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The Short- and Long-Term Career Effects of Graduating in a Recession†

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This paper analyzes the magnitude and sources of long-term earnings declines associated with graduating from college during a recession. Using a large longitudinal university-employer-employee dataset, we find that the cost of recessions for new graduates is substantial and unequal. Unlucky graduates suffer persistent earnings declines lasting ten years. They start to work for lower paying employers, and then partly recover through a gradual process of mobility toward better firms. We document that more advantaged graduates suffer less from graduating in recessions because they switch to better firms quickly, while earnings of less advantaged graduates can be permanently affected by cyclical downgrading. (*JEL* E32, I23, J22, J23, J31)

Increasing evidence suggests that adverse initial labor market conditions can have substantial long-term effects on the earnings of college graduates.[1] This suggests that some cohorts may earn substantially lower returns on their investment into higher education than others.[2] College graduates from less prestigious colleges or majors, who might have received less training or might be of lower ability, are

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[1] See, for example, Oyer (2006, 2008) for an analysis of MBA college graduates and PhD economists; Kahn (2010) for an analysis of college graduates in the 1982 recession; and Genda, Kondo, and Ohta (2010) for a comparison of US and Japanese college graduates. Ellwood (1982); Beaudry and DiNardo (1991); Baker, Gibbs, and Holmstrom (1994); Devereux (2003); and Schmieder and von Wachter (2010), among others, also find persistent effects of cyclical fluctuations for noncollege workers.

[2] Since the literature suggests that high school graduates suffer shorter lived (albeit initially larger) losses (Blanchflower and Oswald 1994; Genda, Kondo, and Ohta 2010), the overall return to college relative to a high school degree is also likely to fall in recessions.

particularly at risk from early career interruptions. Yet, the overall magnitude and heterogeneity of these persistent losses is currently unknown, partly because of a lack of longitudinal data on a sufficient number of cohorts and detailed information on educational background. Similarly, little is known about the sources of persistent reductions in earnings. Yet, an understanding of the mechanisms leading to persistent effects of initial labor market conditions is a key step in devising policy options to assist young workers and in helping to prevent prolonged stagnation in the earnings and careers of "unlucky" cohorts.

The long-term impact from graduating in recessions can depend on how recessions affect the quality and availability of initial job opportunities, wage adjustments within firms, knowledge about workers' productivity by potential employers, and human capital accumulation. A long literature has documented the fact that the quality of jobs tends to decline in recessions (e.g., Reder 1955, Okun 1973, McLaughlin and Bils 2001). Finding jobs that offer significant opportunities for promotion and training are likely more difficult under these conditions—especially for those less skilled—and recovering from these initial shocks may depend on mobility between firms. This would be in line with career development models such as those presented by Topel and Ward (1992) and Gibbons et al. (2005). However, other models, based on human capital accumulation, job assignment, or persistent wage contracts suggest that recovery may occur within firms, and hence that obtaining a stable job is important.

In this study, we examine a unique Canadian administrative employer-employee-matched dataset of over 20 years of male college graduates in an effort to understand how short-term labor market conditions affect long-term earnings within and across firms. College graduates are ideal subjects to study the effects of initial labor market shocks because at graduation the vast majority enter the labor market and begin to search for full-time work. Another advantage of studying college graduates is that based on information on college type, program of study, and length of study, we can categorize our sample into more and less advantaged groups based on predicted labor market success. This information is typically not available for other samples of workers or from other data sources.

This is the first study to document persistent earnings losses for a large number of representative cohorts of male college graduates. The resulting amount of variation allows us to study whether persistent losses arise even from temporary adverse labor market conditions.[3] Our administrative data also allows us to provide an in-depth investigation of the mechanism underlying the observed earnings losses. Our analysis of reallocation *between* firms complements studies showing persistent effects for employment spells *within* firms (e.g., Beaudry and DiNardo 1991, McDonald and Worswick 1999, Grant 2003, and Schmieder and von Wachter 2010). Our analysis also provides direct evidence concerning the role of job transitions to better firms in

[3] Several previous studies on the persistent effects of aggregate labor market conditions have used the Panel Study of Income Dynamics (Devereux 2003) and the National Longitudinal Studies of Youth (Gardecki and Neumark 1998, Kahn 2010). While providing detailed survey information on careers and worker demographics, the small samples of these datasets do not allow controlling for cohort, state, and year effects in a flexible way, controlling for persistent correlated labor market conditions or studying other career outcomes than wages with a sufficient degree of precision. Often by necessity, the range of cohorts studied is limited.

young workers' careers, complementing existing studies documenting the correlation of job mobility and earnings (e.g., Topel and Ward 1992). Finally, this is the first study to analyze the differential effect of graduating in a recession for more and less advantaged college graduates.

Our findings paint an intricate picture of the effect of initial labor market conditions for college graduates in which very short-lived adverse labor market conditions have long-term effects that vary dramatically across the skill distribution. A typical recession—a rise in unemployment rates by 5 percentage points in our context—implies an initial loss in earnings of about 9 percent that halves within 5 years, and finally fades to 0 by 10 years. For this time period, these reductions add up to a loss of about 5 percent of cumulated earnings.

This result is robust across specifications and arises mainly from the first unemployment rate individuals face after graduating—net of correlation with labor market shocks occurring later in workers' careers—and it does not seem to be due to selective employment and graduation decisions. The persistent effects from adverse labor market conditions are much larger for individuals in the first year of their careers than for individuals with just a few years of experience. We also find that graduates with the lowest predicted earnings based on college and major (our measure of skill) suffer larger and much more persistent earnings losses than those at the top. The least advantaged graduates suffer a loss of 8 percent of cumulative earnings in their first 10 years—almost double those of the median graduate and more than four times as much as those of the top graduate.

Initial firm placement plays a significant role in determining long-term labor market success. Along with lower earnings, negative labor market shocks at labor market entry lead to more workers taking jobs at poorer quality firms (with firm quality measured in terms of firm size and average earnings among employees). The ensuing earnings adjustment process is characterized initially by increased mobility across employers and industries and improvements in the characteristics of the average employer. Decomposing earnings losses into their sources, we find that lasting reductions in the quality of employers can explain up to 40 to 50 percent of persistent earnings losses. For college graduates, both mobility toward better firms and recovery within firms are important margins of adjustment to adverse labor market conditions. These patterns also varied by worker type. Graduates at the top of the wage distribution catch up, on average, within two to four years, mostly by moving to better firms. Average graduates recover within ten years, partly by switching jobs and partly within firms. Workers with low predicted earnings are permanently downranked to firms paying lower wages and consequently experience lasting reductions in earnings after a bad start.

Our findings imply that recessions lead to high and unequal losses in cumulated earnings for unlucky college graduates. These losses imply substantial reductions in the financial returns on the investment into higher education, particularly for graduates from schools and majors in which graduates tend to be paid less. Our results also highlight the important role of employer quality—and hence initial job placement and ensuing job mobility for the careers of young college graduates. We are the first to document that this leads to persistent cyclical downgrading for college graduates and that less advantaged college graduates permanently lose access to better employers.

Our results also have important implications for recent strands of literature in macroeconomics. We provide direct evidence that wages of labor market entrants respond more to aggregate fluctuations than do wages of already employed workers, even accounting for changes in employer quality. Our findings also offer direct evidence in favor of gradual sorting processes emphasized by models of reallocation between sectors (e.g., Krause and Lubik 2006, Moscarini and Vella 2008). Yet, our results also imply that even temporary shocks can lead to persistent changes in the allocation of workers. Finally, our study provides direct estimates of the unequal and large costs of recessions for new college graduates—costs that are larger than typical existing model-based estimates (e.g., Barlevy 2005).

I. Alternative Explanations for Persistence of Initial Labor Market Conditions

Our analysis of persistence of initial labor market conditions for college graduates was informed by existing theories of career development. Since these models are not typically used to explain persistence, we will briefly discuss their implications and outline alternative hypotheses. While several models have the capacity to predict differential long-term effects of only temporary labor market conditions by skill group, fewer models are able to rationalize very persistent declines in earnings from only short-term adverse labor market conditions.

A first category of models suggests that job search is an integral part of young workers' careers (e.g., Topel and Ward 1992, Manning 2005). Search theory predicts that even a temporary worsening of the wage offer distribution leads workers entering the labor market in a recession to catch up by undertaking a lengthy search process for higher paying jobs. An increasing empirical literature suggests that the cost of job searches increases with age (for example, as a result of family mobility constraints), and that higher skilled young workers are more likely to move between regions or industries in response to adverse labor market shocks.[4] Thus, lower skilled workers may search less intensely (or receive fewer new job opportunities) after obtaining lower quality jobs in recessions. If they accumulate some employer-specific skill on the job, they may also have a harder time moving the longer they stay with their initial employer.[5]

An alternative, yet not mutually exclusive, class of models explains job mobility in early careers by a process of assortative matching as employers gradually learn about worker quality (e.g., Gibbons et al. 2005). The same class of models has been extended to differential speed of learning by skill (e.g., Lange 2007). In the present context, temporary labor market conditions could lead to lasting declines in earnings if employers learn only gradually about the quality of a graduating cohort after an initial down ranking to lower paying jobs. Faster learning about higher skilled workers could explain differential speeds of recovery.

[4] Among others, see Blau and Robins (1990), Bloemen (2005), Wozniak (2006) and Neal (1999). Mortensen (1986), Pissarides (2000), and Shimer (2004) discuss the theoretical implications of differential search intensities.

[5] In addition to differences in workers' search behaviors, in the presence of rents or complementarities, firms have incentives to select the most able workers for employment and to reduce the employment of less able workers. A cyclical process of adjustment in hiring and promotion standards has often been noted (e.g., Reder 1955). Rents can arise due to rigid pay scales, as in Hall (1974), or unions, as in McDonald and Solow (1985).

Evidence suggests that high-wage jobs are concentrated in particular firms and sectors, and that the supply of high-wage jobs appears to be procyclical.[6] Both job search and employer learning explain how a protracted recovery process could follow after graduates are initially downgraded to worse employers. These models can also rationalize different rates of recovery by skill background. Yet, neither model is geared to explain how recovery occurs on the job or how permanent effects of temporary labor market conditions can arise.

Another class of models links career progression to human capital accumulation at either the firm or the industry level. Since students graduating in a recession experience a prolonged period of job and industry mobility, they will have spent less time, on average, accumulating firm- or industry-specific skills. Thus, if there is a concave profile of learning, human capital accumulation can explain recovery within firms as unlucky graduates catch up with luckier peers. An extension of these models, based on the assumption that recessions are associated with a lower supply of jobs leading to a career track or of jobs offering opportunities for skill accumulation, can also explain permanent effects resulting from temporary labor market conditions (Gibbons and Waldman 2006).[7] A similar observable pattern can be generated by models of long-term wage contracting with renegotiation. Initial labor market conditions set the starting value of the wage, and recovery occurs as the wage is renegotiated based on better outside labor market conditions.[8] Persistence arises if renegotiation is not perfect; permanent effects could occur in the absence of renegotiation.

The list of models given here is not meant to be exhaustive, but has been presented to demonstrate the potential and difficulties in explaining persistent effects of initial labor market conditions. To give an example of a model that captures one set of minimum features needed to yield differential predictions for the persistent effects of temporary labor market conditions by skill group, we developed a search model with high- and low-ability workers (see Oreopoulos, von Wachter, and Heisz 2008). In this model, those of high ability receive better or more frequent job offers, and mobility costs depend on age or job tenure.[9] After a one-period decline in the wage offer distribution (perhaps from an economic downturn), high-skilled workers recover more quickly by moving between jobs. The smaller search intensity of low-skilled workers implies slower mobility to high-wage firms and a more important role of accumulation of firm-specific capital. Because search costs increase with age, some lower skilled workers stop searching before they have found

[6] Firms and industries pay wage premiums that cannot easily be rationalized by worker characteristics (e.g., Krueger and Summers 1988; Abowd, Creecy, and Kramarz 2002). It is also well known that sectors paying higher wages have more pro-cyclical job creation, partly because of more volatile demand for their products (Okun 1973, McLaughlin and Bils 2001, Aaronson and Christopher 2004). There appears to be cyclical downgrading of young and lower skilled workers (e.g., Reynolds 1951; Reder 1955; Cutler and Katz 1991; and Hines, Hoynes, and Krueger 2002). Less able workers tend to flow to larger firms and high wage sectors in booms (e.g., Vroman 1977, Albaek and Sorensen 1998, Devereux 2002).

[7] The more traditional explanation of wage growth with experience—human capital accumulation on-the-job—is unlikely to explain persistent losses from just temporary labor market conditions without a persistent reduction in time worked.

[8] E.g., Harris and Holmstrom (1982), MacLeod and Malcomson (1993), Prendergast (1999), Gibbons and Waldman, (2006). For empirical papers on within-firm wage mobility, see Beaudry and DiNardo (1991); Baker, Gibbs, and Holmstrom (1994), and Schmieder and von Wachter (2010).

[9] To obtain a sense of the age-profile of mobility costs in our sample, we used the information from the Canadian census to show that the rate of marriage and homeownership rises rapidly after college graduation as workers age.

a higher-paying job. An important insight of the model is that initial conditions lead to *permanent* earnings differences only if coupled with search frictions that intensify with age. Without a distinction between "newly minted" workers and workers who appear to have settled, nothing would prevent unlucky workers from continuing to seek better jobs, and thereby eventually recover from beginning to work in a depressed labor market.

To assess the magnitudes of alternative channels, we simulated the model for standard parameter values (Sensitivity Appendix VI of our longer working paper, Oreopoulos, von Wachter, and Heisz (2008)). The results suggested that a standard job search model could explain persistence for high-skilled workers who recover quickly from initial labor market conditions. Yet, for reasonable job offer arrival rates, search frictions alone cannot explain the higher degree of persistence of earnings losses for the average college graduate. Age- or tenure-related mobility costs are needed to explain slower recovery of firm quality for these workers. For the least advantaged workers, job mobility is slow enough that age-related costs become sufficiently large before the initial shock has dissipated, leading to a lasting effect on firm quality and earnings.

The simulation yielded two additional useful results that helped us better understand the model's predictions. First, the larger the initial shock, the more likely it is that the age-related slowdown in search will occur before the initial effect has dissipated, especially for lower skilled college graduates. Thus, larger recessions exhibit more lasting increases in inequality and mismatch, something borne out in our empirical analysis. Second, the persistence due to age-related costs increases with the dispersion of firm quality (i.e., a dispersion in firms' average wages). Thus, the higher the pre-existing inequality in earnings in the labor market, the bigger the persistent rise in inequality due to initial shocks predicted by the model.

II. Empirical Strategy and Matched Data

Our main empirical strategy for estimating the long-term effects of initial labor market conditions was to exploit variation in unemployment rates at graduation at the national and provincial levels in Canada over 20 years. We began by estimating the effect on earnings of the unemployment rate at graduation, and, in the process, we verified the appropriateness of our empirical specification. We then replicated our analysis by subgroups and for a range of alternative outcomes.

Since our main independent variable—the rate of unemployment—varied across provinces and across cohorts, we collapsed the individual-level data at the level of graduation cohort (c), initial region of residence (r), and calendar year (t), and worked only with the cell means $\overline{y}_{crt}$ of the log of annual earnings and other variables (weighted by the corresponding cell sizes). The cell-level model on which most of the estimates in this analysis were based is

$$\overline{y}_{crt} = \alpha + \beta_e UR_{cr0} + \phi_t + \theta_r + \gamma_e + \chi_c + u_{crt}, \tag{1}$$

where θ_r, χ_c, γ_e, and ϕ_t represent unrestricted fixed effects for first region of residence, year of graduation, year of potential labor market experience (e), and calendar year.

The unemployment rate is measured at the time of graduation and the region of first residence (UR_{cr0}). The main coefficients of interest β_e on the initial unemployment rates were allowed to vary with potential experience. Given the presence of experience effects, region effects, and cohort effects, the coefficients measure *changes* in experience profiles in earnings and other outcomes resulting from province-cohort-specific variation in unemployment rates.[10] To account for group-specific error components, we clustered standard errors at the cohort-region level. In the figures, we show separate coefficients for the first ten years of potential experience. For ease of exposition, in our tables, we combined the experience years into three group-level dummies and interacted them with the initial unemployment rate.

We interpret the variation in UR_{cr0} to arise from changes in aggregate labor demand that are uncorrelated with characteristics of different graduation cohorts. To help verify that we picked up effects driven by demand conditions, and not influences from cohort-specific changes in the labor supply of young workers, we also used the provincial unemployment rate for all workers as a measure of initial labor market shock. Differences between graduation cohorts at the national level were taken out by cohort-fixed effects. Below and in the supplementary appendix in our longer working paper version, Oreopoulos, von Wachter, and Heisz (2008), we address other potential biases. We conducted multiple specification and robustness checks to show that our results were unaffected by selective changes in the timing of college graduation, by selective labor force participation, by our functional form, or by our measure of labor market conditions.

Dynamic Effects.—Since the current state of regional labor markets continues to influence earnings of more experienced workers as well (e.g., Blanchflower and Oswald 1994), our basic estimate of the effect of the first unemployment rate exposure yielded the long-term effect of the first unemployment rate plus the weighted sum of the effect of unemployment rates a worker faced during his career. This is a parameter of interest that captures the average change in earnings from graduating in a recession, given *the regular evolution of the regional unemployment rate faced afterwards*.[11] We were also interested in isolating the effect of labor market conditions at entry, *net* of subsequent effects on earnings from exposure to a possibly prolonged recession. The isolation of these effects helped distinguish the impact of labor market conditions at entry (at the time when all cohorts search for work) from

[10] As is well known, cohort effects, potential experience effects, and year effects cannot be identified separately without an additional restriction on cohort effects. Since we are mainly interested in experience effects and in how they change over the business cycle, we simply drop one additional cohort effect from the regression. We could have chosen to restrict cohort effects to sum to zero (as suggested by Deaton 1997). This alternative does not alter our estimates of the experience profile.

[11] Denote the effect on earnings in experience year e from the unemployment rate in the labor market during experience year d (where $e \geq d$) by $\beta_{e,d}$. Then, with the notation of Equation 2, we get that coefficient estimates from equation (1) of the effect of the initial unemployment rates in experience year e can be written as

$$p\lim \hat{\beta}_{e,0} = \beta_{e,0} + \sum_{d=1}^{e} \beta_{e,d} \frac{\text{cov}(UR_{cr0}, UR_{cr_d d})}{\text{var}(UR_{cr0})}.$$

This is the sum of the direct effect of the initial unemployment rate in experience year e ($\beta_{e,0}$), plus the sum of the persistent effects of all other unemployment rate conditions in experience year e the worker faced since graduation ($\beta_{e,d}$), to the extent they are correlated with the initial unemployment rate.

the impact of labor market conditions when working or entering a new firm in mid-career (as stressed, for example, by Beaudry and DiNardo 1991). This approach also allowed us to assess whether the persistent effects of aggregate unemployment rates at time of entry differed from those experienced by more mature workers.

