# The Persistent Effects of Initial Labor Market Conditions for Young Adults and their Sources

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**Abstract**

Unlucky young workers entering the labor market in recessions suffer a range of medium- to long-term consequences. This paper summarizes the findings of the growing empirical literature on this subject and uses it to assess economic models of career development. The literature finds large initial effects on earnings, labor supply, and wages that tend to fade after ten to fifteen years in the labor market, and that are accompanied by changes in occupation, job mobility and employer characteristics. Adverse initial labor market entry also has persistent effects on a range of social outcomes, including timing and completed fertility, marriage and divorce, criminal activities, attitudes, and risky alcohol consumption. There is also evidence that early exposure to depressed labor market lowers health and raises mortality in middle age, patterns accompanied by a reopening of earnings gaps.

In each recession, a concern arises that young adult workers coming of age in a depressed labor market may bear lasting scars. During the Great Recession from 2007-09, for example, newspaper articles and policymakers voiced concerns for this "Lost Generation." More recently, young adults who had been planning to enter the labor market after graduation found that their job prospects shifted dramatically between, say, December 2019 and March 2020. Of course, most jobseekers and many employed workers suffer during a slack labor market, but young labor market entrants are particularly vulnerable to adverse labor conditions. Young entrants are at the beginning of a very productive phase for their careers, when earnings growth and gainful job mobility of the typical worker are as high as they will ever be for most individuals. Starting out one's working life during a recession can affect unlucky labor market entrants for many years, in some cases well into middle age.

This article takes stock of what economists have learned about the persistent effects of entering the labor market in a recession. The first section provides a brief discussion of typical earnings-experience early in a career, both on average and as affected by cyclical economic patterns, as a benchmark for what follows. We then turn to a standard econometric framework used to discuss the short- and long-term effects of initial labor market conditions. The common approach uses state-specific cyclical changes in the unemployment rate to consider how the earnings-experience profiles shifts. We will discuss the assumptions underlying this approach, how it might be implemented using panel and cross-section data, and how it might be adjusted for selection effects.

Over the last 15 years, an increasing number of studies have analyzed the short- and long-term effects on individuals entering the labor market in a recession, and this article will take stock of the core empirical methods and findings from this literature. On average, individuals entering the labor market in a typical recession (a 3-4 point rise in unemployment rates) experience a reduction in earnings of about 10-15 percent initially---somewhat smaller for college graduates, somewhat larger

for high school graduates, and a particularly large reduction for nonwhites. Estimates for college graduates suggest that during recessions, workers tend to start jobs at less prestigious occupations and smaller and lower-paying firms.  For some groups, such as PhD economists and possibly MBA graduates, an initial occupation choice permanently affects career outcomes.  An early-career economic shock has the potential to be disruptive beyond strictly economic outcomes, too.  An increasing number of studies document that adverse labor market entry has effects on health and other outcomes like marriage, divorce, and women's fertility, and can affect socio-economic outcomes, health, and mortality in middle age.

Finally, we turn to potential explanations why young entrants to the labor market may be especially vulnerable, and lessons we can learn for the wider labor market. New labor market entrants have a blank slate in terms of work experience, such that typical concerns regarding selection based on prior job or wage histories complicating most other empirical studies of the career impacts of labor market shocks are not present. Hence, empirical studies reviewed here yield experimental estimates that can be used to make inferences on different models of career environment in a literature where causal evidence is typically hard to come by. To do so, we turn to studies that combine two complementary models of career development and take stock in light of the findings of the literature: skill accumulation (for example, Mincer 1974; Ben-Porath 1967) and job search (for example, Burdett 1978; Manning 2003). One framework is that workers first choose an occupation, then invest in occupation-specific skills and look for a good job in that occupation. Another framework is that individuals have some general skills, look for a good job, and at the same time learn about and choose an occupation, or at least experience some form of growth of earnings on the job. In either of these cases, an initial shock may disrupt career development.

Studying labor market entrants offers interesting insights for economists beyond career development. In the final section, we discuss potential welfare effects, the role of social insurance,

and potential lessons from the study of non-economic outcomes. Studying labor market entrants can also provide insights about what job characteristics and worker mobility changes in recessions, provide credible estimates of hysteresis in the labor market, and yield estimates of the costs of business cycles.

**Background on Career Profiles**

Most individuals transition from full-time schooling, with only part-time or intermittent employment, to seeking full-time work. During the first ten years in the labor market, on average wages for young workers rise by about 60 percent and earnings rise by about 100 percent (for example, Card 1999). The difference is accounted for by increases in labor supply. The early career period is also very active in terms of job mobility. On average, individuals have seven employers in the first ten years in the labor market (Topel and Ward 1992), a pattern that has remained remarkably stable over time. For the typical worker, this job mobility involves towards better jobs at higher paying employers (Smith and von Wachter 2019). After that, mobility and wage growth slow down considerably, and for most workers are steady for the next 20 or so years.

Figure 1 shows typical some patterns for college-educated workers in Canada and the United States from Oreopoulos et al. (2012), though the profiles are similar for other education groups. For each of the four panels, the horizontal axis shows labor market experience, which in this case is just calendar years since graduation. The first two panels show cumulative growth in annual earnings and declining rates of year-to-year job mobility, respectively. The bottom two panels show how two typical measures of firm "quality," firm size and firm average wages, evolve with labor market experience in Canadian data. Smith and von Wachter (2019) show similar patterns for measures of firm wage for a broader group of US workers.

Figure 2 shows profiles of log annual earnings for annual cohorts of labor market entrants in different years, separated by four major education groups from the U.S. Current Population Survey. In all years and for all education groups, cohorts' (log) annual earnings evolve in the typical concave fashion seen in Panel A of Figure 1. However, it is also clear that earnings in the initial experience years tend to fluctuate with the business cycle. The vertical lines in each figure show business cycle troughs: notice that the early years of earnings right after such troughs—say, after 2007—are at a lower level. However, this fluctuation becomes more nuanced or even absent for workers with higher labor market experience. From the profiles, it is apparent that the initial differences between cohorts tend to fade as cohorts spend more time in the labor market. The empirical strategies and findings discussed later in this paper are effectively based on comparison of these type of profiles of individuals entering in recessions with similar individuals entering in expansions.

At the same time as the rapid school-to-work transition is taking place, most individuals will also have their first experience with other important life events, including cohabitation and marriage, child rearing, and home ownership. For many, this is also a time when social networks of friends and coworkers are formed that can last into middle age and beyond. Theory and evidence (mostly from outside of economics) suggest that the school-to-work transition is related to an important phase of socialization that has lasting influences on attitudes and habits relating to health and substance abuse, among others. [1]

Despite a large amount of descriptive evidence, we still have a limited understanding of the key causal forces underlying the patterns of wage growth shown in Figures 1 and 2. The study of exogenous shocks, such as adverse labor market entry, can help shed additional light on the determinants of career developments, much as the study of mature job losers can shed light on

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[1] As one example, Kaestner and Yarnoff (2011) provide evidence that legal drinking ages in early adulthood can persistent effects on drinking behavior.

determinants of the wage structure.

## Methods for Estimating of Persistent Effects of Initial Labor Market Conditions

*The Conceptual Experiment and Baseline Regression*

In estimating whether the state of the labor market has persistent effects on earnings, wages, and other outcomes of labor market entrants, the ideal experiment would be to compare two identical groups of entrants that were randomly exposed to different initial conditions. The studies reviewed here seek to approximate this ideal by comparing labor market entrants in different regional labor markets, typically in the United States but increasingly in other countries, that had different unemployment rates.

To understand what empirical variation is effectively used by these studies, it is helpful to consider a typical variant of the regression specification used in this literature. In these regressions, the outcome variables $y$ for individual $i$ would be wages or earnings (often expressed in logs), categorized by the state s and the calendar year t where labor market entry occurred.

$$y_{ist} = \alpha + \gamma_e + \beta_e\, UR_{st} + \theta_t + \lambda_s + \epsilon_{ist}$$

The main independent variable of interest is the unemployment rate $UR_{st}$ prevailing in a given state during the year of labor market entry. The subscript e stands for years since labor market entry (also referred to as labor market experience). Most studies use so-called potential experience, which is defined as the number of years an individual could have worked after graduation. (In many data sources, it is impossible to calculate actual time worked in any given year.) The basic specification usually includes dummies for potential experience, for calendar year, and the state of labor market

entry.

