, with longer-term losses persisting even after a decade. In contrast, individuals who enrolled during periods of low unemployment face smaller initial losses: around 7%, which vanish within three years of labor market entry.

Post-graduation labor market conditions also differ in impact by enrollment timing. Those who enrolled during high-unemployment periods suffer greater losses from adverse post-graduation labor markets: a one percentage point increase in the post-graduation unemployment rate leads to a 2.5% reduction in earnings, compared to 0.7% for those who enrolled during low-unemployment periods.

Overall, this study contributes to the literature on early-career labor market dynamics by showing that both the unemployment rate at graduation and the broader labor market trajectory substantially influence long-term earnings. While graduating during a recession has clear and significant consequences, the severity of these effects depends on whether the economy improves in the years that follow. Importantly, I also show that labor market conditions at college entry play a critical role, suggesting that selection into higher education during recessions

is a key mechanism behind cohort-specific labor market outcomes. These findings highlight the importance of labor market momentum in shaping career paths and offer a more nuanced framework for understanding how economic downturns affect new entrants to the labor force.

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Appendix

Table A.1: Before-After Comparison by Recession

	Male				Female			
	ln Earnings (1)	ln Wage (2)	Pr(Empl) (3)	Pr(Full-Time) (4)	ln Earnings (5)	ln Wage (6)	Pr(Empl) (7)	Pr(Full-Time) (8)
	1980/1985 Cohorts							
After	0.016	0.049	−0.015**	−0.030*	0.026*	0.134**	0.038**	−0.032
	(0.010)	(0.009)	(0.001)	(0.005)	(0.003)	(0.003)	(0.001)	(0.003)
Observations	1799	1703	1914	1914	1683	1573	1783	1783
	1989/1996 Cohorts							
After	0.345**	0.293***	0.015***	0.023	0.171**	0.213**	−0.005	−0.029*
	(0.007)	(0.004)	(0.0002)	(0.004)	(0.011)	(0.011)	(0.003)	(0.004)
Observations	1954	1879	2047	2047	1956	1821	2105	2105
	2000/2006 Cohorts							
After	0.149***	0.141***	−0.004	0.017	−0.003	0.006**	−0.009*	−0.013
	(0.002)	(0.0005)	(0.002)	(0.005)	(0.015)	(0.0003)	(0.001)	(0.007)
Observations	2140	2058	2258	2258	2371	2229	2535	2535
	2007/2015 Cohorts							
After	0.230*	0.174*	0.034*	0.064*	0.257**	0.291*	0.0003	−0.049
	(0.018)	(0.026)	(0.005)	(0.007)	(0.009)	(0.028)	(0.004)	(0.015)
Observations	1263	1213	1326	1326	1342	1263	1422	1422
Clusters	2	2	2	2	2	2	2	2
State FE	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X

Note: * - significant at 10%; ** - significant at 5%; *** - significant at 1%. Standard errors are in parentheses.
The dependent variables are the logarithm of earnings, the logarithm of wages, an employment indicator (equal to 1 if the individual is employed, reported in Columns (3) and (7)), and a full-time employment indicator (equal to 1 if the individual is employed full-time, reported in Columns (4) and (8)). The sample consists of college graduates with 6–10 years of potential experience who were 22 years old in the year before the recession (cohorts 1980, 1989, 2000, 2007) or after the recession when the national unemployment rate returned to its pre-recession level (cohorts 1985, 1996, 2006, 2015). The Table presents the estimation results of Equation 3, which compares outcomes before and after the recession without interaction terms for the unemployment rate. The table reports the fixed effects included in each specification. All specifications control for race, and standard errors are clustered by graduation year.

Table A.2: Whole Sample. The effect of graduating on the Downward trend of the Unemployment rate