In Section III, we explore this issue by examining whether the effect of the early unemployment rate would remain stable even when we included the cohort's current unemployment rate or when we controlled for current region-year fixed effects. To do so, we worked with a version of the data that was collapsed at the level of graduation cohort, initial region of residence, and calendar year, *as well as* region of current residence. We then allowed for persistent effects of the provincial unemployment rate a worker was exposed to at each experience year (e) in the relevant region (r_e), denoted by $UR_{cr_e e}$. Due to strong correlation in aggregate unemployment rates across years, an unrestricted model allowing for effects from unemployment conditions each year since graduation generated imprecise estimates. Our preferred specification thus used a more restricted model in which we grouped the effects of unemployment over two consecutive experience years. Defining the effect on earnings in experience year e from the unemployment rate at experience year 0–1 (2–3, 4–5, 6–7, …) by $\beta_{e,01}$ ($\beta_{e,23}$, $\beta_{e,45}$, $\beta_{e,67}$, …), and dropping the region subscripts on the unemployment rates for simplicity, the dynamic model whose results were reported in the paper can be written succinctly as

$$\log \overline{w}_{crt} = \phi_t + \theta_r + \chi_c + \gamma_e + \beta_{e,01}\overline{UR}_{01} + \beta_{e,23}\overline{UR}_{23} + \cdot + \beta_{e,45}\overline{UR}_{45} + \cdots + u_{crt}, \tag{2}$$

where $\overline{UR}_{01} \equiv (UR_{cr0} + UR_{cr1})/2$, $\overline{UR}_{23} \equiv (UR_{cr2} + UR_{cr3})/2$, etc., and we imposed the restriction $\beta_{e,d} = 0 \,\forall\, d < e$. The regression estimated the persistent effect of the transitory component of each aggregate unemployment condition in a given pair of experience years, net of its correlation with other unemployment rates affecting the worker in adjacent experience years. For more detail, see Appendix III in the supplementary appendix in Oreopoulos, von Wachter, and Heisz (2008).

Canadian Administrative Data.—Our results are based on a unique match between three large administrative datasets collected and compiled within Statistics Canada (this match is described in detail in the supplementary appendix in Oreopoulos, von Wachter, and Heisz (2008)). The data combined administrative information on about 70 percent of Canadian university students and graduates from 1976 to 1995 with longitudinal individual income tax records and firms' payroll information covering the years 1982–1999.[12] The data contains exceptional information about individual students' courses of study (such as type of degree, major and date of graduation), as well as detailed career information (e.g., annual earnings, province of residence

[12] The term "college" is something of a misnomer in Canada because it is usually used to refer to one- or two-year, community-level, postsecondary institutions, rather than degree-granting universities. However, in keeping with the terminology used most often, we will refer to Canadian universities as colleges. Since we do not observe outcomes before 1982, cohorts graduating from 1976 to 1981 contribute to our estimates with later experience years. Our results are robust to excluding these cohorts.

and receipt of unemployment benefits) and information about employers. To analyze the role of employer characteristics, we exploited the panel nature of our firm data and calculated average firm size, average median wage, and total payroll at the firm level, with year fixed effects taken out. All firm characteristics in our empirical analysis referred to *permanent* attributes so that these characteristics remained unchanged across the worker panel (i.e., an individual's firm characteristics could change only if he moved to a different employer).[13]

To generate a uniform sample with a common definition of labor market entry, we focused on the effect of recessions at the end of the *first* exit from college and excluded workers obtaining higher degrees from our sample.[14] As shown in table A1 in the supplementary appendix of Oreopoulos, von Wachter, and Heisz (2008), even within this relatively homogeneous sample, there was a high dropout rate and high variance in college duration. To focus on students whose labor market conditions at graduation were difficult to predict at the time of entering college, and to reduce possible measurement error, our main sample excluded early college dropouts and concentrated on a more homogenous group of workers with better-measured graduation dates. To do so, we calculated the difference between actual and predicted graduation year (based on length of program in first or second year) and kept only workers with nonnegative differences (we refer to this as the graduate sample). The right columns of table A1 in Oreopoulos, von Wachter, and Heisz (2008) show characteristics for that sample. Within the sample of workers on or above grade, 89 percent graduated and average duration of college was about 4 years.

To assign unemployment rates at the time of graduation, we had to choose a relevant province of residence (which would also constitute the relevant labor market). After careful analysis, we settled on the province of first residence after graduation as the relevant labor market for young college graduates. We imposed some additional basic sample restrictions and limited the degree of missing observations on earnings. In particular, in order to remove individuals who stopped being recorded annually, we dropped workers who permanently stopped filing taxes because they left the country, obtained a new personal identification number, entered the underground economy, or because their file was simply miscoded along the way. None of these choices or restrictions affected our results.

Figure A1 in Oreopoulos, von Wachter, and Heisz (2008) shows that the general experience profiles in annual earnings and job mobility for our baseline Canadian data were similar to those for the United States. In addition, we documented a strong experience gradient in average size and average wages paid by employers: from years 1–10, average firm size and average firm wage increased by 34 percent and 24 percent, respectively. The longer male Canadian graduates progress through the

[13] We thereby conform to the vast majority of the literature, which focuses on permanent firm characteristics. We experimented with alternative measures of firm characteristics, such as firm growth rates, and found other differences to change little over the cycle. The information is at the firm level. For simplicity, we use the terms "firm," "company," and "employer" interchangeably.

[14] Since we found that early recessions do not affect the probability of obtaining a graduate degree, this exclusion did not affect our results. Similarly, the probability of being in the graduate sample as defined below is not affected by graduating in a recession. We have experimented with other definitions of the relevant date of labor market entry (such as last degree or last degree of continuous education) and have seen little effect on the results. In the sensitivity analysis, we also show results using a sample that includes workers obtaining a postgraduate degree.

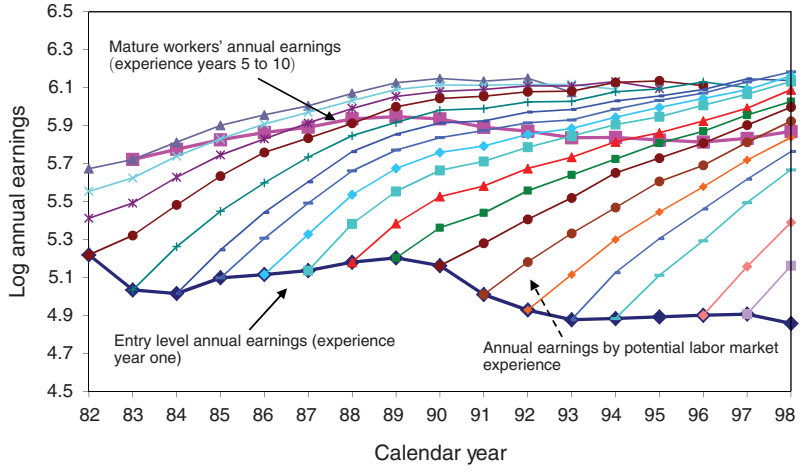

FIGURE 1A. MATURE AND ENTRY LEVEL EARNINGS AND EXPERIENCE PROFILES BY GRADUATION YEAR

Notes: The figure plots average log annual earnings profiles by year of degree completion for our baseline sample (all males in our administrative data that began a full-time undergraduate program at a post-secondary school institution in Canada between the ages of 17 and 20 from 1976–1995). See text and Data Appendix for more details.

labor market, the more they tend to move to firms that, on average, pay more and are larger.[15] Our main analysis measures deviation from these average experience profiles due to unemployment conditions at college graduation.

Canada experienced two major recessions in the early 1980s and 1990s, which increased young workers' unemployment rates for certain years by more than 7 percentage points. We used this variation for our national specification. The evolution of the unemployment rate at the provincial level displayed a high degree of regional heterogeneity. During this period, an increase of unemployment rates of 5 percentage points (or about two standard deviations) described a typical recession.[16]

III. The Persistent Effect of Initial Labor Market Conditions on Earnings

The evolution of annual earnings in our baseline sample displayed clear differences in initial level and ensuing growth of earnings by year of college graduation. This is shown in Figure 1A, which plots mean earnings by experience and

[15] The first years of the careers of young male Canadian college graduates are characterized by steep wage growth (also documented for the United States by Murphy and Welch 1990), frequent job changes (Topel and Ward 1992), initially unstable labor force attachment (Gardecki and Neumark 1998, Ryan 2001), some interregional mobility (Wozniak 2006), and frequent industry changes (McCall 1990, Neal 1995, Parent 2000). Figure A1 (panel C) and Table A5 in Oreopoulos, von Wachter, and Heisz (2008) suggest that average firm size tends to grow with labor market experience for college graduates in the United States, too.

[16] If we regress regional unemployment rates on year and region fixed effects, the R^2 is 0.9, which is a common finding in the United States and other countries. The remaining variation in regional unemployment rates allows us to obtain precise estimates of the effect of province recession shocks and to include further interaction terms, such as region-specific year effects. We should stress that our results are robust when excluding large Canadian provinces, such as Ontario or Quebec.

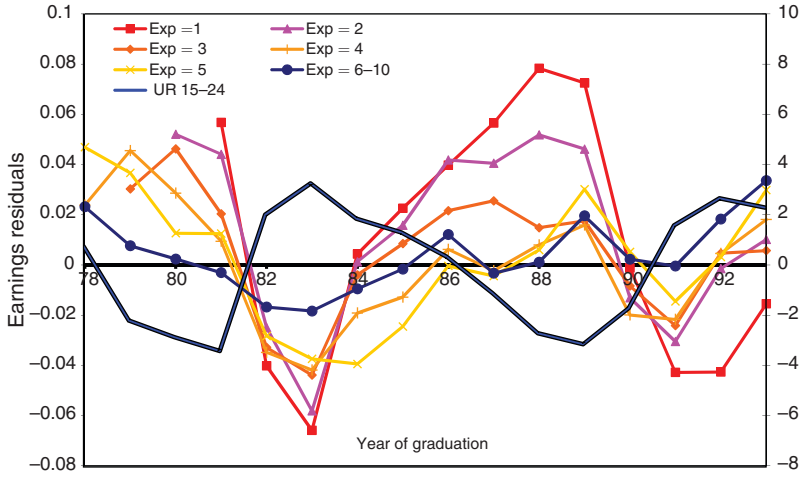

FIGURE 1B. EARNINGS BY EXPERIENCE YEAR FOR COHORTS ENTERING LABOR MARKET 1978–1993

Notes: The figure is constructed by first regressing log earnings from the baseline sample on fixed effects for year of college completion. The figure plots the average residuals from this regression for different years of experience. The figure also shows the national 15 to 24 year-old unemployment rate matched to the year of college completion (these values are from Statistics Canada). See text for more details.

year of graduation at the national level, together with the individual's entry wage at experience one (their first full year of work) and the average wage for "mature" workers (workers with five to ten years of experience). One can clearly see differences in starting wages across graduation cohorts leading to differences in average cohort earnings. The figure also shows a clear pattern of convergence. Initial differences in starting conditions appear to fade over time. Cohort effects appear to have a time-varying component, or, as noted by Beaudry and Green (2000), experience profiles vary across cohorts.

There is a strong correlation between starting wages and initial unemployment rate conditions, which persists into higher experience years and slowly fades over time. This is shown in Figure 1B, which graphs national unemployment rates for young workers and wages at different years of experience by graduation cohort (both expressed as deviations from their means across cohorts). The correlations in the figure strongly suggest that part of the initial but fading earnings differences in Figure 1A are driven by variation in initial labor market conditions.

Table 1 presents analogous results to this figure and other figures in this article, along with standard errors. Similar to the case of Figure 1B, columns 1 and 2 in panel A display estimated effects of the unemployment rate at time of graduation on annual earnings for different years of experience in the work force using national unemployment variation. These estimates control for the year in which earnings are observed, average experience effects across cohorts, and linear or quadratic cohort trends. Standard errors are clustered at the level of graduation cohort to allow for group-level error terms. The results suggest a strong initial effect that persists but fades after about five years in the labor market.

Table 1—The Persistent Effect of the Unemployment Rate (UR) in the Year of College Graduation on Annual Earnings of Male College Graduates by Years Since Graduation, Alternative Specifications

Effect of UR at graduation on annual earnings by year since graduation	National unemployment rate: Linear cohort trend (1)	National unemployment rate: Quadratic cohort trend (2)	Main model based on regional unemployment rate (3)	Working every year in first ten years after graduation (regional UR) (4)	Instrument actual with predicted year of graduation (regional UR) (5)	Effect by different graduation years (regional UR): 1980–1984 (6)	1985–1989 (7)	1990–1994 (8)
Panel A. Sensitivity of main findings with respect to alternative specifications and samples								
Effect Year 0–1	−0.0196	−0.0197	−0.0183	−0.0168	−0.0182	−0.0163	−0.0130	−0.0188
	(0.0037)	(0.0023)	(0.0020)	(0.0022)	(0.0027)	(0.0052)	(0.0059)	(0.0060)
Effect Year 4–5	−0.0038	−0.0038	−0.0089	−0.0067	−0.0079	−0.0088	−0.0118	−0.0087
	(0.0025)	(0.0017)	(0.0016)	(0.0016)	(0.0017)	(0.0025)	(0.0054)	(0.0053)
Effect Year 9–10	0.0035	0.0044	−0.0042	−0.0042	−0.0050	−0.0020	−0.0128	−0.0235
	(0.0031)	(0.0018)	(0.0017)	(0.0018)	(0.0020)	(0.0030)	(0.0051)	(0.0074)

Effect of UR at graduation on annual earnings by year since graduation	Main model but only including cohorts graduating after 1982 (1)	Including initial-firm fixed effects (2)	Including initial-firm-experience fixed effects (3)	By type of initial employer: Median log earnings <75th percentile (4)	Difference for median log earnings >75th percentile (5)	Mean log payroll <75th percentile (6)	Difference for mean log payroll >75th percentile (7)
Panel B. Including controls for initial firm and by initial firm characteristics (*Regional UR*)							
Effect Year 0–1	−0.0180	−0.0168	−0.0099	−0.0236	0.0157	−0.0198	0.0038
	(0.0025)	(0.0019)	(0.0027)	(0.0021)	(0.0010)	(0.0020)	(0.0010)
Effect Year 4–5	−0.0111	0.0026	−0.0046	−0.0131	0.0094	−0.0094	0.0008
	(0.0018)	(0.0015)	(0.0024)	(0.0016)	(0.0008)	(0.0016)	(0.0006)
Effect Year 9–10	−0.0068	−0.0189	0.0001	−0.0084	0.0093	−0.0050	0.0017
	(0.0019)	(0.0020)	(0.0027)	(0.0018)	(0.0012)	(0.0018)	(0.0009)

Notes: The sample includes males in Canada leaving university between 1976 and 1995 (see the data Appendix). Regressions are based on cell data at the level of graduation cohort, province of residence in each year of graduation, and experience year (year since graduation). The national model regresses log annual earnings on the youth unemployment rate in the country at the year of college exit, interacted with dummies for five experience groups, plus experience fixed effects, and a linear or quadratic graduation cohort trend. The regional model regresses log annual earnings on the youth unemployment rate in the province of first residence, interacted with for five experience groups, plus province of first residence fixed effects, experience fixed effects, and year of graduation fixed effects. The coefficients shown are on the interaction of the unemployment rate at college exit and selected experience groups. Standard errors clustered at the first-province-cohort level are in brackets. See text for more details.

A. *Main Regional Models*

Our main results are drawn from regional models that include cohort effects as well as effects for province of first residence as described in Section II. The shifts in experience profiles due to an initial provincial unemployment shock are shown in Figure 2 (panel A) for our baseline graduate sample. The initial effects are similar in size to those from the national model, but starting at experience year four, the regional estimates indicate more persistence. Estimates with standard errors are shown in column 3 of panel A in Table 1.[17] The coefficients demonstrate that the effect on a high unemployment rate at graduation converges to zero only after ten experience years. Although our main results are based on a sample of graduates, as shown in Figure 2, there is little difference in the point estimates if we use all workers with some college. It does not appear that those with a college degree fare better than the full sample.

[17] The coefficient estimates of all figures are contained in the supplementary appendix in Oreopoulos, von Wachter, and Heisz (2008). The main regression specification is given in equation 1.

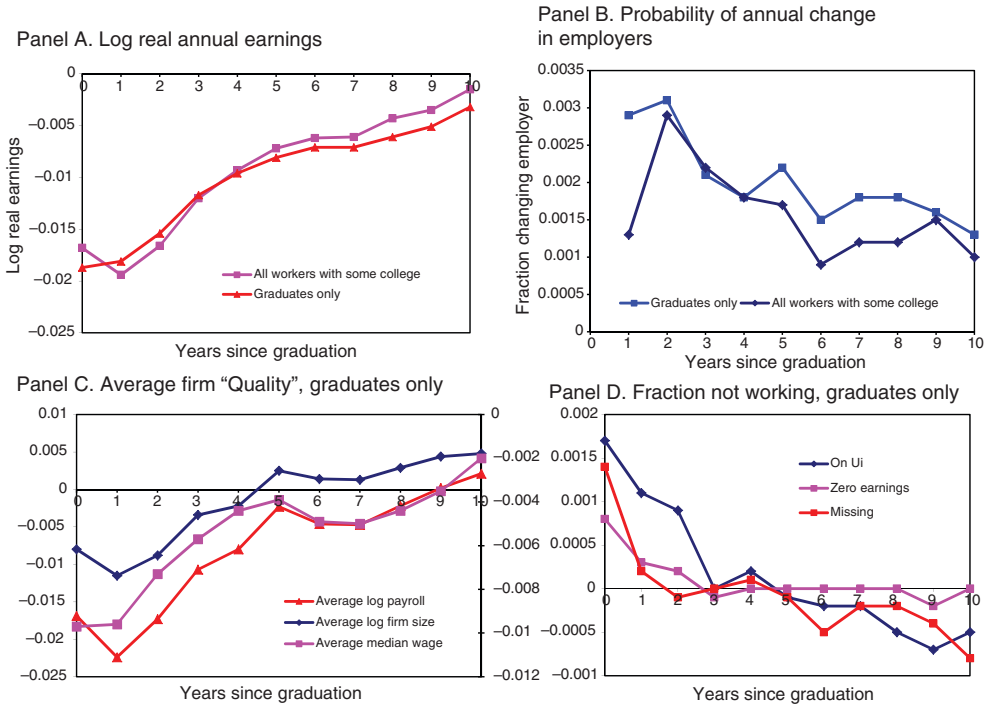

FIGURE 2. PERSISTENT EFFECTS OF THE REGIONAL UNEMPLOYMENT RATE IN THE YEAR OF COLLEGE GRADUATION ON ANNUAL EARNINGS, JOB MOBILITY, EMPLOYMENT, AND FIRM QUALITY BY YEARS SINCE GRADUATION

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 (years since graduation), and region of first residence (equation 1 in the paper). Panels A and B are based on the sample of all 17 to 20-year-olds who started a college program in the data and on 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. Panels 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; (averaged across all years in the dataset) as the outcome of interest: the employer's average log total payroll, 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 ("Ui"), whether recorded as having zero earnings, or whether not recorded as filing a tax return in a given year ("Missing"). See text for more details.