For example, suppose that the outcome variable $y$ is annual labor market earnings. The coefficients on the experience dummies $\gamma_e$ capture the regular growth in earnings for labor market entrants with experience (the so-called "experience profile" shown earlier). The coefficients $\beta_e$ on the unemployment rate measure the deviations of earnings from the typical experience profile at each experience year, and hence together capture the shift of the experience profile due to the initial unemployment rate. Given the year dummies and state dummies, the remaining variation in each state's unemployment rate consists of changes over time (relative to its own mean, captured by the coefficient on the state dummy $\lambda_s$) that differ from the national business cycle (captured by the coefficients on the year dummies $\theta_t$). These state-specific cyclical changes in the unemployment rate are what identify the shift in the experience profiles due to adverse initial conditions.

Note that this regression equation does not include the state unemployment rate prevailing in the current year $t$ as control variable, but instead includes only the unemployment rate in the year of labor market entry for individual $i$. In this case, one can show that the coefficient $\beta_e$ captures the effect of graduating in a recession, *given the typical subsequent evolution* of the local labor market conditions. In other words, this parameter captures the full difference in lifetime earnings due to adverse labor market entry between lucky and unlucky cohorts.[2]

For many questions, it is important to know what the effect of the very first adverse labor market condition is, *net of all subsequent market conditions*. It may not be surprising to see extended effects from a career spent in a sluggish economy. Most economic models have a much harder time

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[2] The effect of the initial unemployment rate consists of its own direct effect, plus the weighted effect of subsequent unemployment rates correlated with it (for a more detailed discussion, see Oreopoulos et al. 2012). Besides including contemporaneous labor market indicator in the regression, a more complete approach is to allow each subsequent unemployment rate to have persistent effects as well. This is difficult to estimate due to the autocorrelation structure of unemployment rates, but again, it is pursued in Oreopoulos et al. (2012).

explaining persistent adverse effects to only short-term exposure to adverse initial conditions. To measure the effect of initial effect net of additional labor market conditions, studies have either included the state unemployment rate in year **t** in regression model (sometimes referred to as the "current" unemployment rate) or joint dummies for year and state (or whichever labor market area is the focus of the study). Future labor market locations may themselves be affected by initial labor market conditions and possibly correlated with unobservable characteristics, but proceeding at the cell level can help with omitted variable bias.

The regression model is typically not directly derived from a theoretical model. For wages or earnings as an outcome variable, it can be interpreted as a representation of a canonical individual wage or earnings process that incorporates a role of local labor market conditions in wage setting. Such local effects have been explored empirically and theoretically in the literature on the wage curve, as in Blanchflower and Oswald (1995). Most models have a hard time explaining persistent effects to short-term exposure to adverse initial labor market conditions, but we discuss potential economic explanations later in this paper.

Several practical choices underlie the choice of this typical regression equation. For example, it uses the unemployment rate in the year of graduation to summarize the state of the local labor market. In case of slow recoveries, alternative measures that are not affected by changes in labor force participation are more suitable, such as the employment-population ratio. The model also presupposes that the effect of the initial unemployment rate is linear. In principle, it is possible that deeper or longer recessions have particularly strong effects. It is also possible that the effect of cyclical conditions changes over time, although analysis of US and Canadian data has revealed that the short- and long-term effects appear comparable in different cycles (for example, Schwandt and von Wachter 2020) and approximately linear in the unemployment rate (for example, Oreopoulos et al. 2012), consistent with similar findings for job losers.

*Threats to Internal Validity*

A causal interpretation of the coefficient estimates for $\beta_e$ requires that the economic conditions at labor market entry are uncorrelated with other determinants of the respective outcome. There are at least two potential threats to validity from estimating this basic regression.

First, individuals may respond to adverse labor market conditions by either anticipating or delaying graduation or by moving to a different local labor market. To address this issue, several papers have used the *predicted* year of graduation – based on age at entry into school or college and duration of the program – to pursue an instrumental variable strategy. In this case, the unemployment rate in the actual year of graduation is instrumented with the unemployment rate in the predicted year of graduation (for example, Kahn 2010; Oreopoulos et al. 2012).

Second, any effect of the initial unemployment rate on wages may also affect labor supply decisions, such that the sample of workers for which the regression can be estimated changes with the business cycle. Most college graduates are likely to work despite adverse labor market conditions, but this can a more serious issue for less-educated workers. It is possible to assess the extent of the problem by analyzing a sample of individuals that are employed in each year after graduation (as in Oreopoulos et al. 2012). In cross-sectional data, a range of strategies can be pursued to address this issue, including imputing small values for zero earnings or wages (so that these workers do not drop out of the sample), quantile regressions, or in the case of earnings, analyzing levels instead of logs such that zeros are included in the regression.

*Measurement and Implementation*

The most common data source used to study the long-term effects of adverse labor market entry is panel data that records information for the same individuals from the time of labor market

entry onwards. Such data have three key requirements: information on the year of labor market entry, the place of labor market entry, and career outcomes for several years after labor market entry. Ideally, the data also have information on the type of education or degree type, so that one can use this information to address potential selection issues (as mentioned the previous section). Also, it can be useful if the data distinguishes between place of graduation and place of first employment. With these panel data at hand, the regression equation can be estimated directly at the individual level (as in Kahn 2010). However, there are three alternative approaches worth considering.

First, given that the main explanatory variable is defined at the state-year level, it is common econometric practice to work directly at the group level. For example, Oreopoulos et al. (2012) work with means among graduation state, graduation year, and experience cells. If multiple education or demographic groups are studied, the dimension of cells can be changed accordingly. The advantages of the cell-level model are discussed in detail in Angrist and Pischke (2009), among others; in the present context, the ability for graphical representation of the underlying data and results represents a particularly useful feature.[3]

A second approach is intended to address a potential drawback of the relatively small sample sizes common with this kind of panel data. While larger administrative panel data sets are becoming increasingly available, they often do not cover enough entering cohorts or have sufficient information on time and place of graduation— and are often not yet universally available to researchers, either. To circumvent these problems, Schwandt and von Wachter (2019) use repeated cross-section data to construct synthetic cohorts of labor market entrants. This approach allows analyzing large cross-sectional data sources previously not available for this type of work, like mortality data from the National Vital Statistics System. A drawback is that the state of labor market entry is typically not

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[3] Even if individual-level covariates are used as controls, these can be incorporated in a first step of a regression model. The resulting point estimates are asymptotically equivalent to estimation based on micro data.

observed in cross-sectional labor market or health data. Thus, they have to rely on either the current state of residence or the state of birth to approximate the initial labor market.

To address the potential biases resulting from measurement error and from the possibility of endogenous graduation and mobility between states, Schwandt and von Wachter (2019) use as a proxy for the state unemployment rate: they use the state unemployment rate that a birth cohort would have expected to face at labor market entry had it followed typical rates of outmigration from their birth state, and typical entry ages (corresponding to four education groups) for their birth state and cohort. They obtain mean migration rates between states and education rates based on state and cohort averages, and use them to construct a weighted average unemployment rate that the cohort would have experienced had it followed average migration and schooling patterns. Because this measure does not use actual migration or graduation decisions, it is not affected by endogenous timing or endogenous location of labor market entry.

A third set of data sources has come from the study of specific occupations: for example, MBA graduates, PhD economists, and Japanese college graduates (Oyer 2006, 2008; Kondo 2007). Borgschulte and Martorell (2018) have examined re-entrants after military service, and similar patterns may hold for women returning from maternal leave. This approach can be attractive because certain occupations have well-defined transitions from schooling into the labor market. Occupation-specific studies can also allow a deeper understanding of what mechanism may be driving the persistent effects.