	ln Earnings	ln Wage	Pr(Empl)	Pr(Full time)	ln Hours	Occupation Earnings	ln Earnings	ln Wage	Pr(Empl)	Pr(Full time)	ln Hours	Oc E
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	
	Male											
U_{sc}	-0.027^{***}	-0.015^{***}	-0.002	-0.009^{***}	-0.011^{**}	-0.002	-0.020^{***}	-0.008	-0.002	-0.009^{***}	-0.010^{*}	
	(0.007)	(0.006)	(0.002)	(0.003)	(0.005)	(0.003)	(0.008)	(0.006)	(0.002)	(0.003)	(0.006)	
$U_{sc} \times Potexp$	0.007^{***}	0.001	0.001^{**}	0.003^{***}	0.005^{**}	0.001	0.007^{***}	0.001	0.001^{**}	0.003^{***}	0.005^{**}	
	(0.003)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)	(0.002)	(0.001)	(0.001)	(0.002)	
$U_{sc} \times Potexp^2$	-0.001^{**}	0.00001	-0.0001^{***}	-0.0003^{***}	-0.0005^{***}	-0.0001	-0.001^{**}	0.00002	-0.0001^{***}	-0.0003^{***}	-0.0005^{***}	
	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0002)	
$DownTrend_c$							0.072^{***}	0.071^{***}	-0.006	0.0002	0.008	
							(0.024)	(0.022)	(0.006)	(0.010)	(0.015)	
$U_{sc} \times DownTrend_c$							-0.008^{**}	-0.007^{**}	0.001	0.0001	-0.002	
							(0.003)	(0.003)	(0.001)	(0.001)	(0.002)	
Obs	81658	77856	86326	86326	80727	86174	81658	77856	86326	86326	80727	
Clusters	2244	2244	2244	2244	2244	2244	2244	2244	2244	2244	2244	
	Female											
U_{sc}	-0.024^{***}	-0.022^{***}	-0.002	-0.007^{**}	-0.004	-0.003	-0.023^{***}	-0.019^{***}	-0.003^{**}	-0.008^{**}	-0.005	
	(0.006)	(0.005)	(0.001)	(0.003)	(0.005)	(0.002)	(0.007)	(0.005)	(0.001)	(0.003)	(0.005)	
$U_{sc} \times Potexp$	0.005^{**}	0.004^{*}	0.001^{***}	0.003^{**}	0.002	0.002	0.005^{**}	0.004^{*}	0.001^{***}	0.003^{**}	0.002	
	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	
$U_{sc} \times Potexp^2$	-0.0003	-0.0002	-0.0001^{***}	-0.0002^{*}	-0.0002	-0.0002^{*}	-0.0003	-0.0002	-0.0001^{***}	-0.0002^{*}	-0.0002	
	(0.0002)	(0.0002)	(0.00005)	(0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0002)	(0.00005)	(0.0001)	(0.0002)	
$DownTrend_c$							0.004	0.033	-0.011^{**}	-0.015	-0.016	
							(0.023)	(0.021)	(0.004)	(0.012)	(0.022)	
$U_{sc} \times DownTrend_c$							0.001	-0.003	0.002^{***}	0.001	0.002	
							(0.004)	(0.003)	(0.001)	(0.002)	(0.003)	
Obs	88891	83453	94248	94248	86121	94123	88891	83453	94248	94248	86121	
Clusters	2244	2243	2244	2244	2243	2244	2244	2244	2244	2244	2244	
State FE	X	X	X	X	X	X	X	X	X	X	X	

Note: * - significant at 10%; ** - significant at 5%; *** - significant at 1%. Standard errors are in parentheses.
The sample consists of college graduates with 1–10 years of potential experience who turned 22 years old between 1976 and 2019. The table presents the estimation results of
5, which includes a dummy variable for the Downward Trend of unemployment rate and its interaction with the unemployment rate. DownTrend is an indicator variable for g
during a period when the unemployment rate is declining (i.e., during an economic expansion). A graduation year is classified as being on a DownTrend if the difference be
unemployment rate in that year and the previous year is negative and the difference between that year and the next year is negative as well. Columns (1)–(4) report results
shorter version of the model, which does not account for $DownTrend_c$. The state-level unemployment rate is defined as the unemployment rate in the year the individual tu
the state of their current residence. The table indicates the fixed effects included in each specification. All specifications control for race and include a cubic time trend. Stand
are clustered by state-graduation year.

Table A.3: Fixing enrollment conditions

	High U_{c18}						Low U_{c18}					
	ln Earnings	ln Wage	Pr(Empl)	Pr(Full time)	ln Hours	Occupation Earnings	ln Earnings	ln Wage	Pr(Empl)	Pr(Full time)	ln Hours	Occupation Earnings
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
U_{sc}	-0.034^{***}	-0.024^{**}	-0.002	-0.010^{**}	-0.004	-0.006	-0.025^{**}	-0.011	-0.001	-0.009^{***}	-0.014^{**}	-0.002
	(0.013)	(0.010)	(0.003)	(0.005)	(0.009)	(0.005)	(0.010)	(0.007)	(0.002)	(0.004)	(0.007)	(0.003)
$U_{sc} \times Potexp$	0.005	0.001	0.002^{**}	0.005^{**}	0.002	0.002	0.008^{**}	0.001	0.001	0.003^{**}	0.006^{**}	0.001
	(0.005)	(0.005)	(0.001)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.001)	(0.001)	(0.003)	(0.001)
$U_{sc} \times Potexp^2$	-0.0003	0.0001	-0.0003^{***}	-0.0005^{***}	-0.0002	-0.0002	-0.001^{**}	0.0001	-0.0001	-0.0002^{*}	-0.001^{***}	-0.0001
	(0.0005)	(0.0004)	(0.0001)	(0.0002)	(0.0003)	(0.0002)	(0.0003)	(0.0002)	(0.0001)	(0.0001)	(0.0002)	(0.0001)
Obs	30921	29517	32541	32541	30502	32497	43720	41704	46232	46232	43179	46138
Clusters	918	918	918	918	918	918	1122	1122	1122	1122	1122	1122

Note: * - significant at 10%; ** - significant at 5%; *** - significant at 1%. Standard errors are in parentheses.
The sample consists of college graduates with 1–10 years of potential experience who turned 22 years old between 1976 and 2019. The table presents the estimation results of Equation 9. High U_{c18} defines the cohorts for which detrended national unemployment rate at 18 (college enrollment) was higher than 0.1%. Low U_{c18} defines the cohorts for which detrended national unemployment rate at 18 (college enrollment) was lower than 0.1% The state-level unemployment rate is defined as the unemployment rate in the year the individual turned 22 in the state of their current residence. The table indicates the fixed effects included in each specification. All specifications control for race and include a cubic time trend. Standard errors are clustered by state-graduation year.