The similarity between the national and regional results suggests we can exclude a strong correlation of initial unemployment rates at the national level with changing unobserved cohort characteristics. Below, we show that higher persistence in our regional results is not driven by more persistent local unemployment shocks. Instead, national estimates may be more affected by measurement error problems due to aggregating across local labor market shocks. Interregional mobility is less common in Canada than in the United States. Thus, the relevant labor market shock is at the regional level, an effect only partially absorbed by the national unemployment rate. Low regional mobility may also explain why results from the national model are not larger than those from the regional model.

Using the results from our main regional model, with an increase in unemployment of 5 percentage points—roughly a shift from boom to recession in our sample—annual wages are about 9 percent lower in the first year after college, still

4 percent lower after 5 years out and about 2 percent lower 9 years out. Overall, we view the regional and national results as telling a consistent story. Graduating during a recession leads to significantly lower earnings at the beginning of an individual's career, but the gap converges to zero within ten years after graduation. The effects of concurrent unemployment rates we find are consistent with estimates from the literature on the "wage curve" in the United States and Canada (Blanchflower and Oswald 1994). They are also consistent with estimates by Bloom and Freeman (1989), who find that initial effects due to differences in cohort sizes fade after ten years. Similarly, Devereux (2003) finds, among a sample of workers from all ages, that half of a wage shock, instrumented by local unemployment conditions, is still present after about five years. Kahn (2010) finds somewhat more persistent losses in earnings than ours for college graduates in the United States, perhaps due to her focus on graduates entering the strong recession of the early 1980s.

Dynamic Effects.—The large number of cohorts at our disposition allows us to take the existing literature a step further by distinguishing the long-term effect of the very first unemployment rate, when the majority of graduates are beginning their search for a full-time job, from the role of persistent conditions in the labor market affecting them in later years. As discussed in Section II, due to the presence of continuing exposure to adverse labor market conditions, the estimates in Figure 2 (panel A) represent a summary of the earnings losses the average worker can expect due to entry in a depressed labor market. To isolate the extent to which our baseline results occur primarily from the very first labor market conditions, we include in our main model controls for the confounding effects of later regional unemployment rates correlated with initial labor market conditions (as explained in equation (2)).

We find that the majority of the effect is due to unemployment "shocks" in the year of labor market entry. We began by adding an interaction between dummies for potential labor market experience and the concurrent regional unemployment rate prevalent in the relevant year and current province of residence, and adding fixed effects for current province of residence. As predicted, the long-term effect of the initial unemployment rate partly arises due to the correlation with ongoing persistent labor market conditions, but the difference is small (not shown). As shown in Figure 3, the basic results are also not affected if in addition we allow for persistent effects of concurrent labor market conditions at higher experience years as discussed in Section II.[18] As benchmark, the figure replicates estimates for β_e corresponding to our main model ("baseline"), as well as estimates of the effect of the average unemployment rates at experience years 0 and 1 without any history controls (labeled "Group 01 (No History)"). We then show results from estimating equation (2) ($\beta_{e,01}$ and $\beta_{e,23}$, labeled "full history"). These results suggest that part of the effect of initial unemployment rates is due to the correlation of initial and continuing regional labor market conditions. This is consistent with the findings of Beaudry and DiNardo (1991), McDonald and Worswick (1999), Grant (2003), and Schmieder and von Wachter (2010), who found that labor market conditions have persistent effects on earnings even for more

[18] Note that since we observe full history of province of residence only for cohorts graduating 1982 and onward, our estimates in Figure 3 and in other relevant specifications use only these cohorts.

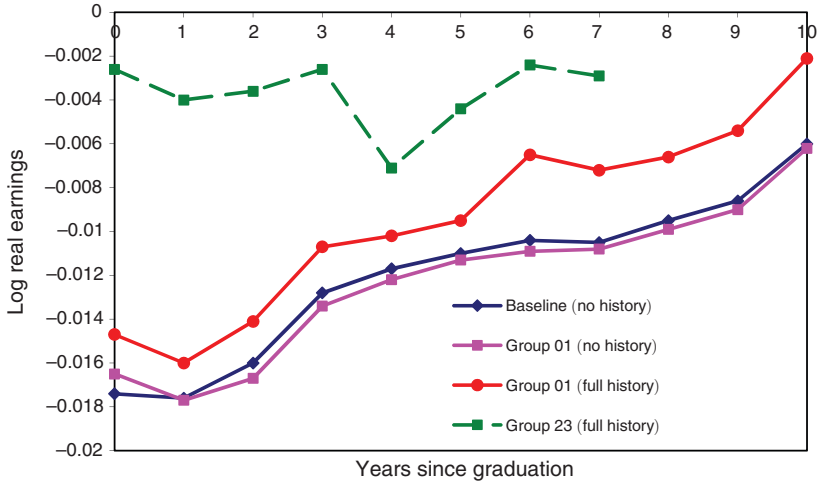

FIGURE 3. EFFECT OF UNEMPLOYMENT RATE AT TIME OF GRADUATION ON EARNINGS CONTROLLING FOR DYNAMIC EFFECTS OF FURTHER UNEMPLOYMENT SHOCKS (*by experience groups*)

Notes: This figure shows estimates from regressing log annual earnings on the average of regional unemployment rates (UR) in experience years 0 and 1 at the end of college completion interacted with experience dummies, controlling for effects for cohort of graduation, experience (years since graduation), and region of first residence ("Group 01 (No History)"). The remaining lines show estimates from equation (2) in the text that control for the dynamic effect of unemployment rates encountered at higher experience years. Since we only observe full labor market histories for cohorts graduating in 1982 onwards, this figure is restricted to this set of cohorts. In addition, the figure shows our main estimates comparable to those in Figure 2 ("Baseline") for this sample.

experienced workers on the job. However, our results also clearly imply that an important part of the effect of initial unemployment rates is driven by the very first "shock" young workers encounter in the labor market at graduation.

Results from the dynamic model also imply that regional unemployment rates have much stronger effects on labor market entrants than on workers with a few years of labor market experience. To put the magnitude of the effect of initial labor market conditions into perspective, Figure 3 shows the dynamic effect of a shock occurring at experience years 2–3 from the grouped model with full history controls ($\beta_{e,23}$ in the notation of equation (2)). To make the dynamic pattern comparable with that of the first group, the figure shows coefficients relative to the time of the shock (i.e., experience zero now relates to the moment of the shock). The effect of a shock experienced at experience years 2 to 3 is much smaller than the effect of a shock at entry (0 to 1) for all experience years. Our period is too short to observe complete reversion, but the point estimates are insignificant after years 5–7. Inspection of the data leads us to believe that the dynamic effects for shocks at later experience years are small. The result highlights the greater importance economic conditions have at the beginning of one's labor market career relative to their effect after an individual has begun his career.[19]

[19] The limited role of regional mobility we find below suggests that the correlation of future unemployment rates with unobserved worker characteristics may not be a major concern. Any remaining amount of selection implies we

Sensitivity Analysis.—Our overall results hold up well against a variety of sensitivity checks. Since most of our measures indicate insignificant effects of unemployment rates on college duration, selective timing of graduation does not appear to be an important phenomenon in our data (see Table 1, panel A, column 5 and the supplementary appendix in Oreopoulos, von Wachter, and Heisz 2008). Not surprisingly, when we use the unemployment rate in the predicted year of graduation (based on starting year of college and typical degree duration) as an instrument, our estimates confirm the main ordinary least squares results. Although all our results carry over with the instrumental variable estimate, in what follows, we report the more efficient ordinary least squares estimates.

The remaining columns of Table 1 (panel A) show two further sensitivity checks. First, column 4 shows that there are only small (and insignificant) differences in the effects when we only include workers always present with positive earnings. This implies that our findings are not due to selective labor force participation. Columns 6–8 show that although there are some expected differences in the effects of initial labor market conditions across cohorts (e.g., graduates entering in the strong recession of the early 1980s suffered slightly larger and more persistent effects), our results are quite similar for different groups of labor market entrants.

We have also tried various other sample and specification choices, none of which substantially affected our results. For instance, including college students who entered the labor market after a graduate degree had no effect on our results (see Figure C3, panel B in the supplementary appendix in Oreopoulos, von Wachter, and Heisz 2008), suggesting that workers in our sample do not selectively choose to enter advanced degree programs due to unemployment. We also tried various ways of excluding workers with repeatedly missing wages and found little effect on our results (see figure C3, panel A in the supplementary appendix in Oreopoulos, von Wachter, and Heisz 2008). We also re-estimated all of our results using the province of college as the region for the relevant initial shock, but in this case, too, our basic findings were unchanged (see Figure C1, panel C in the supplementary appendix in Oreopoulos, von Wachter, and Heisz 2008).

It is possible that regional results show more persistent effects of initial labor market conditions on wages partly because workers are "stuck" in persistently slack regional labor markets. To address this possibility, we also included current-province-by-current-year fixed effects (shown in figure C1, panel D in the supplementary appendix in Oreopoulos, von Wachter, and Heisz 2008), but this showed barely any differences from the main results. This observation is also an indicator that mobility toward provinces with higher wages is not a strong source of catch-up in our sample, a question to which we return below. We also examined whether using the average unemployment rate over several years after entry would yield different results, and found that it does not appear that the effects captured in the main models are driven by periods of extended unemployment (see figure C1, panel B in the supplementary appendix in Oreopoulos, von Wachter, and Heisz 2008). Our results are also robust to many additional sensitivity checks contained in that supplementary appendix.

would tend to overstate the impact of labor market conditions at higher experience years.

Effects on Employment.—If unemployment rates affect participation, part of the recovery process in earnings that we found may be due to sample selection. Similarly, losses in employment could depress wages by reducing accumulation of labor market experience. Figure 2, panel D, replicates the results shown in panel A, using as outcome variables the fraction of workers claiming unemployment insurance benefits (called "employment insurance" in Canada), the fraction of workers filing taxes with zero earnings, and the fraction of workers not filing taxes in a given year. Estimates with standard errors for the fraction with zero earnings are shown in column 1 of Table 2. The table and figure show an initially significant increase in fraction zero earnings and the fraction of unemployment insurance claimants that fades within three experience years. The effects are numerically small and become smaller and insignificant when we control for persistence of local unemployment rates as in equation (2). In other words, a temporary unemployment rate shock has no persistent effects on employment or participation of male college graduates.

Since our sample does not contain information on time worked, we also replicated our results with the Canadian Census and found similar effects of early unemployment rates on annual earnings (see supplementary appendix V in Oreopoulos, von Wachter, and Heisz 2008). Decomposing this effect into the effects of early unemployment rates on weeks worked and on weekly wages, we find that the effect on weeks worked is short lived. The majority of the persistent effects are driven by a reduction in weekly earnings. Overall, the loss in experience due to labor market entry in recessions is not very large for the average college student.[20] Thus, neither reduction in the accumulation of experience nor selective entry or exit from the earnings sample of workers of different abilities affects the main pattern of reversion.

Effects on Regional Mobility.—To explore whether entering the job market in recessions is associated with higher mobility across provinces, we also analyzed the effects of the unemployment rate at college exit on subsequent provincial mobility. As shown in supplementary appendix IV in Oreopoulos, von Wachter, and Heisz 2008, the national unemployment rate is uncorrelated with moving to other provinces. However, for the regression models identifying regional economic shocks, we do observe initially increased provincial mobility for cohorts exposed to higher unemployment conditions at time of college exit.

For the graduate sample, a 5 percentage point difference in the unemployment rate at entry is associated with about a 0.75 percentage point difference in the provincial mobility rate in the first two years. This rate is about half of that for firm mobility and drops quickly after the third year. The benefit of moving to different provinces in terms of earnings also appears to be considerably smaller and shorter lived than that of moving to different firms or industries. The small effect of unemployment at college exit on provincial mobility suggests that most of the pattern of

[20] These results are echoed by Kahn (2010), who has found small initial effects on hours, employment, and weeks worked for male college graduates in the United States after the 1982 recession. Table 2 also displays a pattern of "overshooting" for some measures; this would imply that workers who had initially higher instability become more stable later relative to their more lucky counterparts. However, the estimates are numerically very small and never above 0.2 percentage points.

Table 2—Heterogeneity in the Effect of the Regional Unemployment Rate (UR) in the Year of College Graduation on Annual Earnings, Job Mobility, Employment, and Firm Quality

Outcome variable	Effect of UR at graduation by year since graduation	All graduates (1)	Position in distribution of predicted annual earnings at time of graduation		
			Bottom quintile (2)	Middle quintile (3)	Top quintile (4)
Annual earnings	Effect year 0–1	−0.0183	−0.0277	−0.0232	−0.0147
		(0.0020)	(0.0058)	(0.0033)	(0.0028)
	Effect year 4–5	−0.0089	−0.0167	−0.0124	−0.0042
		(0.0016)	(0.0046)	(0.0025)	(0.0019)
	Effect year 9–10	−0.0042	−0.0161	−0.0039	−0.0024
		(0.0016)	(0.0056)	(0.0028)	(0.0021)
Average firm median log earnings	Effect year 0–1	−0.0096	−0.0111	−0.0128	−0.0082
		(0.0012)	(0.0043)	(0.0022)	(0.0015)
	Effect year 4–5	−0.0042	−0.0087	−0.0050	−0.0004
		(0.0011)	(0.0040)	(0.0017)	(0.0015)
	Effect year 9–10	−0.0028	−0.0126	−0.0043	0.0010
		(0.0012)	(0.0044)	(0.0019)	(0.0015)
Average firm employment	Effect year 0–1	−0.0098	−0.0173	−0.0157	−0.0062
		(0.0048)	(0.0188)	(0.0092)	(0.0070)
	Effect year 4–5	−0.00001	0.0009	−0.0121	0.0069
		(0.0049)	(0.0168)	(0.0089)	(0.0070)
	Effect year 9–10	0.0044	−0.0252	−0.0104	0.0236
		(0.0060)	(0.0191)	(0.0100)	(0.0073)
Fraction changed employer	Effect year 0–1	0.0020	−0.0023	−0.0019	0.0078
		(0.0011)	(0.0024)	(0.0016)	(0.0013)
	Effect year 4–5	0.0021	0.0019	0.0032	−0.0002
		(0.0005)	(0.0020)	(0.0008)	(0.0007)
	Effect year 9–10	0.0016	0.0020	0.0033	−0.0012
		(0.0005)	(0.0020)	(0.0008)	(0.0007)
Fraction changed industry	Effect year 0–1	0.0009	−0.0032	−0.0036	0.0069
		(0.0010)	(0.0021)	(0.0016)	(0.0012)
	Effect year 4–5	0.0016	0.0018	0.0022	−0.0002
		(0.0004)	(0.0018)	(0.0008)	(0.0006)
	Effect year 9–10	0.0015	0.0030	0.0023	−0.0009
		(0.0005)	(0.0018)	(0.0008)	(0.0007)
Fraction zero earnings	Effect year 0–1	0.0014	−0.00001	0.0009	0.0017
		(0.0002)	(0.0009)	(0.0003)	(0.0004)
	Effect year 4–5	−0.0001	−0.0018	0.0003	−0.0005
		(0.0002)	(0.0007)	(0.0004)	(0.0003)
	Effect year 9–10	−0.0002	−0.0015	0.0006	−0.0006
		(0.0002)	(0.0007)	(0.0004)	(0.0003)

Notes: Coefficients from separate regression models of outcomes listed in the first column on unemployment rate at graduation by selected years since graduation, controlling for effects for year of graduation, experience, and province of first residence. Column 1 shows the results for the full sample of college graduates, whereas columns 2–4 show the results separately for college graduates in the first, third, and fifth quintile of predicted earnings at the time of graduation. Standard errors clustered at the first province cohort level are in parentheses. See text for more details.

catch-up in wages over time for individuals who made their first entry into the labor market during a recession occurs within provinces.

To directly assess the potential effect of provincial mobility on earnings, we also replicated our estimates separately for workers who never switched regions and for movers. Those never moving (about three-quarters of our sample) behaved in a way very similar to the behavior of the full sample (see figure D3 in the supplementary appendix in Oreopoulos, von Wachter, and Heisz 2008). It appears that regional mobility after an adverse initial shock may not be as important in Canada as in the United States (Wozniak 2006).

B. *Heterogeneity in the Effect of Graduating from College in a Recession*

In this section, we use our data to show that college graduates with lower predicted wages, based on college background, are more adversely affected by higher initial unemployment rate conditions. We first use a linear regression model to predict log earnings based on college attended, program of graduation, and years of study, conditional on province of study and cohort year. Since individuals are likely to be sorted into colleges, these estimates capture both differences in innate ability and differences in college quality. We then group individuals into quintiles based on these predicted wages.[21]

Our results imply that college graduates with the lowest predicted annual earnings are most affected by higher initial unemployment conditions and experience permanent earnings losses, while those at the top experience losses that are short-lived. Figure 4 shows the same coefficients for the effects of the initial unemployment rate on log earnings, job mobility, individuals' firms' log median earnings, and employment as in the baseline model, but for regression models estimated separately for the first, third, and fifth predicted wage quintiles (this figure corresponds to Figure 2 for the full sample). Columns 2–4 of Table 2 summarize the key structure of losses by quintile and compare them to results for the full sample, with standard errors. As is apparent from the figure and table, those with the lowest predicted annual earnings are most affected by higher initial unemployment conditions and experience permanent earnings losses. Earnings 1 year into the labor market are about 15 percent lower from a 5 percentage point increase in the initial unemployment rate, and, in this case, they remain about 7.5 percent lower even after 10 years. In contrast, the earnings of college graduates in the top quintile are, on average, about 7.5 percent lower in the first year after a 5 point increase in unemployment rates, but the gap falls to less than 2 percent after only 4 years. The median group of graduates experiences similar patterns of reversion as the average shown in Figure 2.

[21] A similar approach to assessing college quality is followed by Betts, Ferrall, and Finnie (forthcoming), who use the same college data and information about wages after graduation as we do. After analyzing majors and colleges separately, in our final specification, we interact major and college dummies. Differences by major or college in themselves are as expected. For example, humanities graduates do worst and then come social sciences; economics and engineering are in the middle range, whereas hard sciences are in the high range (See figure G1 in the supplementary appendix in Oreopoulos, con Wachter, and Heisz). The effect of sorting into colleges is discussed extensively in Black and Smith (2004); Black, Kermit, and Smith (2005); and Dale and Krueger (2002).