**Main Findings on the Persistent Effects of Initial Labor Market Conditions**

*Result 1: Initial Labor Market Conditions Lower Earnings for 10 to 15 Years*

The analysis of college graduates offers a useful benchmark case for the effects of initial labor

market conditions, but the qualitative findings also hold for other education groups in the labor market. College graduates typically enter the labor market full time at graduation, making it straightforward to date their expected entry. For most college graduates, it is relatively difficult or costly to postpone labor market entry in the case of recessions. Moreover, college graduates typically remain in stable employment, so the results are also less likely to be affected by bias from selective labor force participation. These studies suggest that for a typical increase of unemployment in a recession – a rise of 4-5 percentage points in the unemployment rate – the effect of graduating from college in a recession leads to a sharp initial reduction in annual earnings of about 10 percent that fades after about ten years in the labor market (for example, Kahn 2010; Oreopoulos et al. 2012; Altonji et al. 2016). The initial wage losses seem proportional to the rate of unemployment. Hence, deeper recessions, such as the early 1980s recession in the United States (Kahn 2010) or the early 1990s recession in Canada (Oreopoulos et al. 2012), lead to larger initial losses and longer recovery periods that can last up to 15 years. Rothstein (2020) analyzes college graduates specifically entering the labor market during the Great Recession, and finds persistent negative effects on earnings and employment. Going beyond college graduates as a benchmark case, Schwandt and von Wachter (2019) analyze the effect of labor market conditions on all workers entering the U.S. labor market from the late 1970 to after the Great Recession, and confirm that entering the labor market in a recession leads to persistent effect lasting ten to fifteen years in the labor market.

*Result 2: The Size and Duration of Earnings Losses Are Worse for Less Advantaged Workers*

When less educated workers start work during a recession, they tend to fare worse initially and experience longer recovery periods as shown in Figure 3, which replicates results from Schwandt and von Wachter (2019). The figure shows point estimates for the change in the experience profile of annual earnings and family income due to a higher state unemployment rate, based on the $\beta_e$

coefficient obtained from the earlier basic regression equation. The qualitative patterns in the figure are common for studies in this literature. Because labor market entry does not always occur at graduation for less-educated workers, Schwandt and von Wachter (2019) analyze labor market conditions in the predicted year of graduation given typical duration of education, as well as the effect of average labor market conditions at age 18 to 22. With this adjustment, they find that the effect for high-school graduates is about double the effect for college graduates and more persistent. Yet all education groups tend to see a recovery after about ten years in the labor market.

An important question is whether the effect of initial labor market conditions differs by gender, racial, or income groups. Limited sample size makes this a hard question to answer with panel data. Exploiting larger synthetic samples from cross-sectional data, Schwandt and von Wachter (2019) find that non-white labor market entrants experience larger earnings losses, mostly driven by larger reductions in weeks worked in the first four years after labor market entry. However, the persistent effect on hourly wages is of similar magnitude for non-whites and as whites. Also, there do not appear to be substantial differences in the effect of adverse labor market entry conditions for women and men.

*Result 3: The Effect from Initial Conditions Arises From the Very First Labor Market Condition*

Are these earnings losses are only driven by the initial exposure, or by the ensuing correlated history of unemployment rates? The general finding is that the persistent effects are driven by the very first exposure to unemployment rates alone, though persistent slack tends to lead to longer-term effects. For example, to demonstrate robustness, Oreopoulos et al. (2012) engage in an extensive comparison of the effect of various measures of initial labor market conditions, include state-year fixed effects, and allow for future unemployment rates to have persistent effects. Similarly, Schwandt and von Wachter (2019) show their findings are robust to including the current state unemployment

rate as control variable.

*Result 4: The Persistent Earnings Reduction is Largely Driven by Wage Reductions*

Are these earnings losses are driven by reductions in labor supply, which might imply some form of hysteresis in the labor market, or by persistent declines in hourly wages, which could imply a long-lasting reduction in labor productivity? Schwandt and von Wachter (2019) show that for all education groups, persistent reductions in wages play a key role in explaining the adverse effect of initial labor market conditions.  Employment reductions are less persistent than wage reductions for all workers, and generally disappear after about four to five years in the labor market.

*Result 5: Unlucky College Graduates Tend to Work in Less Attractive Occupations*

Unlucky labor market entrants might end up entering different occupations or otherwise less attractive jobs. In one of the earliest papers in this literature, Okun (1973) suggested that a change in the type of jobs offered over the business cycle may lead to lasting benefits from entering the labor market in a high-pressure labor market. Some papers have indeed pointed to a reduction in jobs in high-wage durable manufacturing sectors during recessions (for example, McLaughlin and Bils 2001), but did not focus on younger workers. Most of the current research on how initial labor market conditions affect occupation and industry has focused on college graduates. For example, Kahn (2010) shows unlucky college graduates start jobs with lower occupational prestige. They also tend to start and stay longer in lower-wage occupations (Altonji et al. 2016) and industries (Oreopoulos et al. 2012, Web Appendix). Both studies also show that higher-earning majors typically fare substantially better in recessions relative to lower earning majors. Oreopoulos et al. (2012) show that those predicted to have high earnings based on college, major, and degree type fare best in recessions, with only short-term losses, while those at the bottom can experience permanent reductions in earnings.

Less information on occupational choice is available for lower educated workers.[4]

Oyer (2006, 2008) studied the occupational choices of two groups of high-skilled graduates: Stanford MBAs and PhD economists. In both cases, entering the labor market in a recession has permanent effects on occupational choice. Comparatively unlucky Stanford MBAs are found to have much lower propensities to enter investment banking rather than consulting, and unlucky PhD economists have lower propensities to obtain academic jobs. It is unclear whether such persistence arises because initial investment in job skills specific to an occupation tends to keep a person on a certain career trajectory, or whether perhaps adverse signaling from starting in a less prestigious job hinders unlucky graduates to from switching occupation when the labor market recovers. Nunley et al. (2017) suggests that at least in the short run, signaling from worse quality jobs can play a role for college graduates.

*Result 6: Unlucky College Graduates Start Out Working at Less Attractive Firms*

Recent work from Haltiwanger et al. (forthcoming) suggests that, during a recession, higher-wage firms tend to reduce hiring even within sectors. This may disproportionately affect younger workers, since an important part of their wage growth results from moving to higher paying firms (for example, Smith and von Wachter 2019). Oreopoulos et al. (2012) exploit their matched worker-firm data to show that college graduates' earnings grow rapidly in part by advancing to higher-paying firms (as shown in Panel C of Figure 1), and that part of the earnings loss from adverse entry arises because the average employer quality is lower for unlucky young graduates. In their data, an above-average rate of job switching after unlucky entry leads to a recovery in firm quality for the first five

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[4] Using cross-country data from European countries, Arellano-Bover (2020a) finds adverse labor market entry leads to persistent reductions in measures of general skills, suggesting a channel along which initial lower job placement could persistently affect wages.

years, after which graduates' earnings keep recovering while they stay at the same employer. These estimates are replicated in Figure 4, which shows the deviations from the average experience profiles in the outcome variable due to a one-point increase in the provincial unemployment rate. Initial reductions in firm quality are also found in in studies of unlucky labor market entrants in Germany (Umkehrer 1999), Austria (Brunner and Kuhn 2014), Norway (Liu et al 2016), and Spain (Arellano-Bover 2020b).

Several studies find mobility between jobs, industries, and occupations tends to be elevated temporarily after adverse entry. The fact that disadvantages from starting at worse initial employers tends to fade suggests that signaling does not appear to be an insurmountable barrier to mobility for the average unlucky graduate. Wozniak (2010), among others, shows that geographic mobility of unlucky college graduates increases and speeds their recovery, but that the same is not true for lower educated labor market entrants.


*Result 7: Persistent Shocks Have Bigger Effects for Entrants than for Mature Workers*

Both aggregate labor market fluctuations and individual shocks can have lasting consequences for more mature workers as well. For the college graduates they analyzed, Oreopoulos et al. (2012) directly compared the effect of unemployment rates at graduation with the persistent effect of unemployment rate at higher years of experience, and they find that the initial effect is substantially larger.

This general conclusion is borne out by the related literature. For example, Schwandt and von Wachter (2019) find that each additional point in the initial unemployment rate lowers initial earnings for unlucky labor market entrants by 3.8 percent (see their Table 1).  This number can be compared to estimates of the effect of local unemployment rate on earnings from studies of the wage curve. For example, elasticities for annual earnings reported in Card (1995) imply an approximate marginal

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effect of 2 percent, about half the effect for labor market entrants. These estimates look only at contemporary effects of labor market conditions on wages. For longer-term effects of the initial unemployment rate in ongoing job spells, Beaudry and DiNardo (1991) find a coefficient of negative 3 percent and Schmieder and von Wachter (2010) report a coefficient of negative 1 percent. Yet, unlike these studies focused only on labor market entrants, these papers show that the initial effect gets superseded by subsequent labor market conditions.[5]

Studies that consider reemployment wages of older jobseekers also find that the typical effect of poor labor market conditions for more mature workers is smaller than for labor market entrants. For example, Davis and von Wachter (2011) find that each additional point in the unemployment rate lowers percentage earnings losses of workers displaced from stable jobs at mid-size to larger firms by 2.2 percent. Schmieder et al. (2019) obtain comparable effects using German data, and show that the majority of the effect is from changes in conditions in the labor market, not changes in worker composition.[6] Thus, wages and earnings of young labor market entrants is substantially more affected by the business cycle than that of more mature job seekers, even though they look for jobs in the same labor market.

*Result 8: The Effect of Initial Labor Market Conditions Recur in Middle Age*

How long does the effect of initial unemployment rates last? As of the start of 2020, US researchers had studied the short- and longer-run effects of adverse labor market entry for four

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[5] The main result of Beaudry and DiNardo (1991) is that on a job spell, the initial unemployment rate eventually gets superseded by the lowest unemployment rate on the job. Schmieder and von Wachter (2010) show this wage premium is lost at job change.

[6] Using the Displaced Worker Survey, Farber (2011) also shows that reemployment wages of a broader group of displaced workers also fluctuate with the cycle. He does not report point estimates, but from the worst to the best state of the labor market from 1984 to 2010 losses fluctuate from -.2 to -.1. At a four to five percentage-point difference in the unemployment rate from peak to through, this is in the same ballpark. Estimates for all unemployed job seekers are harder to interpret because of composition changes over the cycle.

business cycles back to the early 1980s. To keep a balance between cohorts, most studies focus on the 10-15 year horizon. However, a few studies have attempted to look at longer run effects. For example, Kahn (2010) reports that for college graduates entering during the early 1980s, recession-related earnings losses grow larger again after about 15 years in the labor market. For all recessions since 1970, Rothstein (2020) finds evidence of a lasting effect of the national unemployment rate on unlucky college graduates' long-term employment rate. Schwandt and von Wachter (2020) broaden Kahn's (2010) finding to all unlucky graduates and additional ages, and confirm that by the time these unlucky cohorts reach middle age, they have lost ground again in terms of earnings.

*Result 9: Poverty of Less Advantaged Unlucky Entrants Rises Temporarily, Despite More Benefits*

The social insurance system is generally ill-equipped to assist unlucky labor market entrants. The typical mechanisms assisting workers in weathering unemployment and earnings reductions, such as unemployment insurance, job search assistance, or retraining, are usually not available to individuals with little labor market experience—because they are likely to have too little employment to qualify for these benefits. Means tested anti-poverty programs, such as Supplemental Nutrition Assistance Program (SNAP) or Medicaid, may provide imperfect insurance for those in most urgent need. In fact, Schwandt and von Wachter (2019) find that receipt of SNAP and Medicaid rises temporarily in response to higher initial unemployment rates, while there is no increase in receipt of unemployment insurance. These increases occur only for workers with a high school degree or less, and are substantially higher for non-whites.

Wealth is an important but understudied indicator of the cumulative effect of adverse initial labor market conditions. While Kawaguchi and Kondo (2020) find no effects of adverse labor market conditions on later wealth or homeownership for entrants during the early 1980s recession, descriptive evidence suggests graduates entering during the Great Recession may have lower rates of

homeownership (for example, Dettling and Hsu 2014).

*Result 10: Adverse Early Conditions Worsen Health Behaviors and Raise Long-Run Mortality*

Initial labor market entry could affect long-term health for several reasons. One possibility is that certain health behaviors are established in early adulthood; for example, initial labor market conditions persistently increases excessive alcohol consumption (Maclean, 2015) and leads to higher obesity, more smoking and drinking in middle age (Cutler, Huang, and Lleras-Muney 2015). More generally, lower income could affect the stock of health through reduced investments and more stress. College graduates entering during the 1980s recession experience higher incidence of heart attacks in middle age (Maclean 2013). Following all labor market entrants from these cohorts, Schwandt and von Wachter (2020) find that starting in their late 30s, unlucky entrants begin experiencing a gap in mortality compared to luckier peers that keeps increasing in their 40s, driven by higher rates of heart disease, liver disease, lung cancer, and drug overdoses.

*Result 11: Adverse Labor Market Entry Affects Family Formation, Crime, and Attitudes*

Marital patterns of unlucky cohorts are affected from the time they enter the labor market up into middle age, when these cohorts have fewer children (Currie and Schwandt 2014), are more likely to have experienced a divorce, and are more likely to live on their own (Schwandt and von Wachter 2020). Initial labor market conditions also have been found to have effects on attitudes towards economic success and the role of the government (Giuliano and Spilimbergo 2014) and to lead to increasingly lower individuals' self esteem (Maclean and Hill 2015). Naturally, there is a question of disentangling causality here: lower earnings contribute directly to worsening self-esteem and could affect attitude, but these could in term help explain lower earnings, something we return to below. Given low incomes and increasing poverty, it is perhaps not surprising that evidence from the United

States and United Kingdom indicates that adverse labor market entry persistently raises criminal activities for at least 15 years after entry, especially for men and high-school dropouts (Bell et al. 2018).

**Some Related Studies from Other High-Income Countries**

While most empirical work on persistent effects of initial labor market conditions is based on data from North America, the number of studies of initial labor market conditions from other countries is increasing. These studies tend to confirm persistent effects of initial unemployment rates on earnings, employment and job quality that are greater for lower skilled workers. For example, most college graduates in Japan obtain regular full-time jobs at career fairs at the end of university. If a recession reduces the number of available jobs and unlucky graduates that do not obtain such a job the first time around, they cannot return to the career fair, and the effect is a prolonged period of unstable and part time jobs (Kondo 2007). In Germany, most young individuals that are not bound for college enter formal apprenticeship programs that include partial schooling. Unlike US high school graduates who often have a more gradual transition into the labor market, these apprentices have to seek employment once the internship ends, no matter what the state of the labor market. Umkehrer (2019) shows that the initial effect varies by type of training, with manual and service occupation experiencing long-term effects, and technical occupations experiencing medium term effects. In addition, persistent initial effects from adverse initial labor market conditions have also been found in studies from Great Britain (Taylor 2013), Austria (Brunner and Kuhn 2014), Spain (Fernandez-Kranz and Rodriguez-Planas 2018), Blegium (Cockx and Ghirelli 2015) and Norway (Raum and Roed 2006,

Liu et al. 2016, Haaland 2018), an, among others.[7] In some countries with a rigid wage structure, there are stronger effects on the probability of being employed.

A separate literature has analyzed the long-term "scarring" effects of an early job loss or unemployment spell. Studies based on correlation of initial job instability and longer-term outcomes point to relatively long-lasting effects (for example, Ellwood 1982). However, sustained early unemployment is likely to arise from a combination of exogenous labor market conditions, specific displacement events, and an individual's own characteristics, which can make it hard to obtain causal estimates. Neumark (2002) uses initial local unemployment rates as an instrumental variable and (not surprisingly given the literature discussed here) finds persistent effects of initial job instability. Using year-to-year fluctuations in the retention rate of apprentices in Germany by their training firm as an exogenous displacement shock, von Wachter and Bender (2006) find that initial displacement has a substantial negative earnings effect that fades after about five years. With the increasing availability of large-scale administrative data, additional estimates will likely become available.

**Potential Mechanisms Underlying Persistent Career Effects**

The empirical results that emerged from the analysis of the effects of initial labor market conditions provide useful experimental findings for the literature on career development that is mostly based on descriptive evidence. These findings can be viewed as empirical moments that any model of career growth has to fit, and in this way the findings yield binding constraints on existing models. In sum, these patterns point to a clear pattern and class of models that future research can refine further.