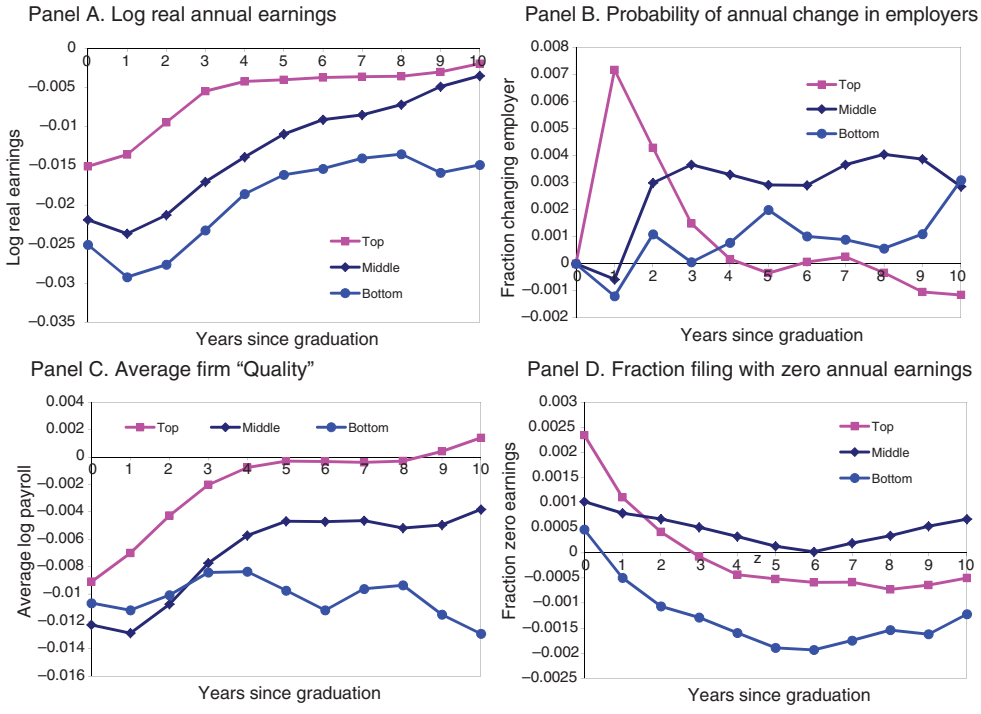

FIGURE 4. PERSISTENT EFFECTS OF THE REGIONAL UNEMPLOYMENT RATE IN THE YEAR OF GRADUATION ON ANNUAL EARNINGS, JOB MOBILITY, EMPLOYMENT, AND FIRM QUALITY FOR WORKERS WITH DIFFERENT PREDICTED EARNINGS BASED ON COLLEGE AND MAJOR

Notes: The figures show coefficients from regressing specified outcome variables on regional unemployment rates at the end of college completion, controlling for effects for year of graduation, experience (years since graduation), and province of first residence (equation (1) in the paper). The samples are divided into predicted skill groups, based on major program of study and college (see text for more details). 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 shows coefficient estimates using the employer's average log total payroll (averaged across all years in the dataset) as a measure for firm quality. Panel D shows coefficient estimates for whether recorded as having zero earnings in a given year.

Overall Costs of Recessions.—The longitudinal data allowed us to obtain a direct measure of the cost of recessions that is a useful complement to measures in the literature based on the standard deviations of earnings. Figure 5 graphs the percentage decline in the present discounted value of annual earnings by deciles of the predicted earnings distribution. We discounted earnings at an interest rate of 5 percent and included only the first 10 years of earnings in our calculation. This assumed that the difference in annual earnings had decayed after 10 years. We thus *understated* the loss for less advantaged workers, whose earnings had not fully recovered by that time. Thus, we view our calculations as lower bound estimates of the full, life-time loss in earnings.

Figure 5 illustrates two key messages. First, there is an important gradient in the cost of recessions in predicted earnings—those individuals with lower earnings capacity face four to five times the cost of recessions than do the most advantaged workers. On the other hand, the least advantaged college graduates appear to bear most of the impact

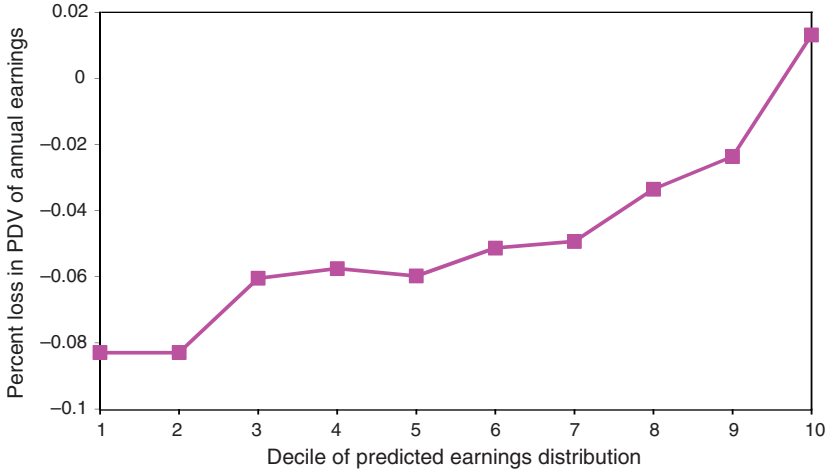

FIGURE 5. HETEROGENEITY OF LOSSES FROM GRADUATING IN A RECESSION AS MEASURED BY LOSS IN PRESENT DISCOUNTED VALUE OF EARNINGS IN FIRST TEN YEARS SINCE GRADUATION

Notes: The figure shows the percentage loss in the present discounted value of annual earnings in the first ten years after graduation due to graduation in a recession by deciles of the distribution of predicted earnings, assuming an interest rate of five percent and that losses fade after ten years in the labor market. See text for details. The numbers have been smoothed by a moving average.

from graduating in a recession. Second, losses from starting to work in a recession as measured by actual changes in the present discounted values of earnings or utility losses are high even for the more able workers. In particular, for the median worker in our sample, losses are much higher than what is typically found in the literature.[22]

IV. Mechanisms of Recovery from Graduating in a Recession

The preceding results draw a detailed picture of the effect of initial labor market conditions on college graduates, in which very short-lived, adverse labor market conditions have long-term effects, in which labor market entrants are much more affected than workers with just a few years of experience, and in which the size and persistence of the effect vary dramatically across the skill distribution. In Section III, we ruled out mobility across provinces and reduced work time in terms of non-employment or weeks worked in determining income recovery for students graduating in a recession. In this section, we analyze two additional key channels: the role of first employers and mobility across jobs and industries.

[22] The median worker in our sample loses about Can$22,000 (in 2005 prices), which represents about 6 percent of the present discounted value of earnings, during their first 10 years in the labor market. This compares to average annual earnings during the first experience year for the median worker of about Can$25,000 (in 2005 prices). In Appendix IX in the supplementary appendix in Oreopoulos, con Wachter, and Heisz (2008), we also show the fraction increase in annual earnings a worker would require in order to be indifferent between a noisy earnings path and an alternative stable path, using a constant relative risk aversion utility function. This corresponds conceptually to the original Lucas measure. The results convey the same message as Figure 5. We find that an uncertain stream of earnings had to be increased by about 7 percent for the median worker in our sample in order for it to be of equal utility as a comparable certain path. The typical estimate in the literature is below 1 percent. Some studies, such as Storesletten, Telmer, and Yaron (2001) and Krusell and Smith (1999), find effects comparable to ours for households with no wealth.

Figure 2, panel C, and column 1 of Table 2 show that, according to our data, graduates entering the labor market during times of high unemployment are more likely to begin work at lower quality employers, measured in terms of average log firm size, log total payroll, and log median wage over the course of the panel.[23] Figure 2 also shows that after an initial down ranking, firm quality improves quickly in the first three to five years that a worker spends in the labor market when job mobility is higher than average. As the effect of initial unemployment on job mobility declines (panel B of Figure 2), improvements in firm quality slow down visibly (panel C). Reversion in firm quality continues, but at a reduced rate. According to these results, the catch-up process appears to occur in two phases. In the first phase of catch-up, workers experience rapid improvements in the quality of their employers through job mobility. This phase lasts four to five years. Improvement in employer quality is largely absent in the second phase, where reversion appears to occur within firms.

Figure 4 and the remaining columns of Table 2 highlight important differences in catch-up for workers with different skill levels. High-skilled workers experience large, temporary increases in rates of job mobility and completely close the gap in employer quality within four years. Medium-skilled workers experience above-average job mobility and increases in firm quality within the first four years, too, but they do not fully close the gap. College graduates at the bottom of the skill distribution experience only small increases in job mobility and improvement in firm quality in the years after graduation, and they are permanently downgraded to lower-paying employers and sectors. For these workers, any catch-up that occurs appears to happen within firms, but does not fully close the gap.

Sensitivity.—As in our analysis of earnings effects, all of our firm mobility results are robust to a range of specification checks. For example, the results hold when we use national instead of provincial unemployment variation (see table D4 for job mobility and table E2 for firm quality in the supplementary appendix in Oreopoulos, von Wachter, and Heisz 2008). We also find similar results after including concurrent unemployment rates in the present province of residence. Controlling for persistent unemployment generates larger estimated effects for unemployment conditions at labor market entry. This is because higher unemployment rates tend to reduce job mobility among more experienced workers (e.g., Shimer 2005 and Appendix VIII in the supplementary appendix in Oreopoulos, von Wachter, and Heisz 2008). This exercise shows that job mobility and firm quality of labor market entrants respond more strongly to conditions in the labor market than do the job mobility and firm quality of workers already in the labor market. It also confirms our conclusion in Section IIIA that labor market entrants have exceptional responses to labor market conditions.

In Table 2, we also report how unemployment conditions affect workers' propensity to switch industries. In addition to job shopping, workers may actively search

[23] High-wage sectors have more pro-cyclical employment (e.g., McLaughlin and Bils 2001), and we find a corresponding pattern for firms. Typical high-wage and pro-cyclical industries are durable goods manufacturing and construction. Typical low-wage, less pro-cyclical sectors are retail trade and personal services. At the firm level, the patterns may arise due to changes in demand for products of different quality, differences in the costs of job creation, or because of changes in product market competition.

for a match with the "right" industry (see, for example, McCall 1990 and Neal 1995). We discovered a similar pattern of cyclical downgrading toward low-wage industries as the one we found for low-wage firms (see table E3 in the supplementary appendix in Oreopoulos, von Wachter, and Heisz 2008), but we also found that downgrading occurs within industries. Finally, as observed in the United States by Topel and Ward (1992), on average, job mobility in Canada during the first ten years of workers' careers substantially contributes to wage growth. This positive association of job changes and wage changes strengthens for workers graduating during a recession, further suggesting that job mobility plays an important role in the recovery process (Table D5 in the supplementary appendix in Oreopoulos, von Wachter, and Heisz 2008).

What's Behind the Catch-Up Process?—Our analysis of channels has suggested that initial down ranking to low-wage employers and gradual improvements in firm quality play key roles in explaining persistent earnings effects in our data. To obtain a sense of the potential magnitude of the role of job mobility, we calibrated the magnitude of the effects of job change or improvements in firm quality based on the average wage gain at job mobility. We find that 40–50 percent of recovery after initial earnings losses could be explained by productive job mobility (appendix VII in the supplementary appendix in Oreopoulos, von Wachter, and Heisz 2008). To directly assess the magnitude of alternative channels underlying the catch-up process, we added controls for a cohort's average firm quality and current and lagged regional unemployment rates to our cell-level regression of average log annual earnings. Since career outcomes after graduation are potentially correlated with unobserved individual characteristics, such a regression is not meaningful at the worker level. However, due to our finding that recessions do not appear to affect the timing of graduation or labor force participation in our data, there is no selection at the cell level. Thus, the inclusion of cell-level variables allows decomposing the persistent effect of the initial unemployment rate on earnings into the part explained by differences and changes in firm quality, the part explained by persistent effects of unemployment rates and what is explained by other factors. Effectively, we add average outcome variables at the level of cells defined by graduation cohort, initial province, and experience year to versions of the regression model in equation (2).

Figure 6 shows the effect on earnings of initial unemployment rates in years 0 to 1 in the labor market (these are simply estimates of equation (2) without any controls for unemployment rate histories as in Figure 3). The second line from the bottom shows the remaining effect of initial unemployment rates after we conditioned for average employer quality in a given cell. The figure suggests that an important part of the earnings difference (about 40–50 percent) could be explained by reductions in firm quality. As predicted by a model of job search with age-related mobility costs, differences in firm quality matter especially during the first years after entry into the labor market.

We then added the *current* unemployment rate to the model, interacted with labor market experience to allow for persistent effects (thus, these are estimates of $\beta_{e,01}$ for a version of equation (2), where we added the average mean firm earnings of the

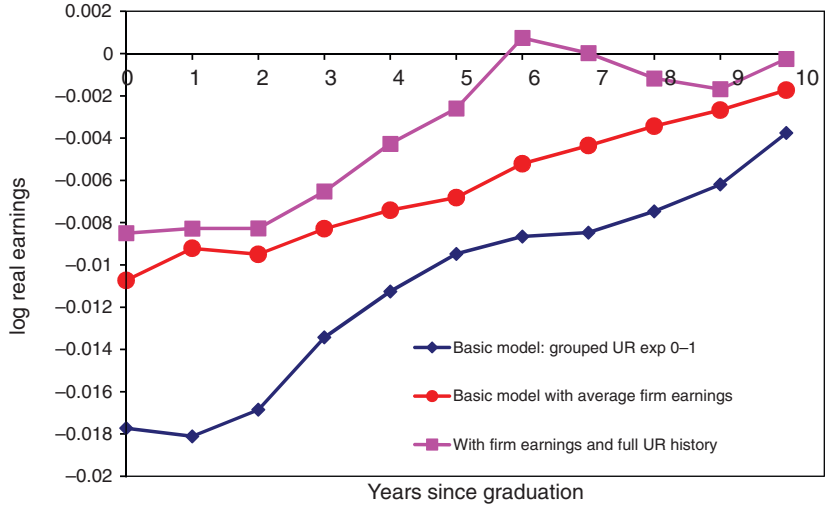

FIGURE 6. THE ROLE OF LABOR MARKET CONDITIONS AND FIRM CHARACTERISTICS IN EXPLAINING PERSISTENCE IN THE EFFECT OF UNEMPLOYMENT RATES IN THE YEAR OF COLLEGE GRADUATION ON ANNUAL EARNINGS

Notes: The figures show coefficients from regressing annual earnings on the average of regional unemployment rates (UR) in experience years 0 and 1 at the end of college completion interacted with experience dummies, controlling for effects for cohort of graduation, experience (years since graduation), and region of first residence ("Basic Model"). The circled line adds as a regressor average firm earnings at the cell-level to this model (where as discussed in the text cells are defined by graduation year, region of first residence, and year of experience). In addition, the squared line adds controls for the dynamic effects of the continuing history of unemployment rates as shown in equation (2) in the text. Since we only observe full labor market histories for cohorts graduating in 1982 onward, this figure is restricted to this set of cohorts.

current employer at the cell level). Once we added persistent effects of further labor market conditions, the long-term effect of initial unemployment faded completely by the sixth year in the labor market. Thus, temporary reductions in firm quality *plus* continuing exposure to adverse labor market conditions correlated with the effect at entry explain a large fraction of the earnings losses we find.

Discussion.—The available evidence suggests that mobility toward better employers is an important channel through which catch-up after an adverse initial start occurs. Differences in job mobility can also explain the heterogeneity in responses of earnings and firm quality that we discovered. This has implications for our understanding of the role of job mobility in workers' careers and in the labor market's adjustment to cyclical shocks. Overall, the results support an environment in which heterogeneous workers gradually search for jobs at better firms, but in which recovery is slowed due to accumulation of specific capital and increases in the cost of mobility as workers age. An important feature of the model we summarized in Section I is that these adjustment processes may differ by workers' skill level. Given realistic assumptions about comparative advantage, low-skilled workers are more likely to be affected by time-increasing mobility costs and to be persistently downranked to lower-paying firms. As a result, low-skilled workers are more likely

to experience permanent effects from initial labor market conditions. A key insight of the search model we outlined in Section I is that effects of initial unemployment rates lead to *permanent* earnings differences only if coupled with search frictions that intensify with age. Without a distinction between "newly minted," flexible workers, and workers settling down, nothing would prevent workers to keep seeking better jobs once they have entered the labor market.

While a model based on search frictions yields a parsimonious explanation of the findings, as discussed in Section I, other modeling approaches combining differential job mobility and persistence by skill levels could yield similar predictions. For example, a neoclassical model of gradual sorting, in which employers learn about workers' ability at differential speeds (Gibbons et al. 2005) and provide different degrees of training (Gibbons and Waldman 2006) may explain some of the patterns we found. In either case, one key mechanism underlying our findings is likely to be the interaction between age- and skill-related incentives to job mobility. It is beyond the scope of this article to test between these models. Instead, in the remainder of this section, we will summarize two additional empirical results that are consistent with search-related frictions playing a role in the recovery process.

Our longitudinal worker-firm-college dataset allows us to make a direct assessment of the long-term effect of a worker's very first job by including fixed effects for his first employer interacted with experience dummies in an individual-level version of our regression model. To do so, we were able to re-estimate equation (1) without first collapsing our data to the cell level (only the dependent variable changes and, besides the firm-experience year effects, all other regressors are as stated in equation (1)). Note that if high-wage firms attract workers of higher ability during recessions, the result will tend to be an overestimation of the role of the initial employer. Consistent with the findings in Figure 6, the result suggests that about half of the earnings loss can be explained by the first employer alone (see Table 1, panel B, column 3; and Figure 7 of Oreopoulos, von Wachter and Heisz (2008)). This finding confirms that first job placement plays an important role in explaining the long-term consequences of graduating in a poor labor market. It appears less consistent with models of employer learning unless (contrary to the assumptions of the learning model) first placement correlates strongly with worker ability.