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[7] While all of these papers seek to identify the persistent effects of initial unemployment, they differ in the use of regional vs. national unemployment rates, among others. As discussed above, these and other specification choices can matter when comparing magnitudes between studies.

A natural starting point for trying to understand the persistent effects of initial labor market conditions are the two workhorse models of career development: human capital accumulation and job search. It turns out neither of the two can explain persistent effects, but certain combinations of models seem more promising.

*Two Benchmark Models of Career Development*

The basic human capital model posits that general skills are accumulated on the job, whether through learning-by-doing or on-the-job training (for example, Mincer 1974; Ben-Porath 1967). Such a model could explain depressed wages following longer spells of nonemployment. However, the earlier evidence shows that wages were reduced for up to ten years even for college graduates, who have relatively stable labor force attachment. Also, even short-term exposure to adverse labor market conditions can lead to long-term effects, making it quite unlikely that the basic human capital model could explain these persistent effects.

In a sequential job search model of career transitions, wages of young workers grow as they repeatedly draw job offers from other firms (for example, Burdett 1978; Manning 2003). Given search frictions, a short-term initial reduction in the distribution of wage offers leads to a period of recovery. However, typical estimates of the speed of job offer arrival lead to recovery patterns that only take three to four years (for example, Shimer 2004). This fits with the duration of persistent effects that Oreopoulos et al. (2012) found for their most advantaged college graduates, who are perhaps more likely to see only a short-term reduction in job opportunities. But the basic search model has a difficult time explaining more persistent effects of temporary labor market shocks.

*Extending the Benchmark Models*

As researchers have sought to explain how a short-term initial shock could have longer-term

effects, one approach has been to extend the job search model. For Canadian college graduates graduating during recession, Oreopoulos et al. (2012) not only observed a lasting decline in earnings over ten years, but also a temporary rise in job mobility, and an initial reduction and then recovery in the firm quality of their employers. In particular, increased job mobility and the recovery in firm quality was concentrated among the first five years after labor market entry, suggesting that recovery occurred in two stages: one between firms, followed by one within firms. To explain these patterns, they posit a model with two types of labor market entrants (low- and high-skilled) and two types of firms (low- and high-wage). Wages can grow either through finding a job at the high-wage firm or by accumulation of firm-specific skills on the job. Higher-skilled workers have an absolute advantage in job search, and search costs increase with years in the labor market. A labor market shock in this model constitutes a one-period decline in the availability of high-wage jobs. Given the assumptions, a one-period reduction in job availability leads to a persistent effect because workers first search again for a better job. Once workers found a better job, their earnings are lower because they have on average lower tenure, and wage recovery continues on the job. This model produces persistent losses that eventually fade.

The model captures the reality that switches between firm types plays an important role in explaining career growth (for example Topel and Ward 1992; Smith and von Wachter 2019), and that the availability of high-wage jobs declines in recessions (for example, Haltiwanger et al., forthcoming). As intended, the model also explains changes in job mobility and job characteristics for unlucky college graduates shown in Figure 4. By design, the model also predicts that low-wage workers take longer to recover, and that they are of higher risk of permanent effects. Remember, search costs in the model rise with time in the labor market. An intuitive reason for this condition might be that as workers marry, have children, and buy homes, costs of job-switching rise. Such search costs are less likely to bind for high-wage workers because they have higher job arrival rates.

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Additional research connecting life events and costs of job search, or on the evolution of job search costs over the life cycle is needed, but this factor may play a role in the persistent effect of initial labor market conditions.

An alternative and complementary approach has been to extend models of skill accumulation. As one example, to obtain persistent wage effects of initial conditions, Gibbons and Waldman (2006) posit that workers can accumulate general skills and human capital that is task-specific, and that firms create more high-level jobs in economic expansions. In their model, task-specific skills raise wages only in the given job, and do not lead to promotion to a higher-level job. They embed these patterns in a model that also has general human capital accumulation, employer learning about worker skills, and comparative advantage. Workers starting to work in recessions are more likely to start their career in lower-type jobs. While workers may get promoted to higher type job based on general human capital accumulation or if they are revealed to be of the higher type, once promoted they have less task-specific skills for the higher-type job than luckier labor market entrants who were more likely to start at the higher-type job right away.[8] These effects are smaller for higher educated workers, who accumulate skills faster.

Both the Gibbons and Waldman (2006) extension of skill accumulation models and the Oreopoulos et al. (2012) extension of job search models can explain the first four main results of the literature reviewed previously, and focus on the role of occupation (Result 5) and firm quality (Result 6), respectively. They can also be used to explain why initially unlucky labor market entrants may experience increasing earnings losses in middle age after an initial earnings recovery (Result 8). In the former case, unlucky entrants have spent less time in the higher job type, and hence have accumulated

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[8] Huckfeldt (2014) also develops a model in which fluctuation of job creation among low- and high-wage occupations over the business cycle can explain why job losers experience larger wage losses in recessions. Neal (1999) analyzes a related model in which workers first search over occupations, then look for an employer within that occupation.

less task-specific skills.  In case of a downturn, these workers would be at higher risk of layoff compared to more lucky entrants. In the latter case, workers have spent less time at their current employer, and hence are at higher risk of being laid off again in a downturn. In both cases, a widening of the earnings gap could also arise if in a downturn lower job- or firm-tenure leads unlucky entrants to experience fewer opportunities for promotion.

While human capital accumulation and search frictions are key ingredients in other models of career growth, some other common ingredients are worth mentioning.  One class of models introduces information asymmetries, in which case job mobility can be understood as a process of gradual sorting (as in Farber and Gibbons 1996; Gibbons and Waldman 1999). Another class of models views careers and institutions within firms as an important feature of career development (for example, Doeringer and Piore 1985; Baker et al. 1994; Frederiksen et al. 2020). Research from particular occupation or other countries has pointed to the potential usefulness of considering explanations outside the main economic paradigms.

**Broader Implications: Welfare, Policy, and Non-Economic Mechanisms**

While research on how outcomes such as health, family status, attitudes, or criminal behavior are affected by unlucky timing of starting a career is still in its infancy, it has begun to yield a richer and more complex picture of the prospects for Lost Generations. Increasing data availability will further improve our understanding of the effect of initial conditions on welfare, on the potential for government interventions, and on additional mechanisms explaining the persistent fallout from short-lived economic conditions.

*Welfare Effects and Government Intervention*

A standard benchmark to gauge the order of magnitude of welfare effects that can be calculated from some of the existing studies is the cumulative loss in short- to medium-term earnings. If individuals make optimal choices conditional on relative prices and their resources, this shift in the budget constraint due to initial condition will be the key input in a welfare calculation. Table 1 shows measures of the present-discounted loss in earnings over the first 10 and 15 years in the labor market after entry based on estimates in Schwandt and von Wachter (2019), who present comparable estimates by education and demographic groups based on the same methodology and data. The estimates assume a 5 percentage point increase in unemployment rates, corresponding to a large downturn such as in the early 1980s or the 2008 recession. As a benchmark, the table uses the "lucky" cohort of labor market entrants in the boom year 1995 and discounts future earnings at a rate of 5 percent per year. The table presents the cumulative earnings loss as a fraction of the total present-discounted value (PDV) of earnings over the same period. Among all labor market entrants, the cumulative earnings loss from entering the labor market during a large recession over the first ten years in the labor market amounts to a 9 percent reduction in the present discounted value of earnings over this period. These losses are larger for less educated workers and non-white workers (with about an 13 and 11 percent loss over a 10-year horizon, respectively), and smallest for college graduates (a 5 percent loss over 10 years). Female entrants tend to have a slightly lower reduction in cumulated present discounted earnings than men (8.6% vs. 10.2% loss over 10 years). These losses amount to three quarters of mean annual earnings over the first ten years for the average labor market entrant. They range from 100% of average earnings for lower educated workers to 40% for college graduates.