Again using an individual-level version of our main regression equation, we also found that the rate of catch-up slowed for workers whose first employer paid high average wages (Table 1, panel B, columns 4–7; and Figure 7 of Oreopoulos, von Wachter and Heisz (2008)). This is consistent with the search model we outlined, according to which the nature of catch-up changes once workers enter high-productivity firms, and is from thereon driven by accumulation of specific skills. Given the large differences in average employer quality on the one hand and moderate consensus estimates of the returns to tenure on the other hand, it is not surprising that this second phase is slower.[24] Such a pattern is more difficult to rationalize in the context

[24] Even if workers continue to search, once they are employed by a large firm, they are less likely to obtain a better job match. Again, the probability of starting to work at a high-quality firm may be correlated with workers' ability, and the degree of selectivity might be affected by early unemployment rates. To address this problem, we have included control functions in the fraction of workers starting to work at high-quality firms. Similarly, we have included average father's income as a control function. Neither strategy affects our results (results available

of a model of employer learning, where wages depend on workers' expected skills, not their employers, or in a model of skill accumulation, unless higher-paying firms also have fewer opportunities for skill accumulation and hence wage growth.

V. Conclusion

We have estimated the long-term effects of entering the labor market in a recession for a large sample of Canadian men leaving college whose earnings, employers, and career outcomes were tracked for ten years. Using an unusually large number of cohorts, we discovered that the average worker graduating from college in a recession faces earnings losses that are very persistent but not permanent. A key contribution of this article is to document the fact that the average estimates mask complex patterns in the timing and heterogeneity of the effects from early labor market conditions. Controlling for unemployment rate conditions after the first year of labor market entry, we conclude that an important part of the wage deficit can be attributed to the unemployment rate variation in the very first year after leaving school. We have also found that the effects of recession shocks are strongest for young workers, while workers with a couple of years of labor market experience are less affected. In addition, we have found that college graduates at the bottom of the wage and ability distribution have larger and more persistent losses, while the effects at the top are small and short lived. Our estimates of how the path of earnings declines suggest that the present discounted value of losses in annual earnings could be three to four times larger for the least advantaged as compared to the most advantaged workers – indicating that even within the group of college graduates, there is a large degree of heterogeneity in the costs of recessions.

Another key contribution of this study is its analysis of the mechanisms behind these persistent and heterogeneous effects of short-term labor market shocks. We find that recessions initially lead workers to start to work at less attractive employers. An important part of earnings catch-up occurs by means of workers moving to higher paying firms, especially during the first years after the shock. These patterns are much more pronounced for more advantaged college graduates. Less advantaged graduates recover at much slower speeds, if they recover at all, from the initial downgrading to lower paying employers. The patterns are also much more pronounced for labor market entrants than for workers with two or three years of labor market experience.

Our results provide direct evidence that short-term shocks can lead to cyclical downgrading with an ensuing gradual process of reallocation through job mobility. Our approach based on exogenous variation in labor market conditions has allowed us to explicitly quantify the contribution of job mobility to individual wage growth —an important channel in many micro and macro models of the labor market. We have also shown that the adjustment process can take a long time, that it differs by

upon request). Since young workers' earnings may not be entirely a function of their ability (due, for example, to the presence of employer learning), including worker fixed effects is not be the ideal strategy for dealing with this problem.

college background, and that some workers never recover, a challenge for typical models of career progression.

We have argued that a job search model with frictions that vary with skill as well as age would have the capacity to capture the main patterns in our data, including the high degree of persistence. However, other relevant mechanisms could explain part of the catch-up process—including gradual reallocation through employer learning (e.g., Gibbons et al. 2005). We have also emphasized a potential role of recovery on the job due to contracting (e.g., Beaudry and DiNardo 1991) or job assignment (e.g., Gibbons and Waldman 2006). We leave an explicit test between different models to future work. Finally, we should emphasize that by focusing on male college graduates, we have left out other workers, such as high school graduates and women, that could be important in determining the overall response of labor market entrants to cyclical shocks.

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Supplementary Appendix

"**The Short- and Long-Term Career Effects of Graduating in a Recession"**

Philip Oreopoulos, Till von Wachter, and Andrew Heisz

Spring 2011

Contents

Appendix I: Data and Sample

Our data combines three administrative datasets from Statistics Canada. The first is the University Student Information System (USIS), which includes enrollment and graduate information of post-secondary students in Canada from 1974 to 1997. We augment the USIS data by linking it to income data from the T1 Family File (T1FF) between 1982 and 1999, and to an employer-employee matched dataset called the Longitudinal Employment Analysis Program database (LEAP). Each is described below, followed by how we defined the variables used in our analysis.

USIS is a national database containing pertinent up-to-date information on student participation in and graduation from Canadian degree granting institutions obtained from administrative records provided at the individual level. USIS has two main components. The *enrolment* survey collects information on student counts, and requests information on a broad array of student and program characteristics including institution, province, gender, age, mother tongue, immigration status, country of citizenship and country of origin, full- or part-time status, type of qualification sought (e.g., bachelor, masters, etc., or none), field of study, year of study in program and an individual identifier. The *degrees* survey collects information on all students who have received a degree, diploma or certificate during the calendar year. The degrees survey has a more limited number of data elements than the enrolment survey. These datasets have been merged by the Education, Culture and Tourism Division of Statistics Canada, creating a third file commonly referred to as the *linkage* file. We use the linkage file in this analysis.

The information is obtained from the administrative records of Canadian degree-granting institutions, generally in an individual record format. Approximately 70 percent of post-secondary institutions provided regular annual individual information, including student identifiers that allow matching to the other two administrative datasets. We therefore focus on students from these institutions.[1] All information in the USIS is checked for validity edited by the universities and, in some cases, by the province and by Statistics Canada.

The enrolment survey collects information on student counts as of December 1st in all provinces except Ontario, where the reference date is November 1st. This means that each student who attends university in the fall session is counted only once annually, even though the student may be enrolled in more than one program. This student count is used as a proxy for the total number of students enrolled during a complete academic year.

The degrees survey collects information on all students who have received a degree, diploma or certificate during the calendar year ending in December. It is a count of the number of degrees, diplomas and certificates awarded, not the number of individual students who receive them.

From the enrolment data, we keep all males that began a full-time undergraduate program at a post-secondary school institution between the ages of 17 and 20. We note students' graduation date, or last year enrolled full time (plus one since enrolment was recorded as of December 1). Experience is defined as number of years since graduation or number of years since ending full-time post-secondary education. We examine earnings starting when experience equals zero, since students are likely to have worked for 7 months since graduation. We remove any student taking longer than 8 years to complete an undergraduate degree (dropping less than 1 percent of the sample). We also calculate predicted graduation year based on entry year plus four.

The enrolment data includes information on home province. If missing, home province was assumed to be the province of the institution the student began their program. After finding that national and regional unemployment rates at time of graduation were not correlated with obtaining a subsequent degree, we focus on students that obtain no more than one degree.

The post-secondary students we examine from the USIS are matched to the T1FF using the student identifier. The T1FF is a data set of individual tax records from 1982 to 1999. The T1FF includes information on earnings, defined as the sum of taxable earnings from employment and self-employment. The dataset also contains information on transfers, as well as age, gender, residential address and an identification number for the firm at which the individual is employed. Some students (fewer than 15 percent of the sample) were not matched, mostly due to missing identifiers. Missing ID may be because (1) the

[1] For more on the USIS and the match to the T1FF, see Heisz (2001) and Heisz (2003).

student did not have an ID code (perhaps because he or she was a foreign student), (2) the student had an ID code, but either did not give it to the institution or the institution did not request it, or (3) the institution collected the ID code but did not report it on the USIS survey. To remove individuals that have left the country, we drop any student that does not file in the last two years of the T1FF data.

Our baseline sample compares well with Census data for the same underlying population. Supplementary Figure A2 of our Supplementary Appendix, for example, shows mean earnings profiles generated from a 1995 cross section of our baseline data with analogous profiles generated from the 1996 Canadian Census (that surveys 1995 annual earnings) of college graduate males. Predicted differences over potential experience are highly similar.

The cross-section outcome variables we examine include whether a student receives a degree, and years in post-secondary school. The annual outcome variables we focus on are log earnings, dummy variables for not filing taxes, zero earnings, and living in different province than initial province.

Individuals working in the USIS-T1FF are also matched annually to information about their firms from Statistics Canada's Longitudinal Employment Analysis Program database (LEAP), beginning in 1983. The match rate was 96 percent.[2] LEAP is a company-level database that includes all employers in Canada, both corporate and unincorporated. The database tracks the employment and payroll characteristics of individual firms from their year of entry to their year of exit.[3] Employers in Canada are required to register a payroll deduction account and issue a T4 slip to each employee that summarizes earnings received in a given fiscal year. The LEAP database includes every business that issues a T4 taxation slip.

The LEAP includes a 3-digit industry code and information on annual firm size and total payroll amounts. We recorded average firm size, and total firm size between 1982 and 1999, and also subtracted the mean amounts for each year before averaging. Both methods produced similar results.[4] We also recorded when individuals switched firms and industries.

The data are collapsed into cell means by home province, year left post-secondary education, predicted year left post-secondary education, and experience. Supplementary Appendix Table A3, Panel A and B show sample sizes of the two-way match by graduation and experience year for graduation cohorts from 1977 to 1995 (including and excluding observations with missing earnings). Since graduation year 1994 is an outlier both in terms of sample size and the level of average earnings, in Figure 1 it is omitted. Since the earnings difference is stable across experience years, in the regressions cohort-effects absorb for the difference.

The cell means are matched to national and provincial unemployment rates both at time of school exit and predicted school exit. We use Statistics Canada's youth unemployment rate (ages 16 to 25). Results with the full unemployment rate were similar.

We work with two samples – the two-way student-earnings match, and the three-way match that also includes firm variables. The main results are obtained on the former, but estimates differ little between the two samples. To maximize the range of cohorts with as much as possible experience history we focus on the full range of graduation cohorts that we can match to unemployment rates at time of labor market entry (1976-1995). In the empirical analysis, we also report alternative results with subsets of cohorts.

Appendix II: Accounting for Selective College Graduation

The decision to leave college may be a function of the business cycle.[5] If workers postpone college exit in recessions, we would expect that the unemployment rate in the year of *predicted graduation* is positively related

[2] In the case of multiple employers, the main employer is the one from which a worker has the most earnings. In defining our mobility measures, we have taken particular care with missing values for firm identifiers and industry codes. To address the problem of missing values, we first fill in single missing values with the adjacent past firm identifier or industry code. We then estimate a conservative and a more inclusive measure of mobility. The first only considers changes between two valid firm identifiers or industry codes. The second treats remaining missing values as a job or industry change. The two measures approximate upper and lower bounds of job mobility.

[3] The self-employed that do not draw a salary are not included on the LEAP database. In addition, businesses comprised solely of individuals or partnerships who do not draw a salary are also excluded from the LEAP.

[4] The USIS industry code is documented in Statistics Canada's USIS user guide, 1995.

[5] College enrollment decisions also depend on the state of the local labor market. However, the effects appear to be small in the U.S. since the 1960s (e.g., the fraction of men age 19 to 21 in college is not affected by the unemployment

to college duration. Similarly, since workers with shorter durations are more likely to be able to further postpone graduation labor market entrants in a recession are more likely to have longer durations. Appendix Table H3 shows the effects on various basic measures of college duration of the national and regional unemployment rates, as well as of predicted regional rates, separately for all workers and for those at least on grade. We see no significant correlations at the national level or for regional unemployment at the time when workers should have graduated were they on grade. However, we see some significant effect of early unemployment rates at actual graduation with duration. For a five percent change in unemployment rates, this would imply an increase of 2.5 percentage points (10% relative to the 0.26 average shown in Appendix Table A1).

Panels D to F of Appendix Table H3 show the same specifications for those workers on or above grade (see also Appendix Tables H1 and H2 for more detail). The effects are somewhat smaller. A five point shock to unemployment implies a 0.05 increase in average years of college (corresponding to three weeks or 1.4% relative to a mean of 4.11 years). These results suggest that a very small fraction of workers who are barely on or above grade tend to extend their stay in college by one or two years.[6] The fact that unemployment at predicted graduation matters less suggests this is driven primarily by workers who are already beyond grade. Consistently, the fact that the results are even weaker for the full sample and the fact that being on or above grade is not affected indicates that students overall do not make significant attempts to avoid leaving school in a recession by delaying graduation or enrolling in a new program.[7]

To directly address endogenous college exit we instrument unemployment in the actual year of exit with unemployment in the predicted year of exit based on official degree duration. Predicted year of exit is a valid instrument for actual year if college entry is uncorrelated with unemployment rates in the year of predicted exit, if it has no direct effect beyond the actual unemployment rate, and if it correlates with unemployment at actual exit. We believe the exclusion restrictions are valid, since even if students wanted, given the covariance structure of unemployment rates it would be hard for them to forecast future unemployment rates. The case could be made that the unemployment rate at predicted graduation could in itself be viewed as the relevant 'shock' to workers' careers. Thus, we present and discuss both reduced form and instrumental variable (IV) estimates.

The first two columns of Appendix Table H4 present the reduced form estimates of the interactions of potential labor market experience for the same specifications as in Table 1 (OLS). Columns 3 and 4 show the IV results and the coefficients on the instrument from the corresponding first stage. The reduced form estimates are either equal (all workers) or slightly smaller (graduates) than the corresponding OLS estimates. The numbers in Appendix Table H3 imply that delayed entry is unlikely to affect the estimates of the catch-up pattern in the reduced form. The first stage coefficient is highly significantly different from zero and

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rate for mature workers, see Card and Lemieux (2000) Table 4, nor is the proportion of workers who finish 12th grade and start college (Table 5). The unemployment rate at age 17 does not affect the probability of having a college degree, but raises the fraction of workers with some college (Table6)). Note that if unemployment triggers entry into college of workers with particular unobserved characteristics, this could affect our instrumental variable strategy even if workers are not forward looking due to correlation of the unemployment rate at entry and at exit. However, as shown in the next section, most of the correlation of unemployment rates fades after three years.

[6] Additional results in Appendix Tables H suggest that for this sample the probability of being above grade 1-3 years is raised marginally. Taking the results from Panel F, if 0.85% of workers stay longer and raise average college duration by 0.0056 years, the average additional time spent in college must be more than one year.

[7] Note that as pointed out in Section 2, the propensity of obtaining a graduate degree is also not affected by the unemployment rate in the year of the first exit from college (a 5 point unemployment shock leads to an increase in the probability to obtaining a post graduate degree of 0.008, relative to a mean of 0.2, with the lowest p-value of 0.157 in the regional sample for all workers). Post-graduate degrees are specially concentrated in the health professions, social sciences, and other majors (25-30% of all graduates obtain a graduate degree) and less concentrated in business, engineering, and teaching (8-12% obtain a graduate degree). Our sample restriction tends to more heavily exclude health profession and the social sciences than economics and engineering. To assess whether for some of these subjects the propensity to obtain a higher degree responds more strongly to unemployment at time of graduation, we ran the regressions by major. Social sciences is the only major experiencing consistent increases in the fraction of post-grad degrees during recessions, while health professions experiences consistent declines. All other majors show no clear patterns.

different from one. The ensuing IV results are either the same as OLS (for those on/above grade), or slightly more negative and more persistent (for all workers). All IV coefficient estimates are well within the confidence intervals for OLS results.[8] Since the general effects of unemployment rates on labor market entry are quite small, it would have been surprising to find much of a difference. We conclude that OLS is appropriate to analyze the effects of early labor market conditions on the long-term career outcomes of Canadian college graduates.

Appendix III: Accounting for Labor Market History

All estimates presented so far represent summary effects of the dynamic impact of the initial unemployment rate plus the dynamic effects of ensuing unemployment rates that correlate with the first. They characterize the expected earnings loss of a worker graduating in a recession and help to assess the implications of different models of career determination. Another estimate of interest is the long-term impact of an isolated temporary shock of labor market conditions for individuals entering the full-time labor market for the first time, holding all else constant. This effect can also be compared to similar shocks at later experience years to benchmark whether initial shocks, when virtually all labor market entrants must search for employment, generate different permanent and transitory effects than subsequent shocks.

Since the current province of residence is available from income tax records, we can use our data to construct unemployment rate histories for each individual starting in 1982. We interact these histories with unrestricted experience dummies and include them into the basic model as additional control variables to isolate the effect of the unemployment rate at time of college exit. Since we only have complete data for 'market history' of individuals graduated starting in 1982, we focus on this restricted group of cohorts.[9] Although shocks are highly persistent initially, the auto-covariance structure dips to zero after three to four years.[10] Thus, the inclusion of two to three lags should suffice to absorb most of omitted variable bias.

Table 2 shows a series of models with augmented controls for unemployment history, each interacted with experience. The table shows the basic regional model with the graduate sample for two models with outcomes recorded between 1982 and 1995. To compare similarly defined unemployment shocks, all models include current province fixed effects.[11] The first model includes the unemployment rate at the current experience year interacted with experience dummies, without additional labor market history. As expected, this has some small initial effects for experience years one to three, but little thereafter. Given that each of these unemployment rates has itself a potentially dynamic effect, the next models include interactions of these unemployment rates with experience dummies.

The first model, shown in Column 3 of Table 2 only includes dynamic effects of unemployment rates occurring in experience years one to three. The result shows an increasing spread in the two estimates that flattens out after experience year 5, exactly as predicted by a simple omitted variable bias calculation.[12] At each experience year the worker is exposed to additional shocks correlated with the initial shock that in itself have dynamic effects, leading to an increasing bias; as the effects of shocks decline for mature workers (as shown in Table 6 of Oreopoulos et al. 2006) and the correlation with unemployment fades or becomes

[8] Note that Hausman tests cannot be read off the tables since standard are clustered at either graduation cohort or graduation cohort-initial province level. Although we could implement a test based on Davidson and McKinnon's (1989) approach, we believe that the differences so small that it would not reverse our conclusions.

[9] As shown in Figure 4, this group of cohorts has slightly more persistent effects of initial labor market conditions. We have also experimented with including cohorts with incomplete unemployment histories. We also included unemployment histories based on unemployment rates for all workers, with no differences in the results.

[10] If as commonly done we specify the time series process of the unemployment rate as an AR(2), the coefficients are 0.87 and -.158 for the first and second lag, respectively, in a sample pooling all states and including year and state fixed effects (a procedure followed by Blanchard and Katz 1992). Figures of the auto-covariance structure and further discussion are available in Appendix Figures B.

[11] As shown in Appendix Figure C1, Panel D and discussed in Section 4, this has little bearing on our original results.

[12] With the notation of Equation (4) the omitted variable bias of the coefficients on the first unemployment rates is

$$p\lim \hat{\beta}_{e,0} = \beta_{e,0} + \sum_{d=1}^{e} \beta_{e-d,d} \frac{\mathrm{cov}(UR_{rv0}, UR_{r_d d})}{\mathrm{var}(UR_{rv0})}.$$

slightly negative, the size of the gap stabilizes. Towards experience year eight the estimates become imprecise as the number of cohorts decline. The next model in Column 4 includes the entire interacted history for each experience year from one to ten. As predicted, the model is extremely similar to the one in Column 3 (however, the joint hypothesis that all additional coefficients or that all dynamic effects at higher experience years are jointly equal to zero is rejected by an F-test). Overall, the effect of the unemployment rate a worker faces in the year of college entry has a long term effect even when controlling for unrestricted dynamic effects of each single unemployment shock experience afterwards.

Since the estimates at later experience become imprecise, we now turn to a grouped model. We restrict the dynamic effects to be equal in two-year intervals (i.e., the effects of the unemployment rate at experience years 0-1, 2-3, 4-5, etc., is constrained to be equal). To keep the size of the coefficients comparable to that of the main model, we take the averages of unemployment rates within groups (the results are the same if we were to compare coefficients at two standard deviations of the respective regressors). The fully interacted model with grouped unemployment rates then is

$$\log \overline{w}_{crt} = \phi_t + \theta_r + \chi_c + \gamma_e + \beta_{e,0}(UR_{cr0} + UR_{r_1}1)/2 + \beta_{e,1}(UR_{r_2}2 + UR_{r_3}3)/2 + ... + u_{crt}\,.$$

Our data does not allow us to estimate the dynamic effects of unemployment shocks at experience years greater than three with a sufficient degree of precision due to a declining number of cohorts.[13] Thus, we present dynamic estimates for groups 0-1 and 2-3, and include additional dynamic interactions as controls for omitted variable bias. The dynamic effect at experience year 2-3 will help us to give a benchmark for the size of the impact of initial labor market conditions.

The effect of a single shock at experience zero and the effect of the average unemployment in experience years zero and one are very similar. The last columns of Table 2 then show the model with fully interacted controls for grouped unemployment history. The coefficient estimates are graphed in Figure 5 (Panel A). The effect of omitted variable bias is again as predicted. Moreover, now the estimated effects are smooth and show a similar convergence pattern as before.[14]

Appendix IV: The Role of Regional Mobility

In our NBER Working Paper (Oreopoulos et al. 2006) we compare the effect of initial unemployment rates on the gains from regional mobility by experience (columns 6 and 7 of Table 5).[15] Interestingly, while regional movers gain more if affected by an early recession initially, these gains fade after experience year three. It is those who stay in the region or residence who have consistently higher earnings growth. Thus, while regional mobility may still be as beneficial in booms as in recessions, it appears regional movers do not have permanently higher rates of catch up than regional stayers. That gains at regional mobility are not as exceptional as gains at job or industry moves also results from the fact that average earnings growth for region movers and stayers is quite similar, as shown in the last columns of Panel A, Table 5 (Oreopoulos et al. 2006). This is also shown in Figure D3 in the Supplementary Appendix, which shows that the effect of graduating in a tight labor market fades faster for those moving province, but that the main results are driven by those staying in the same province.

It appears that regional mobility is not as important in Canada as in the U.S. (Wozniak 2006). To further explore whether the higher job mobility for workers entering the job market in recessions is associated with higher mobility across provinces, the last columns of Table 3 shows the effects of the unemployment rate at college exit on subsequent provincial mobility. The national unemployment rate is uncorrelated with moving to other provinces for both the full sample and graduate sample in Columns 5 to 6 respectively. The results here suggest no inter-provincial mobility response from worsening in overall economic conditions. For the

[13] Thus, dynamic estimates for unemployment shocks at higher experience years pick up the behavior of a limited number of cohorts. While interesting in its own right, the analysis of single cohorts is left to a separate study.

[14] If we repeat the exercise with the full set of cohorts (for which we do not have complete history controls) the results are very similar for the grouped model, with complete convergence occurring after six years in the labor market (shown in Appendix Figure B2).

[15] See also Supplementary Appendix Tables D5 and D6.

regression models identifying regional economic shocks, however, we do observe initially increased provincial mobility for cohorts exposed to higher unemployment conditions at time of college exit. For the graduate sample, a 5 percentage point difference in the unemployment rate at entry is associated with about a .75 percentage point difference in the provincial mobility rate in the first two years. This rate is about half that for firm mobility, and drops quickly after the third year.[16] The small effect of unemployment at college exit on provincial mobility suggests that most of the pattern of catch-up in wages over time for individuals that began the labor market in a recession occurs within provinces.

Appendix V: Weeks Worked and Weekly Earnings in the Canadian Census

Since our sample does not contain information on time worked, we also replicated our results with the Canadian Census (Appendix Table C5). We use four years from the Census (1981, 1986, 1991, and 1996). Due to the different nature of the data we have to make assumptions on the timing and province of college graduation. The fact that the main effects on annual earnings are very similar to our results is reassuring. Decomposing the effect of early unemployment rates on annual earnings into the effect on weeks worked and on weekly wages we find that the effect on weeks worked is short lived. The majority of the persistent effects we find is driven by a reduction in weekly earnings. Consistent with the small effects on employment we find our results change little if we restrict our sample to workers with positive earnings in each year (see Table 1). Thus, neither changes in labor market experience nor selective entry or exit from the earnings sample of workers of different abilities affect the main pattern of reversion we see.[17]

Appendix VI: Simulation Exercise

While our model can reconcile important facts in the data, there are several potential channels in the theory to which the data does not speak directly. To assess the potential role of additional mechanisms implied by the model and to see whether they could be reconciled with the data as well, we simulated the model for different values of the basic parameters. We first simulated the model for the case of a stationary environment (i.e., without returns to tenure or age-related costs); second, we introduced different degrees of age-related costs of search. To keep the analysis simple, we work with two groups of workers (high and low skilled). The parameter values are chosen to replicate basic features of our data. The main outcome of interest is the effect of a one-period initial reduction of the hiring rate at good firms (a reduction in p_0).[18]

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[16] After the fifth year out of college, the unemployment rate at time of exit is negatively correlated with provincial mobility. Those induced to move to another province from entering the local labor market during high unemployment appear to be less likely to move thereafter. We also replicated our estimates separately for workers who never switch region and for movers. Those never moving, about three quarters of our sample, behave very similar as the full sample (see Appendix Figure D3).

[17] This is corroborated by the fact that those who permanently stop filing do not appear to be any different from those who remain active (Panel A of Appendix Figure C3). The estimates based on the balanced panel in Figure 5 (Panel C) are by 0.002 smaller in absolute value than our main estimates, a difference that is not statistically significant. Note that, if at all, the figure suggests negative initial selection, possibly consistent with a certain degree of out-migration to the U.S. of high earners. This is consistent with small decline in average predicted earnings with experience in our sample.

[18] The basic parameter values are $\beta = 0.9$, $\lambda = 0.5$, $\alpha = 1.4$, $w_2 = 1$, and $w_1 = 1.4$, where we think of wages as log-wages for this purpose (so high-skilled workers earn 40% than low-skilled workers at firm 1, and firm 1 pays 40% higher wages than firm 2). In addition, we set the fraction of high skilled workers in the economy to 0.4. We let returns to job tenure be 5% in the first four years, 1% in the five following years, and zero thereafter, which is in the middle to high range of what has been estimated in the literature. Age-dependent search costs γ are benchmarked at 1 initially, and are allowed to increase 20% in the first five years after graduation, and 10% for the five following years (30% and 20%, respectively, in the scenario for "steep" rise in costs). These increments loosely follow the observed increase in marriage and home ownership rates among Canadian college graduates observed in the Canadian Census. Note that to avoid needing to model further job mobility, we have set age equal to job tenure at low firm equal to time since exit from college. We then chose alternative values for the initial hiring rate (p_0) and the steady state hiring rate (p). We allow for separate values for high and low skilled workers as described in the text. The values were

The simulation exercise highlights some important insights from the model. First, given that high skilled workers lose more from down grading to the low-wage firm, the fact they appear to do better initially suggests that their hiring rate at good firms falls less in recessions. Second, the large observed discrepancy in the rate of catch-up between high and low skilled workers is unlikely due to differences in search intensity alone; steady state hiring rates at good firms (p) appear to be higher for high skilled workers. Thus, we allow for differential steady state and initial hiring rates by skill-group in our simulations. Third, given differential steady state and initial hiring rates, age-related search costs have a larger effect on low-skilled workers (Appendix Figure J1, Panel B); the effect averages out in part at the mean (Appendix Figure J1, Panel A), but is still present. Fourth, the effect of age-related costs is particularly strong for very low skilled workers; it also increases with the dispersion of firm quality. Thus, the higher the pre-existing inequality in the labor market, the bigger is the persistent rise in inequality due to initial shocks predicted by the model. Fifth, the model implies that the degree of persistence increases with the size of the shock, especially for older and lower-skilled college graduates. This arises because for large initial shocks it is more likely that the slow down in search occurs before the initial effect has dissipated.

These simulations are robust to alternative choices of parameter values. They further underline the ability of the model to make rich predictions regarding the long-term effects of early short-term labor market shocks. In particular, the simulations underscore the importance of interactions of age-related costs with other factors determining search intensity (such as skills), the hiring rate, and the size of the initial shock. Yet, another result apparent from the figure is that the predicted slowdown in the recovery due to age-related costs, although significant, is not as large as in the data. This suggests that other factors may matter as well, such as long-term contracting or on-the-job human capital accumulation.

Appendix VII: The Effect of Firm, Industry, and Regional Mobility on Earnings

Mobility across Firms, Industries, and Regions. Job search is a common explanation for both high wage growth and high job mobility in young workers' careers (e.g., Topel and Ward 1992). Several studies aim at testing the basic elements of job search theory, such as the effect of past wages, tenure, and experience on the probability of job change (e.g., Topel and Ward 1992, Manning 2006, Farber 1994). While most of these studies try to control for unobserved heterogeneity, few exploit external sources of variation to identify the effects of interest. In this section we report estimates of the direct effect of early labor market conditions on the annual propensity of job change.

To gauge the magnitude of the effect initial labor market conditions on job mobility, consider the reductions in job change with labor market experience apparent in Supplementary Appendix Figure A1. Between experience years 2 and 4, the rate of job change for graduates declines by 3 percentage points annually. If this increasing stability reflects improving job matches due to search, a 2 percentage point increase in job mobility is comparable to holding workers back 3 to 4 months in their job search efforts. A similar pattern holds in experience years 5 and 6, where overall mobility declines 2 percentage points, such that a 1 percentage point increase in mobility compares to a loss in job search of about 4-6 months. Thus, entering the labor market in a recession implies that workers lose about 4 months of search effort annually due to a bad initial start.[19]

To what extent does the increased job and industry mobility contribute to the reversion of earnings losses? Clearly, the initial increase and gradual fading of mobility-responses with experience follow similar patterns as the change in the experience-earnings gradient. Mobility is likely endogenous itself, and thus we

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$p^{High} = 0.8,\ p^{Low} = 0.5$ in scenario with a higher steady state hiring rate for low skilled workers ("more offers", and $p^{Low} = 0.4$ for the scenario with a lower hiring rate; the values for the initial hiring rate were $p_0^{High} = 0.65,\ p_0^{Low} = 0.1$ for the "severe" shock and $p_0^{High} = 0.7,\ p_0^{Low} = 0.25$ for the less severe shock, respectively. Note that given the size of the earnings premium and the speed of observed recovery, the baseline and initial hiring rate have to be higher for high skilled workers to match the patter of the data.

[19] The initial increase in job mobility we find is of comparable size as the effect of a 10% reduction in wages found by Topel and Ward (1992), consistent with the magnitude of wage losses we find.

cannot 'condition out' the contribution of mobility on earnings effects of early unemployment rates. To gauge the potential of job and industry mobility to explain the observed earnings pattern, the upper panel of Appendix Table D5 shows the average earnings gain at job and industry changes by experience. Columns 1 through 5 show percentage annual earnings increases for movers and stayers, as well as for the full sample.

The purpose of this descriptive table is to characterize the association of mobility and wage growth without any causal interpretation. Similar to Topel and Ward (1992)'s results, the table documents a strong correlation between job changes and wage growth. On average, wage changes at job changes account for about 40% of overall wage growth in the first five experience years, and thereafter steadily declines to reach about 20% in experience year 10. Despite the differences in samples (their sample included workers of all education levels), these fractions are remarkably similar from what results in Topel and Ward (1992) and Giuliano and von Wachter (2005).

Earnings growth at job and industry mobility is 24% on average, and about double the growth for stayers from experience years 2 to 5, and then 1.5 times thereafter.[20] If one took this as a typical gain associated with a job change, then the estimated 1.5 point increase in job changes due to a 5 point recession shock could explain about 20-25% of the reversion of initial losses. (Appendix Table D5, Panel B, implies that an average increase in the rates of earnings growth for the first experience years due to 5 point initial UR shock is about 1.5-2 points.) Thus, job and industry mobility have the potential to explain an important fraction of the decay of initial job losses. However, the actual effect is likely to be larger since in a search framework the gains for workers starting at lower wages are likely to exceed those of the average.

To take this into account, Appendix Table D6 presents models of the effect of initial unemployment rates on the rate of earnings growth by mover status. Due to selection into mover status, we cannot obtain a causal effect for wage growth of movers and stayers, neither is there a simple decomposition of the effect on total wage growth into the effects on its components. Instead, to complement the results in Panel A, the goal of Panel B is to assess whether the correlation of earnings growth and job mobility strengthens for workers entering the labor market in a recession. Column (1) shows that the effect on changes in earnings for the full sample is of similar magnitude as the corresponding level estimates in Table 1 of the main paper.[21]

Columns 2 and 3 show that the correlation between earnings growth and job mobility rises in recessions. This implies that the average earnings gains shown in Panel A are likely to understate the true gains of those moving jobs in response to a recession. Job movers have persistently higher wage gains than stayers in response to an initial unemployment shock, that is, job movers catch up faster from the initial loss. Columns 4 and 5 suggest that earnings gains at moves across industries are less precisely estimated, but follow a similar pattern. Appendix Table D6 also shows estimated gains from regional mobility. As further discussed in this appendix, while the regional mobility appears conducive to wage growth, most of reversion of the losses from initial labor market shocks appears to take place within regions.

Careers Between Firms. The experience profiles in firm size and firm wages shown in Appendix Figure A1 suggests workers search for better employers over time. This is consistent with a growing literature documenting large difference in firms' wages not explained by worker and firm characteristics (e.g., Abowd, Creecy, Kramarz 2002, Idson and Oi 1999). A similar gradient arises if high wage firms gradually screen for more able workers among labor market entrants, either because of comparative advantage (Gibbons, Katz, Lemieux, Parent 2005) or because they thereby minimize the rents they pay (Lemieux 1998).[22] Adverse labor market conditions may impact these processes and reduce the quality of firms at which workers start their

[20] Experience year one includes transitions from jobs with half a year to jobs with a full year of earnings and thus is overstated. Note that these gains are higher than those found by Topel and Ward (1992) (Table VII), but they look at all workers and at quarterly earnings data.

[21] The effects based on changes are slightly more persistent, partially due to a slight difference in samples as well as due to the implicit control for worker fixed effects in the wage growth model.

[22] This process is reinforced if human capital increases with experience. Fox (2004) suggested that large firms will try to attract older, more experience workers because of span of control considerations. Or if, as in Neal (1998), high ability workers are better at acquiring specific human capital, and large high-wage firms value human capital more, over time more able workers will again transit to high wage firms. Alternatively, workers may start at low paying firms that allow for more general human capital investment on the job and then switch employers (Rosen 1972, Mincer 1974).

careers. Bils and McLaughlin (2001) find that better paying industries have pro-cyclical hiring patterns.[23] Similar pattern are appear to hold for better paying or large firms; for example, this may arise due to changes in demand for products of different quality, differences in the costs of job creation, or because of changes in product market competition. In addition, it has long been speculated that firms raise their hiring standards in recessions (e.g., Hall 1974, Barsky, Solon, and Parker 1994). This would lead to a temporary cyclical downgrading as workers tend to start at low wage firms.

The paper provides evidence of this process. A reduction occurs in initial firm size that fades within four years; for the graduate sample, a 5 percentage point recession reduces firm size by 4-5% in the first years. The average median log wages of a workers' employer falls 3-5% in the first years after entry into a 5 point recession. This effect declines to a 2% reduction in years 5 to 9, and only fades by year 10. Since the effect of average log payroll combines the effects on average size and average median wages, the effects are initially larger (7-10%) than those on median earnings but decline more rapidly over time.

These numbers suggest that about 40% to 50% of the effect of an initial 5 point unemployment shock on wages shown in Table 1 could be explained by reductions in the average wage of an employer. To gain further insight about the economic significance of these results, compare the effects of early recessions on average median firm wages with the experience profiles in firm 'quality' in Appendix Figure A1. The increase in average median firm wages due to experience is 8%, 6%, 4%, 4%, and 2% from year zero to year five (in the graduate sample).[24] If workers search continuously throughout the year, and job search entails a continuous increase in firm size, then the effects of recessions set people back by about half a year in their job search process consistently in each of the first five years in the job market.[25]

It appears that a considerable part of earnings losses from graduating in a recession can be explained by the start of working life in lower paying industries and firms. Over time, affected workers improve their relative position vis-à-vis other more lucky workers by switching to better paying establishments. These moves entail switches across industries and across regions as well, but little losses in the time spent working. Thus, firms appear to play an important role in the determination of early wage growth and in the persistence of early labor market shocks on wages. This is consistent with a pattern of cyclical down- and upgrading of workers between industries and firm-types (e.g., Okun 1973). However, workers do not appear to be confined to their initial employer and can remedy an initial bad draw due to temporary changes in hiring standard in a recession by switching employers as the economy turns back to normal.

Appendix VIII: The Effect of Unemployment on Outcomes for Mature Workers

To explore the difference between labor market entrants and more mature workers further, Appendix Table D7 analyzes the profile in the effect of unemployment rates on wages and other outcomes by five experience groups. To make our estimates comparable with the previous literature, we show effects of the natural logarithm of unemployment rates controlling for current province fixed effects. The upper panel uses the unemployment rate for workers age 15 to 24 and the lower panel considers the effect of unemployment rates for all workers. The first rows of Panel A and B show the effect of unemployment without experience interaction. The elasticities in the first row of Column 1 of the two panels essentially replicate the results typically found in wage-curve estimates. The remaining columns show the effects of unemployment on other outcomes; the remaining rows of the table show separate estimates by experience groups.

The table makes strongly confirms the exceptional role of labor market entrants vis-à-vis mature workers. First, in all estimates there is an important experience gradient in the effect of current unemployment rates. Thus, the pooled estimates in the first row potentially obscure important effects present in the data. Second, the initial effects in early experience years are the strongest across all groups. Unemployment conditions in

[23] Typical high wage and pro-cyclical industries are durable goods manufacturing and construction. Typical low wage, less pro-cyclical sectors are retail trade or personal services.

[24] Relative to the increase in average firm size (-4%, 7%, 4.4%, 1.3%, and 4% in years 1 to 5 for the graduate sample), the effect of initial firm size sets workers back by about a little more than half a year.