It is well known that earnings may not fully capture welfare effects for various reasons, including taxes and public or private transfers; costly efforts to prevent career or consumption declines; or direct effects on physical or mental health that are not the result of consumption and investment choices. One estimate of willingness-to-pay to avoid recessions that circumvents these

issues comes from reenlisting military personnel. Borgschulte and Martorell (2018) find that military personnel at risk of reentering the labor market in recessions are willing to forego 5 to 7.5 percent of earnings to avoid a recession that raises the unemployment rate by 5 percentage points. Their estimates suggest that individuals bear the cost of over two-thirds of the total present-discounted value of earnings losses from initial labor market conditions, and only one-third is offset by transfers or utility from leisure.

Society's short- and long-run costs from Lost Generations is likely to be larger than welfare losses based on willingness to pay or earnings losses, because these measures are unlikely to factor in the full public cost of criminal activity, worsening health, single parenthood, or transfer payments. Only few studies have estimated the effect of early labor market conditions on family income and public and private transfers.[9] Increasing availability of large administrative data sources integrating information on earnings, family background, social programs, and even taxation will allow a better understanding of changes in income, wealth, and other life circumstances. In addition, these data will allow a better understanding of the role of the tax and transfer system in buffering the effect of initial labor market conditions (for example, Meyer and Wu 2018). Similar integrated data from the criminal justice system may lead to a better accounting of the costs of elevated criminal activity. Such estimates would help to assess whether these young workers would benefit from interventions outside the standard tax and transfer system. This point has been made in the literature of the school-to-work transitions largely outside economics that stresses the role of education in buffering labor market instability (for example, Ryan 2001). Because educational interventions as means of income support have become ubiquitous as a research topic in economics, assessing the potential effectiveness of such

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[9] For example, using cross-sectional household data sets, Cribb, Hood, and Joyce (2018) find both private and public transfers offsets the earnings penalty of initial conditions in the UK, while Schwandt and von Wachter (2019, 2020) find that increases in public transfers in the US cannot prevent increases in poverty for less advantaged entrants.

interventions for the lower educated, often non-white individuals particularly hard hit by initial recessions seems worthwhile. A fuller understanding of the economic and health effects well into middle age, for example based on administrative health records, may tilt the balance in favor of such educational interventions.

*Additional Mechanisms: Family Formation, Networks, Attitudes, Health*

Studies of non-economic outcomes can help refine our understanding of the interaction of economic opportunity, individual choices, and lifetime outcomes. For example, the findings that initial conditions anticipate marriage and fertility, and also increase divorce and single parenthood, may be a source of increases in the cost of job search that forestalls an earnings recovery through job switching. Similarly, assortative mating within cohorts would lead young workers to have spouses with fewer economic opportunities, further lowering family income and reducing intra-family insurance against shocks. For the same reason, the networks of unlucky individuals' spouses and friends likely have above-average shares of unlucky entrants, potentially affecting economic opportunities (as in Schmutte 2015). At the same time, family networks may play an outsized role for as insurance mechanism for lower-educated unlucky graduates, potentially lowering economic mobility. For unlucky non-white labor market entrants, aggravating factors such as discrimination and incarceration may represent important hurdles to recovery.

All the while, lower lifetime resources, worse health behaviors, and greater stress could make unlucky cohorts respond more strongly to common health shocks whose incidence typically rises with age. Unlucky graduates also highlight how non-economic behaviors could affect economic outcomes. For example, the finding of worsening health behaviors (like excess alcohol consumption, as discussed in Maclean 2015) could explain worsening health (like elevated deaths due to liver and lung disease discussed in Schwandt and von Wachter 2020) and a decline in economic outcomes in middle

age. Similarly, changes in attitudes or loss of self-esteem may affect job search or human capital investments. Additional research on these and other potential mechanisms using new data sources would be fruitful and likely help to refine and extend the economic models of career development and economic outcomes we discussed.

**Conclusion**

Unlucky young workers entering the labor market in recessions suffer a range of medium- to long-term consequences. Large initial effects on earnings, labor supply, and wages tend to fade after 10-15 years in the labor market, partly accompanied by changes in occupation, job mobility, and employer characteristics. Adverse initial labor market entry also has persistent effects on a range of social outcomes, including fertility, marriage and divorce, criminal activities, attitudes, and risky alcohol consumption. Some evidence suggests that early exposure to depressed labor market lowers health and raises mortality in middle age, patterns accompanied by a reopening of earnings gaps.

Overall, the average unlucky college graduate loses about 10 percent of cumulated discounted annual earnings over the first ten years of their career, amounting to three quarters of average earnings during that period. These effects are larger for unlucky lower educated and non-white entrants, who lose up to 13 percent of cumulated discounted earnings, and smaller for unlucky college graduates, who lose about 5 percent.

Experimental estimates from the analysis of initial conditions on long-term career outcomes can be used to infer about models of career developments. Standard career models fail to explain persistent career effects from short-lived labor market conditions. Two models combining fluctuations in firm and job quality—sequential job mobility and human capital accumulation—can explain these findings. Additional evidence, possibly from large-scale administrative data sets with detailed

information on employers and job characteristics, can be used to further refine these models, and test their predictions against additional career events. The imputation methods proposed by Schwandt and von Wachter (2019) should aid the broader use of datasets that do not have information on place and time of labor market entry. Increasingly available data sets integrating earnings, income, and taxes and transfers can be better used to understand the role of social insurance in preventing hardship among less advantaged labor market entrants, and to assess the effectiveness of alternative government interventions. Finally, the increasing research on non-economic outcomes may yield a more integrated understanding of how family formation, social environments, attitudes, and economic opportunities may interact to shape lifecycle outcomes including earnings and health.

The crisis in the labor market triggered by COVID-19 pandemic has given this line of research increased urgency, and has made it relevant to the 4 million or so young individuals graduating from college or high school in the summer of 2020. Some useful lessons emerge from the research reviewed here:

1) Your first job out of school may not be what you had expected, but that's OK. Being flexible in your choice of, say, occupation or where you live will give you more options.

2) Your career will take longer to develop than that of luckier peers. Do what you can to avoid being locked into that first job, by continuing to accumulate general skills and looking for opportunities to move to other jobs.

3) If things are going slow, remember, it is hard for everyone. At the same time, all findings discussed here are for averages, and do not necessarily apply to you – you have agency in shaping your life and career.

4) You may need to save a higher percentage of income early in life to meet long-term wealth goals.

5) Your desired patterns of marriage and fertility may take more effort to achieve.

6) Take particular care to develop and maintain a healthy life-style and be kind to yourself, in part because it will help you weather difficult initial labor market conditions.

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**Table 1: Losses in Present Discounted Value (PDV) of Annual Earnings in First 10 and 15 Years After Entry Into Labor Market, Overall, By Education Groups, and by Demographic Groups**

| | Potential Labor Market Experience | PDV of 1995 Entry Cohort ("Lucky") | Loss in PDV Due to a Large Recession | Loss as Fraction of PDV of "Lucky" Cohort | Loss as Fraction of Avg. Earnings of "Lucky" Cohort |
|---|---|---|---|---|---|
| **All Labor Market Entrants** | **10** | $309,226 | -$29,778 | -0.096 | -0.752 |
| | **15** | $466,264 | -$31,862 | -0.068 | -0.705 |
| **By Education Group:** | | | | | |
| **Less Than Highschool** | **10** | $164,250 | -$21,102 | -0.128 | -1.007 |
| | **15** | $230,179 | -$21,147 | -0.092 | -0.968 |
| **Highschool** | **10** | $219,813 | -$23,861 | -0.109 | -0.853 |
| | **15** | $321,992 | -$24,874 | -0.077 | -0.806 |
| **Some College** | **10** | $263,847 | -$25,667 | -0.097 | -0.763 |
| | **15** | $393,170 | -$32,027 | -0.081 | -0.845 |
| **College or more** | **10** | $470,890 | -$23,588 | -0.050 | -0.392 |
| | **15** | $710,906 | -$19,812 | -0.028 | -0.288 |
| **By Demographic Group:** | | | | | |
| **Women** | **10** | $280,194 | -$24,117 | -0.086 | -0.675 |
| | **15** | $409,802 | -$26,508 | -0.065 | -0.674 |
| **Men** | **10** | $332,254 | -$33,932 | -0.102 | -0.795 |
| | **15** | $510,420 | -$35,859 | -0.070 | -0.721 |
| **Non-Whites** | **10** | $305,398 | -$34,633 | -0.113 | -0.882 |
| | **15** | $453,476 | -$34,545 | -0.076 | -0.788 |
| **Whites** | **10** | $309,979 | -$30,156 | -0.097 | -0.760 |
| | **15** | $469,439 | -$32,987 | -0.070 | -0.725 |

Notes: Calculations based on Current Population Survey ASEC (March) Supplement and estimates from Schwandt and von Wachter (2019). Potential experience is equal to age minus years of schooling minus 6. The PDV earnings is calculated using a 5% interest rate. A "large recession" refers to a rise in unemployment rates in 5 points. To capture workers that made the transition into the labor force, PDV and average earnings are calculated based on annual earnings for workers employed at least 25 weeks in the previous year and with at least 20 usual weekly hours. Average earnings refers to unweighted average of mean annual earnings by experience over respective period. Dollar values are expressed in 2019 prices using the Consumer Price Index.