[25] Similar results are also obtained for average one, two, and three-digit industry wage premiums, consistent with the fact that high wage industries have more pro-cyclical employment creation. However, changes in average industries wage premiums for labor market entrants can only partially explain decline in average firm wages.

the local labor market matter three to four times as much for labor market entrants than for young workers who already progressed into their career by a few years. Third, the estimated gradient is as expected from results of the previous literature. For example, job to job mobility of mature workers declines in recessions (Shimer 2005), effects on non-employment are small, and average firm size rises for mature workers since smaller plants are more likely to close (Krashinsky 2002). Note that since later experience years pick up some of the persistent effect of the initial shock, the difference between the effect of unemployment at experience years 0-1 and 2-3 or later years is understated. A replication of the table with full dynamic controls yields qualitatively similar results but larger initial differences.

Appendix IX: Alternative Measures of the Differential Cost of Recessions

To characterize the overall cost due to cyclical fluctuations sustained by different groups in the population, we can use our estimates to approximate the present discounted loss of annual earnings arising from actual early recession shocks. This complements existing estimates of the costs of recessions based on the average standard deviation of consumption or earnings process. Most of these estimates are based on Lucas' (1987) original exercise of comparing the present discounted value of utility derived from two consumption streams, one uncertain and one certain. Lucas asked by what proportion consumption has to rise to make workers indifferent between the two paths.[26] Lucas' initial findings of small valuations of uncertainty have been revised in the literature in favor of more nuanced estimates taking into account imperfect capital markets, lack of savings, or concentrated job losses (e.g., Barlevy 2005). We replicate the classic Lucas measure for different groups in the population using the actual changes in the streams of annual earnings we estimate. Since none of these estimates use actual changes in earnings or consumption in response to a recession shock to estimate the cost of recessions or explores the role of heterogeneity in the costs of recessions, our estimates provide a useful complement to the existing literature.

The patterns of earnings losses, job mobility, and recovery by our measure of skill discussed in the main paper are summarized in Appendix Figure G3 (Panel A). By deciles of predicted earnings, the figure shows the fraction of earnings losses that have faded after five years in the labor market, as well as the improvements in firm quality and the fraction of workers that left their first employer. Those deciles with highest rate of job mobility and larges changes in firm quality appear to have faster reversion of earnings. The correlations in the figure lend additional support to the result based on the average in our sample that increasing job mobility and improvements in firm quality are important channels of recovery from an initial recession shock.[27]

The longitudinal data also allows us to obtain a direct measure of the cost of recessions that is a useful complement to measures in the literature based on the standard deviations of earnings. Appendix Figure G3 (Panel B) graphs two summary measures of the present discounted loss due to entry into the labor market in a recession by deciles of the predicted earnings distribution. First, it plots the percentage decline in the present discounted value of annual earnings; second, it shows the fraction increase in annual earnings a worker would require to be indifferent between the noisy earnings path and an alternative, stable path. The

[26] Specifically, Lucas compares the present discounted value (PDV) of utility from two consumption streams; one certain, $\{C_1^*, C_2^*, \ldots\}$, and one uncertain $\{C_1, C_2, \ldots\}$, where $C_t = (1+\varepsilon_t)C_t^*$, and epsilon is a white noise shock with constant variance. He then asks by proportion μ the uncertain stream has to be higher in each period than the certain stream to be of equal PDV utility. Using a constant relative risk aversion (CRRA) utility function with coefficient of relative risk aversion equal to one and estimates of the standard deviation of aggregate consumption, he derives that for the average worker μ is extremely small. More generally, Lucas' calculations suggest that costs of recessions are very small unless risk aversion is extremely high. Lucas' original study has been extended to take into account different form of risk aversion, absence of savings, or unevenly distributed income shocks. To our knowledge, no one has used the effects of actual recessions shocks or considered heterogeneity in workers' underlying earnings capacity.

[27] As Figure 7 (Panel D) shows, the lowest ability workers are an exception and tend to converge by improving labor force attachment relative to similar workers graduating in booms.

latter corresponds conceptually to the original Lucas measure where we have replaced consumption by annual earnings and is comparable to several estimates of costs of recessions in the literature.[28]

Appendix Figure G3 (Panel B) has two key messages. First, there is an important gradient in the cost of recessions in predicted earnings – those individuals with lower earnings capacity have four to five times costs of recessions than the most advantaged workers. The least advantaged appear to bear most of the costs of recessions. Second, the losses from starting to work in a recession as measured by actual changes in the present discounted values of earnings or utility losses are high even for the more able workers. In particular, they are much higher for the median worker in our sample than what is typically found in the literature.[29]

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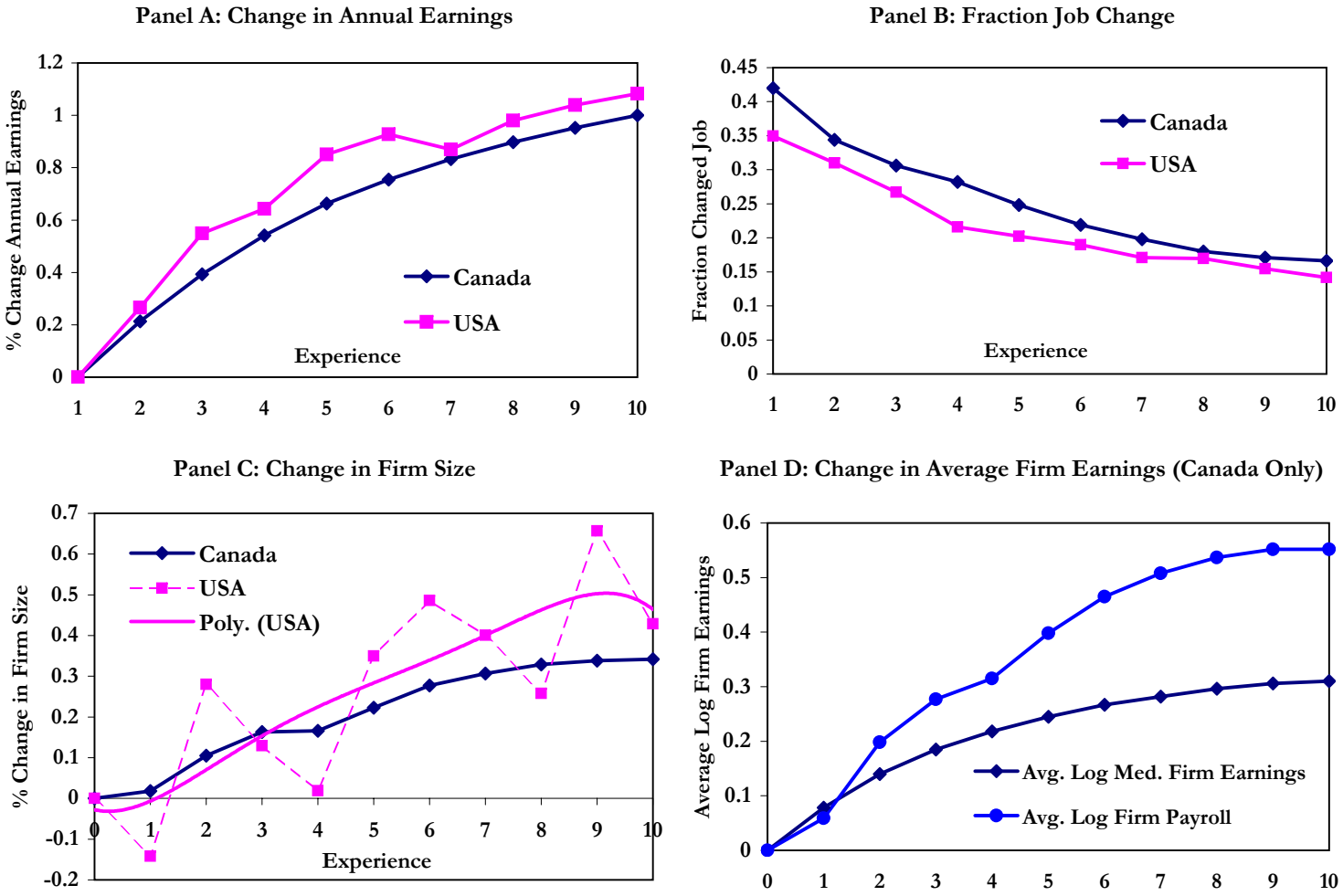
[28] This approximation has clearly important flaws, since social insurance programs smooth temporary earnings shocks and may lead consumption to be less volatile than earnings. On the other hand, this might be less of a concern for highly educated workers whose take up of social programs is low. Here we follow the literature on the costs of recessions by approximating the risk faced by individuals with earnings risk.

[29] We find that an uncertain stream of earnings had to be increased by about 7% for the median worker in our sample to be of equal utility as a comparable certain path. The typical estimate in the literature is below 1%. Some studies, such as Storesletten, Telmer, and Yaron (2001) or Krusell and Smith (1999) find effects comparable to ours for households with no wealth.

Tables and Figures of Supplementary Appendix

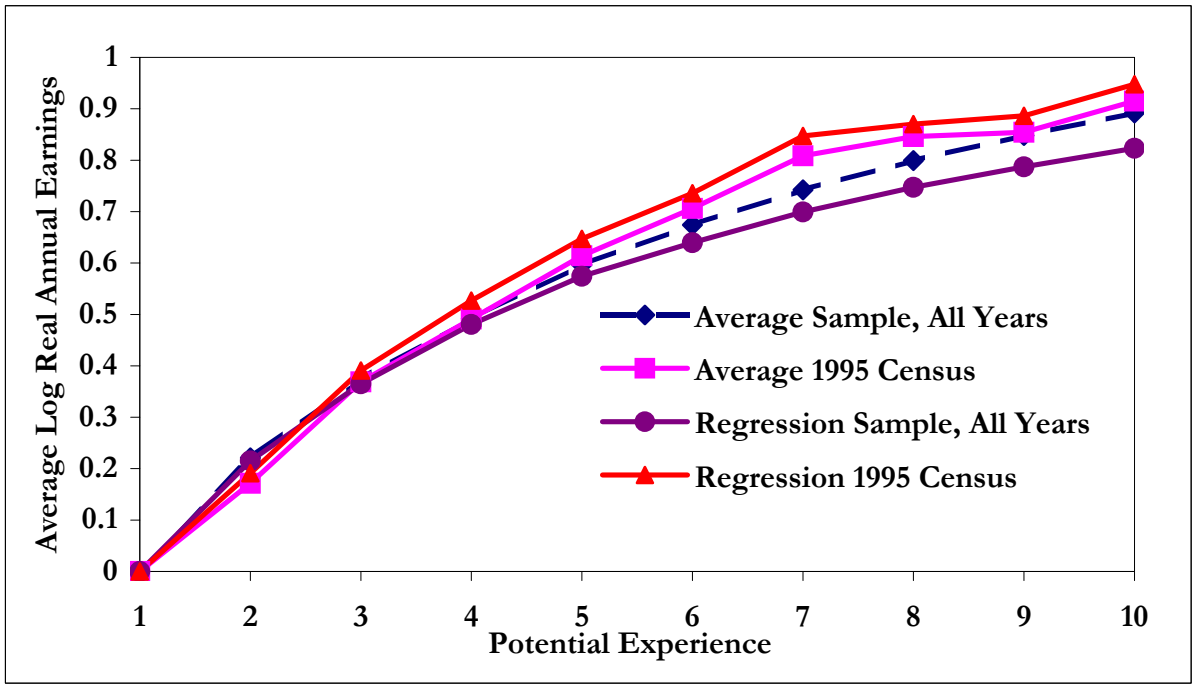
Appendix Figure A1: Experience-Profiles in Earnings, Mobility, and Firm Charachteristics for workers with some college in Canada (Administrative Data) and U.S. (Current Population Survey)



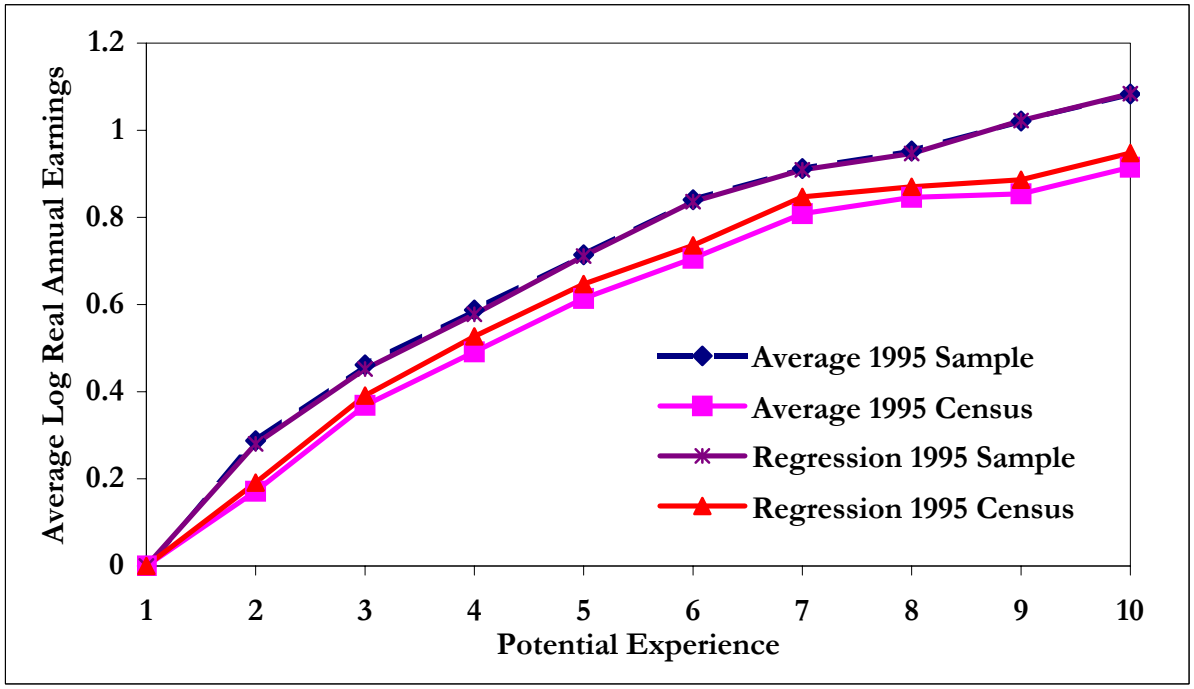
Notes: The figure shows average cross-sectional profiles in potential labor market experience (years since graduation) in Canada and the U.S.; the Canadian figures are derived from the administrative data we use in the paper; the U.S. data are taken from various years of the Current Population Survey (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).

Appendix Figure A2: Compare Census Experience Profile with Sample Profile, with and without Controlling for Region and Years of College (Graduate Sample)

Panel A: All Sample Years



Panel B: Single Year 1995



Notes: Figures compare cumulative growth in annual earnings for male workers with a college degree in the 1996 Census with the earnings data drawn from income tax records matched to administrative university data. Only cohorts graduating from 1976 to 1995 are included. Other restrictions on the administrative data are the same as in the paper. Since the distribution of years of college and regions are different in the two sample, the figures also compare estimates controlling for fixed effects for years of college and region of residence.

Appendix Table A1: Descriptive Statistics from Administrative College Data 1976-1995

Panel A: Duration of College

	Entire Sample (Some College)				Graduates (Actual ≥ Predicted Year)			
	Years Until BA	**In Graduate Sample**	**Fraction Above Grade**	**Predicted-Actual BA Years**	**Years Until BA**	**In Graduate Sample**	**Fraction Above Grade**	**Predicted-Actual BA Years**
At Exp. Zero	3.31	0.63	0.26	-0.10	4.11	0.89	0.40	0.86
	(1.29)	(0.38)	(0.37)	(1.69)	(0.59)	(0.11)	(0.39)	(1.08)
	Fraction D >1	**Fraction D >2**	**Fraction D<-1**	**Fraction D<-2**	**Fraction D >0**	**Fraction D >1**	**Fraction D >2**	--
At Exp. Zero	0.13	0.06	0.23	0.10	0.52	0.20	0.09	--

Panel B: Unemployment Rates Ages 15-24

	Average	Standard Deviation	Maximum	Minimum
National	14.76	2.42	19.2	11.0
Province	14.13	3.98	32.7	6.3
National Detrended	0	2.41	4.53	-3.83
Province Demeaned	0	3.01	6.53	-7.12

Panel C: Provinces	Sample Size		Unemployment Rate	
	N	**Fraction**	**Average**	**Std. Dev.**
Nova Scotia	1,143	0.84	18.99	2.50
PEI	109	0.08	18.91	2.08
Newfoundland	2,535	1.86	27.11	3.51
New Brunswick	7,281	5.33	20.07	2.13
Quebec	10,472	7.66	17.20	2.60
Ontario	71,995	52.69	13.03	3.14
Manitoba	10,308	7.54	12.59	1.81
Saskatchewan	4,557	3.34	11.84	2.26
Alberta	11,742	8.59	11.68	3.08
British Columbia	16,493	12.07	15.93	3.86

Notes: See text and Data Appendix. D=Actual Graduation Year - Graduation Year Based on Program Duration.