## Figure 1: Experience-Profiles in Earnings, Mobility, and Firm Characteristics for All Workers with Some College in Canada and United States (Oreopoulos, von Wachter, and Heisz 2012)

**Panel A: Change in Annual Earnings**

**Panel B: Fraction Job Change**

**Panel C: Change in Firm Size**

**Panel D: Change in Average Firm Earnings (Canada Only)**
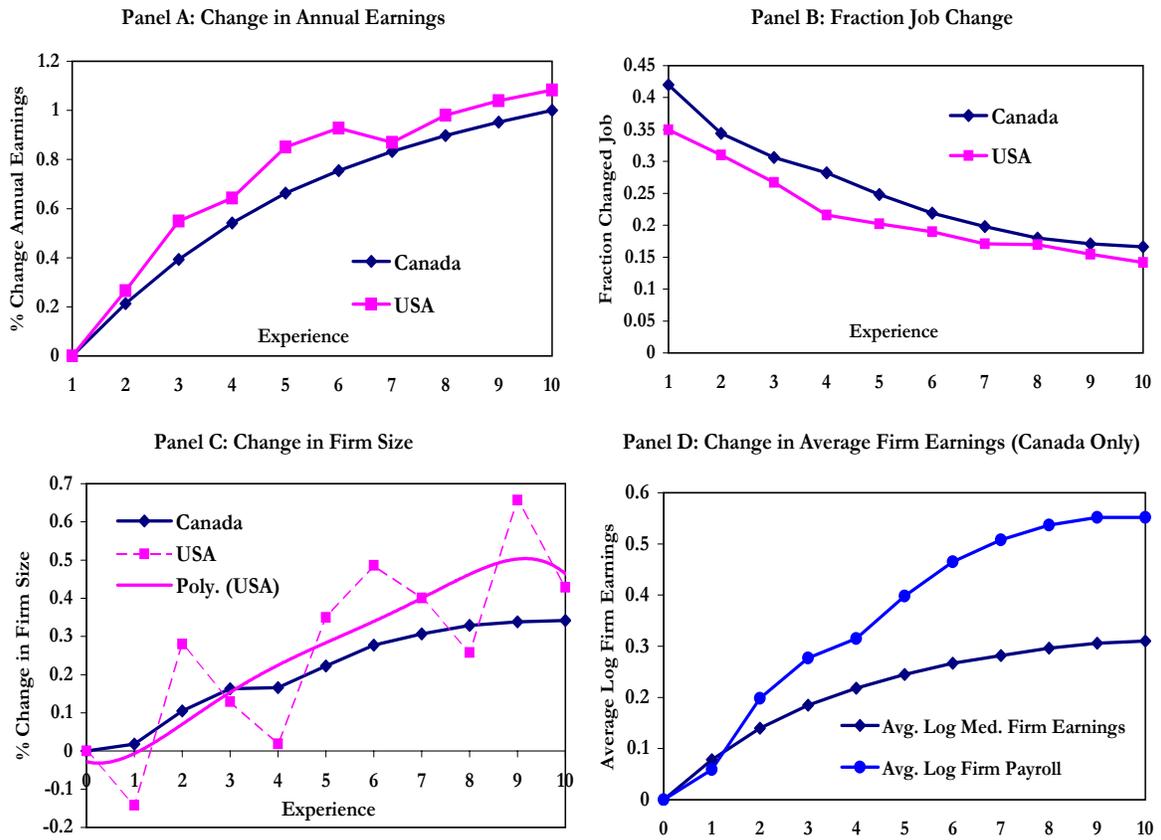
Notes: The figure shows average cross-sectional profiles in potential labor market experience (years since graduation) in Canada and the U.S.; the Canadian figures are derived from the administrative data we use in the paper; the U.S. data are taken from various years of the Current Population Survey (CPS). The underlying sample are all workers with some college in the relevant range of potential experience. Panel A shows percentage increases in annual earnings (for the U.S. from the March Demographic Supplement of the CPS in 1994-1996). Panel B shows the fraction of workers changing jobs in a given experience year (for the U.S., these figures are calculated as the fraction of workers with one year of tenure from the CPS' tenure, mobility, and pension supplements from 1979 to 2000.). Panel C shows the percentage change in firm employment (for Canada, this is average firm employment taken over all years the firm was alive from 1982 to 1999, controlling for year fixed effects; for the U.S., this is current firm size from firm size brackets taken from Supplements to the CPS in 1979, 1983, and 1988; for the U.S., we also show a polynomial approximation). Panel D shows average firm log median earnings or firm log payroll taken over all years the firm was alive from 1982 to 1999, controlling for year fixed effects (see text for details).

**Figure 2: Evolution of Real Log Annual Earnings for Labor Market Entry Cohort from 1978 to 2009 by Years Since Entry and Major Education Group**
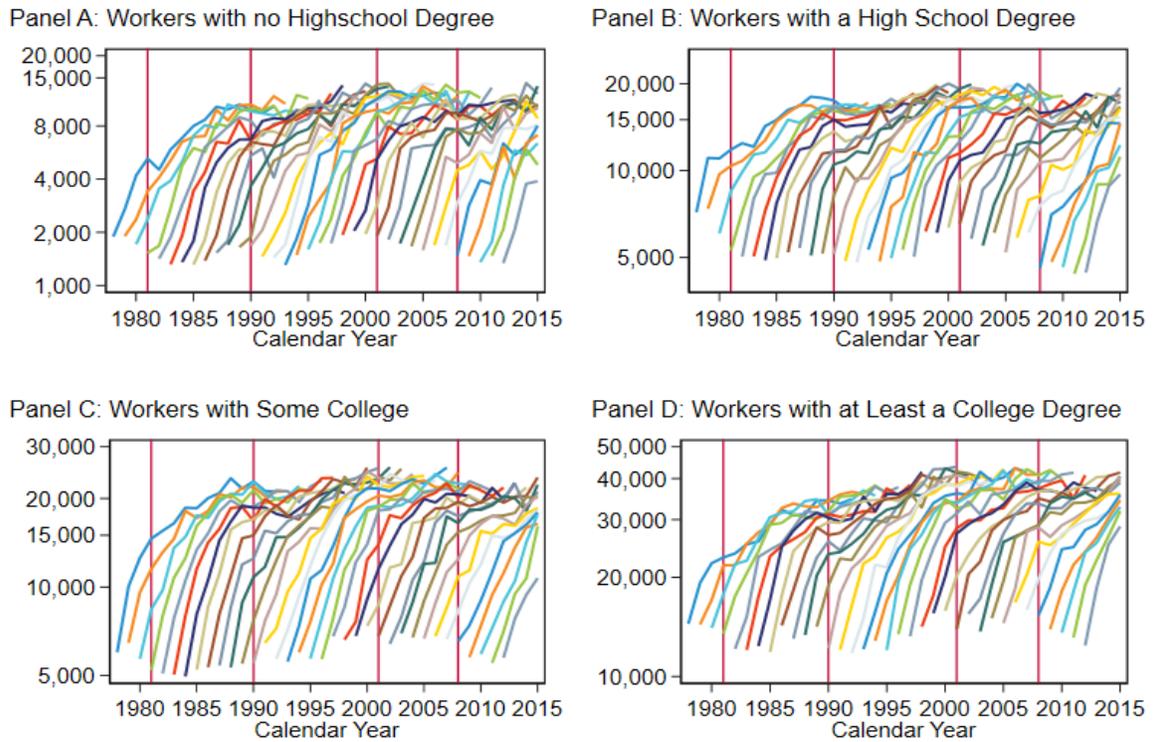


Notes: Current Population Survey ASEC (March) Supplement. Figures in US Dollars. Vertical lines drawn at business cycle peaks. Earnings deflated by Consumer Price Index.

**Figure 3: Effect of State Unemployment Rate at Labor Market Entry on Earnings and Income by Education Groups**(Schwandt and von Wachter 2018)
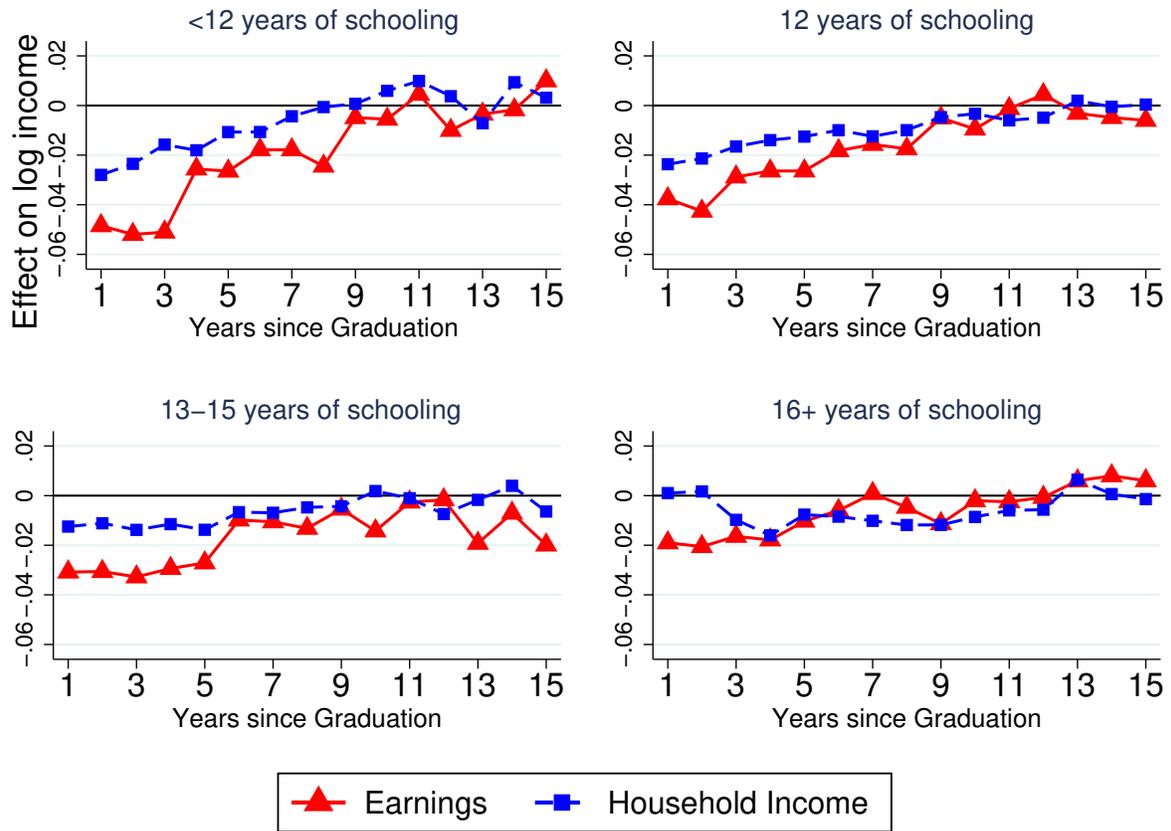


Notes: Results are based on the Mincerian specification (equation 2), using data from the ASEC Supplement to CPS from 1976 to 2016.

# Figure 4: The Persistent Effects of Unemployment in the Year of Graduation on Earnings, Job Mobility, and Firm Outcomes (Oreopoulos, von Wachter, and Heisz 2012)

**Panel A: Log Real Annual Earnings**
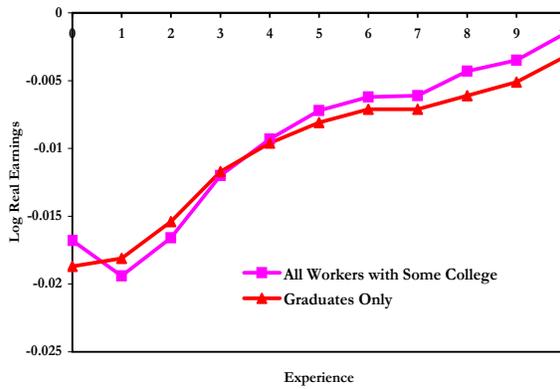


**Panel B: Probability of Annual Change in Employers**
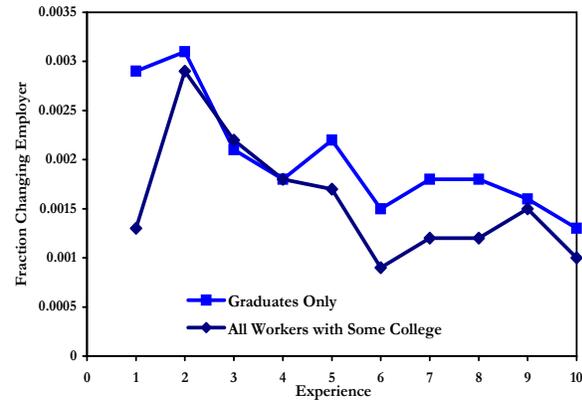


**Panel C: Average Firm 'Quality', Graduates Only**
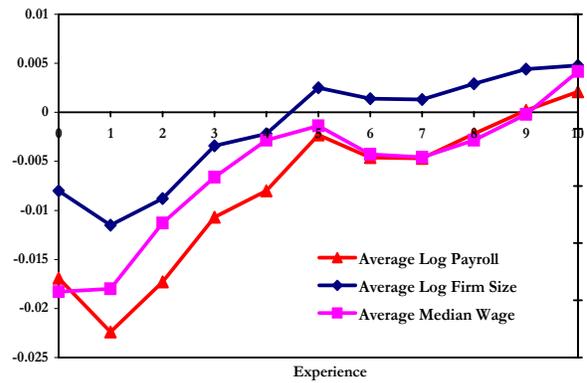


**Panel D: Fraction not Working, Graduates Only**
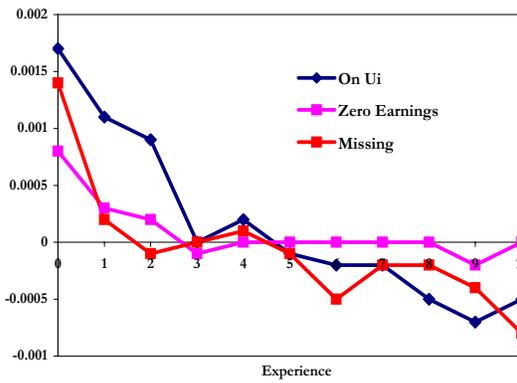


Notes: The figures show coefficients from regressing specified outcome variables on regional unemployment rates at the end of college completion interacted with experience dummies, controlling for effects for cohort of graduation, experience, and region of first residence (equation 4 in the paper). Panel A and B are based on the sample of all 17 to 20 year olds who started a college program in the data and our main sample of only college graduates. Panel A shows coefficient estimates with log annual earnings as the outcome variable. Panel B shows coefficient estimates using a dummy variable for whether an individual was classified working in a different firm as the one indicated in the previous year as the outcome variable. Panel C and D only show results based on our main sample of college graduates. Panel C shows coefficient estimates using measures of current firm quality as the outcome of interest: the employer's average log total payroll (averaged across all years in the dataset), average log employee size, and average median log wage. Panel D shows coefficient estimates for employment status measures: dummy variables for whether receiving any unemployment insurance in a given year, whether recorded as having zero earnings, or whether not recorded as filing a tax return in a given year. See text for more details.