Appendix Table A2, Panel A. Sample Size by Graduation Cohort and Experience

Graduation Year	Years Since Graduation											
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
1976							3732	3732	3732	3732	3732	18660
1977						6875	6875	6875	6875	6875	6875	41250
1978					7863	7863	7863	7863	7863	7863	7863	55041
1979				7780	7780	7780	7780	7780	7780	7780	7780	62240
1980			7869	7869	7869	7869	7869	7869	7869	7869	7869	70821
1981		7899	7899	7899	7899	7899	7899	7899	7899	7899	7899	78990
1982	8033	8033	8033	8033	8033	8033	8033	8033	8033	8033	8033	88363
1983	9146	9146	9146	9146	9146	9146	9146	9146	9146	9146	9146	100606
1984	8746	8746	8746	8746	8746	8746	8746	8746	8746	8746	8746	96206
1985	9584	9584	9584	9584	9584	9584	9584	9584	9584	9584	9584	105424
1986	9379	9379	9379	9379	9379	9379	9379	9379	9379	9379	9379	103169
1987	9307	9307	9307	9307	9307	9307	9307	9307	9307	9307	9307	102377
1988	9621	9621	9621	9621	9621	9621	9621	9621	9621	9621	9621	105831
1989	9391	9391	9391	9391	9391	9391	9391	9391	9391	9391	9391	103301
1990	9408	9408	9408	9408	9408	9408	9408	9408	9408	9408		94080
1991	9288	9288	9288	9288	9288	9288	9288	9288	9288			83592
1992	9770	9770	9770	9770	9770	9770	9770	9770				78160
1993	10429	10429	10429	10429	10429	10429	10429					73003
1994	14416	14416	14416	14416	14416	14416						86496
1995	10117	10117	10117	10117	10117							50585
Total	136,635	144,534	152,403	160,183	168,046	164,804	154,120	143,691	133,921	124,633	115,225	

Appendix Table A2, Panel B. Sample with Non-Missing Earnings by Graduation Cohort and Experience

Graduation Year	Years Since Graduation											
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
1976							3416	3364	3387	3367	3429	16963
1977						6320	6263	6322	6227	6303	6233	37668
1978					7284	7199	7199	7073	7173	7050	7168	50146
1979				7119	7058	7088	6934	7026	6937	7032	7097	56291
1980			7226	7134	7208	7073	7139	7041	7135	7194	7138	64288
1981		7166	7115	7160	7069	7097	7004	7102	7139	7131	7096	71079
1982	7083	7204	7274	7170	7214	7131	7209	7287	7218	7201	7288	79279
1983	7863	8144	8130	8249	8201	8221	8284	8221	8214	8221	8351	90099
1984	7723	7796	7896	7763	7858	7906	7876	7774	7835	7895	7899	86221
1985	8422	8637	8561	8637	8689	8672	8599	8616	8689	8693	8742	94957
1986	8443	8456	8512	8557	8524	8440	8457	8475	8476	8560	8571	93471
1987	8308	8428	8453	8375	8318	8311	8364	8383	8453	8473	8672	92538
1988	8790	8776	8717	8661	8670	8658	8668	8746	8773	8854	9029	96342
1989	8621	8530	8451	8433	8460	8411	8440	8557	8666	8785	9391	94745
1990	8532	8454	8427	8421	8445	8452	8532	8658	8742	9408		86071
1991	8325	8300	8294	8302	8392	8410	8510	8632	9288			76453
1992	8650	8707	8737	8806	8814	8895	9044	9770				71423
1993	9284	9389	9410	9371	9462	9650	10429					66995
1994	12756	12863	12941	13160	13376	14416						79512
1995	9149	9152	9291	9403	10117							47112
Total	121949	130002	137435	144721	153159	150350	140367	131047	122352	114167	106104	

Appendix Table A3: Cross-Sectional Experience Profiles in Annual Earnings, Unemployment, Participation, and Job Change, Canada and USA

	Entire Sample (Some College)				Graduates (Actual ≥ Predicted Year)			
Panel A: Average Experience Profile Canada (Income Tax Records, 1982-1999)								
Year of Exp.	**Average Log Earnings**	**Fraction on UI**	**Frac. Not in Labor Force**	**Fraction Changed Firm**	**Average Log Earnings**	**Fraction on UI**	**Frac. Not in Labor Force**	**Fraction Changed Firm**
0	8.83	0.016	0.111	-	8.93	0.020	0.102	-
1	9.30	0.023	0.103	0.42	9.49	0.020	0.094	0.40
2	9.51	0.023	0.100	0.35	9.71	0.020	0.093	0.31
3	9.69	0.021	0.099	0.31	9.87	0.016	0.093	0.28
4	9.84	0.017	0.091	0.28	9.99	0.013	0.085	0.25
5	9.96	0.016	0.090	0.25	10.10	0.012	0.085	0.22
6	10.05	0.015	0.092	0.22	10.18	0.011	0.086	0.20
7	10.13	0.013	0.090	0.20	10.25	0.009	0.084	0.18
8	10.20	0.012	0.089	0.18	10.30	0.008	0.082	0.17
9	10.25	0.011	0.086	0.17	10.36	0.007	0.082	0.16
10	10.30	0.010	0.081	0.17	10.40	0.007	0.077	0.16
Panel B: Average Experience Profile USA (March Current Population Survey 1994-1996)								
Year of Exp.	**Average Log Earnings**	**Fraction Unem-ployed**	**Frac. Not in Labor Force**	**Fraction Changed Firm[a]**	**Average Log Earnings**	**Fraction Unem-ployed**	**Frac. Not in Labor Force**	**Fraction Changed Firm[a]**
1	8.94	0.047	0.150	0.349	8.91	0.044	0.144	0.386
2	9.21	0.068	0.132	0.310	9.30	0.064	0.128	0.326
3	9.49	0.045	0.120	0.267	9.57	0.041	0.119	0.258
4	9.59	0.038	0.054	0.216	9.62	0.036	0.054	0.208
5	9.79	0.028	0.055	0.202	9.84	0.025	0.059	0.198
6	9.87	0.040	0.052	0.190	9.91	0.032	0.055	0.180
7	9.81	0.030	0.048	0.171	9.89	0.024	0.048	0.183
8	9.92	0.028	0.039	0.170	9.98	0.019	0.036	0.169
9	9.98	0.015	0.037	0.155	10.05	0.012	0.037	0.146
10	10.03	0.023	0.034	0.142	10.12	0.021	0.035	0.133

Notes: Years of experience refer to potential labor market experience in the U.S. (age-years of education-6), and years since graduation in Canada. In the U.S. data, graduates refer to workers with a college degree or more; those with some college are workers with more than a high school but less than a college degree. See notes to Appendix Figure A1 and Data Appendix for further details.

[a]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.

Appendix Table A4: Experience Profile in Mobility and Firm Characteristics, Canada 1982-1999, Graduates Only

Panel A. Mobility Outcomes by Potential Labor Market Experience

Year of Exp.	Difference >=0 (Graduates)							
	Fraction Changed Industry 1	Fraction Changed Industry 2	Fraction Changed Industry 3	Fraction Changed Province	Fraction Left 1st Firm	Fraction Left 1st Industry 1	Fraction Left 1st Industry 2	Fraction Left 1st Province
0	--	--	--	--	--	--	--	--
1	0.308	0.352	0.365	0.040	0.399	0.31	0.35	0.052
2	0.220	0.257	0.270	0.029	0.558	0.42	0.48	0.086
3	0.186	0.220	0.233	0.027	0.65	0.48	0.56	0.104
4	0.163	0.194	0.207	0.024	0.709	0.52	0.61	0.115
5	0.141	0.169	0.181	0.021	0.745	0.55	0.64	0.124
6	0.126	0.151	0.163	0.020	0.769	0.56	0.66	0.133
7	0.113	0.135	0.146	0.015	0.784	0.57	0.67	0.138
8	0.104	0.124	0.134	0.012	0.799	0.58	0.68	0.143
9	0.098	0.118	0.128	0.011	0.813	0.59	0.69	0.147
10	0.098	0.116	0.126	0.009	0.827	0.61	0.71	0.150

Panel B. Firm Outcomes by Potential Labor Market Experience

Year of Exp.	Difference >=0 (Graduates)							
	Mean Log Firm Size	Actual Mean Firm Size	Fraction Firm > 100	Fraction Firm > 500	Fraction Firm > 1000	Fraction Firm > 5000	Avg. Log Med. Firm Earnings	Avg. Log Firm Payroll
0	6.94	27705	0.73	0.59	0.53	0.34	0.62	5.94
1	6.95	26563	0.74	0.59	0.53	0.33	0.70	6.00
2	7.03	28549	0.75	0.60	0.54	0.33	0.76	6.14
3	7.07	29701	0.75	0.61	0.55	0.34	0.81	6.22
4	7.08	30210	0.75	0.61	0.55	0.34	0.84	6.26
5	7.13	31429	0.76	0.62	0.55	0.35	0.87	6.34
6	7.17	33207	0.76	0.62	0.56	0.36	0.89	6.41
7	7.20	34164	0.76	0.63	0.56	0.36	0.91	6.45
8	7.21	34981	0.76	0.63	0.56	0.37	0.92	6.48
9	7.21	35286	0.76	0.63	0.57	0.37	0.93	6.50
10	7.20	35810	0.76	0.63	0.57	0.37	0.94	6.50

Notes: See text and Data Appendix.

Appendix Table A5: Firm Size and Average Firm Wages Experience -- USA

	All Workers (Some College)				At Least 16 Years of Schooling			
Year of Experience	**Log Firm Size**	**Fraction Firm Size > 100**	**Fraction Firm Size > 500**	**Fraction Firm Size > 1000**	**Log Firm Size**	**Fraction Firm Size > 100**	**Fraction Firm Size > 500**	**Fraction Firm Size > 1000**
0	5.30	0.58	0.42	0.33	5.70	0.62	0.49	0.40
1	5.16	0.52	0.40	0.33	5.65	0.61	0.47	0.40
2	5.58	0.62	0.46	0.37	5.86	0.66	0.51	0.41
3	5.43	0.59	0.42	0.34	5.52	0.59	0.44	0.36
4	5.32	0.58	0.39	0.33	5.52	0.60	0.42	0.36
5	5.65	0.61	0.47	0.36	5.89	0.64	0.50	0.40
6	5.79	0.64	0.48	0.39	5.89	0.64	0.50	0.42
7	5.70	0.63	0.48	0.38	5.80	0.65	0.50	0.39
8	5.56	0.59	0.45	0.37	5.68	0.63	0.47	0.39
9	5.96	0.67	0.51	0.44	6.18	0.71	0.54	0.46
10	5.73	0.63	0.48	0.40	5.88	0.67	0.50	0.40

Notes: Pension and Benefit Supplements to The Current Population Survey, 1979, 1983, 1988. Sample size is 4607 for all workers with 13 to 18 years of schooling and 2987 for workers with at least 16 years of schooling.

Appendix Table A6: Experience Profile in Mobility and Firm Characteristics, Canada 1982-1999, All Workers with Some College

Panel A. Mobility Outcomes by Potential Labor Market Experience

Year of Exp.	All Workers With Some College							
	Fraction Changed Industry 1	Fraction Changed Industry 2	Fraction Changed Industry 3	Fraction Changed Province	Fraction Left 1st Firm	Fraction Left 1st Industry 1	Fraction Left 1st Industry 2	Fraction Left 1st Province
0	--	--	--	--	--	--	--	--
1	0.329	0.374	0.387	0.029	0.423	0.33	0.37	0.034
2	0.253	0.293	0.306	0.028	0.586	0.45	0.51	0.059
3	0.217	0.252	0.265	0.027	0.677	0.52	0.59	0.076
4	0.191	0.225	0.239	0.025	0.736	0.56	0.64	0.090
5	0.165	0.195	0.208	0.022	0.772	0.59	0.67	0.099
6	0.144	0.170	0.183	0.021	0.791	0.60	0.69	0.105
7	0.127	0.151	0.162	0.019	0.806	0.61	0.70	0.110
8	0.114	0.136	0.146	0.018	0.82	0.62	0.71	0.116
9	0.108	0.129	0.139	0.016	0.831	0.63	0.72	0.120
10	0.105	0.124	0.134	0.015	0.844	0.64	0.74	0.124

Panel B. Firm Outcomes by Potential Labor Market Experience

Year of Exp.	All Workers With Some College							
	Mean Log Firm Size	Actual Mean Firm Size	Fraction Firm > 100	Fraction Firm > 500	Fraction Firm > 1000	Fraction Firm > 5000	Avg. Log Med. Firm Earnings	Avg. Log Firm Payroll
0	6.76	26978	0.70	0.56	0.50	0.32	0.52	5.66
1	6.78	26419	0.71	0.56	0.50	0.31	0.60	5.73
2	6.87	28656	0.72	0.58	0.52	0.32	0.67	5.88
3	6.92	29858	0.73	0.58	0.52	0.33	0.72	5.99
4	6.93	30342	0.73	0.58	0.52	0.33	0.76	6.03
5	6.98	31373	0.73	0.59	0.53	0.34	0.80	6.12
6	7.04	33148	0.74	0.60	0.54	0.34	0.83	6.21
7	7.07	34202	0.74	0.60	0.54	0.35	0.86	6.26
8	7.09	35085	0.74	0.61	0.54	0.35	0.87	6.31
9	7.10	35465	0.74	0.61	0.55	0.35	0.89	6.33
10	7.10	35933	0.74	0.61	0.55	0.36	0.89	6.35

Notes: See text and Data Appendix.

Appendix Table A7: Longitudinal Experience Profiles in Career Outcomes, Full Sample with and without Cohort, Year, Region Controls and Cross-Sectional Experience Profile Calendar Year 1995 with Region Controls (Graduate Sample Only)

Years Since Graduation	Earnings			Firm Size			Firm Wage			Payroll		
	All Years		1995	All Years		1995	All Years		1995	All Years		1995
	Average	Controls	Controls	Average	Controls	Controls	Average	Controls	Controls	Average	Controls	Controls
0	0	0	0	0	0	0	0	0	0	0	0	0
1	0.563	0.560	0.476	0.002	0.040	0.128	0.078	0.082	0.084	0.058	0.103	0.194
2	0.782	0.775	0.753	0.084	0.148	0.125	0.140	0.149	0.193	0.197	0.275	0.288
3	0.942	0.928	0.933	0.123	0.222	0.293	0.184	0.197	0.257	0.274	0.395	0.513
4	1.062	1.043	1.058	0.133	0.270	0.356	0.217	0.235	0.328	0.314	0.481	0.653
5	1.169	1.142	1.196	0.187	0.312	0.494	0.245	0.255	0.358	0.397	0.545	0.848
6	1.248	1.213	1.314	0.229	0.350	0.604	0.267	0.271	0.418	0.465	0.603	1.000
7	1.320	1.278	1.391	0.255	0.382	0.601	0.282	0.284	0.429	0.510	0.650	1.014
8	1.377	1.328	1.434	0.266	0.409	0.614	0.297	0.297	0.456	0.540	0.694	1.054
9	1.428	1.371	1.511	0.269	0.432	0.672	0.306	0.308	0.466	0.556	0.732	1.124
10	1.472	1.409	1.565	0.259	0.450	0.651	0.311	0.314	0.470	0.554	0.763	1.109

Years Since Graduation	Industry Mobility			Firm Mobility			On UI			Zero Earnings		
	All Years		1995	All Years		1995	All Years		1995	All Years		1995
	Average	Controls	Controls	Average	Controls	Controls	Average	Controls	Controls	Average	Controls	Controls
0	--	--	--	--	--	--	0.020	0.045	0.042	0.047	0.032	0.038
1	0.351	0.334	0.340	0.398	0.363	0.375	0.020	0.046	0.046	0.036	0.020	0.030
2	0.256	0.241	0.260	0.309	0.278	0.301	0.020	0.047	0.053	0.035	0.020	0.025
3	0.217	0.194	0.210	0.272	0.231	0.254	0.016	0.044	0.048	0.034	0.020	0.022
4	0.191	0.164	0.158	0.245	0.199	0.201	0.013	0.041	0.048	0.030	0.019	0.018
5	0.165	0.139	0.129	0.216	0.172	0.165	0.012	0.040	0.045	0.031	0.020	0.024
6	0.148	0.124	0.112	0.196	0.154	0.146	0.011	0.039	0.048	0.032	0.021	0.021
7	0.132	0.109	0.093	0.177	0.137	0.125	0.009	0.037	0.044	0.033	0.022	0.017
8	0.122	0.099	0.088	0.165	0.125	0.117	0.009	0.037	0.044	0.033	0.023	0.024
9	0.114	0.091	0.068	0.155	0.114	0.097	0.007	0.037	0.040	0.035	0.025	0.019
10	0.110	0.084	0.066	0.148	0.106	0.094	0.007	0.037	0.041	0.033	0.023	0.020

Notes: For full sample (All Years), model with controls includes fixed effects for cohort of graduation, region of first residence, and year. For year 1995, model with controls includes fixed effects for region of first residence.

Appendix B: Auto-Covariance Structure of Regional Unemployment Rates

If as commonly done we specify the time series process of the unemployment rate as an AR(2), the coefficients are 0.87 and -.158 for the first and second lag, respectively, in a sample pooling all states and including year and state fixed effects (a procedure followed by Blanchard and Katz 1992). Additional lags are not significant.

The auto-covariance structure of the unemployment rate for the observations in our sample controlling for cohort, region, and year fixed effects is shown in the Figure. (These correspond to the auxiliary regression coefficients that pre-multiply the effects of the omitted unemployment rate history in the omitted variable bias calculation of Section 2.) Although shocks are highly persistent initially, the auto-covariance structure dips to zero after three to four years. Thus, the inclusion of two to three lags should suffice to absorb most of omitted variable bias.

To account for the high persistence of unemployment shocks, often an ARIMA(1,1,0) process is specified instead of an AR(2). It is often difficult to distinguish the two processes in short samples, but given a prior of stationarity for the unemployment rate we opt for the latter. A strand of literature in time series econometrics models the unemployment rate accounting directly for asymmetry and short-run persistence in the dynamics of unemployment rates (e.g., Koop and Potter 1999, Rothman 1998), although the AR(2)/ARIMA(1,1,0) appears to be a common choice (Montgomery et al. 1998). On the time series properties of the unemployment in Canada see Fauvel et al. (1999) or Mikhail et al. (2003).

References:

Fauvel, Yvon, Alain Paquet, and Christian Zimmerman (1999). 'Short-Term Forecasting of National and Provincial Employment in Canada.' Working Paper No. R-99-6E Applied Research Branch, Strategic Policy, Human Resource Development Canada.

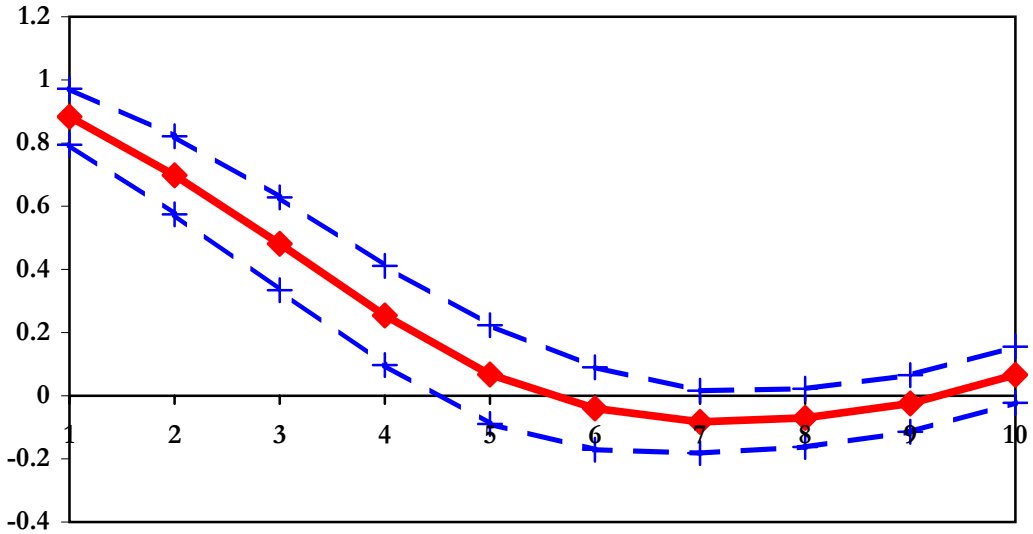
Mikhail, Ossama, Curtis Eberwein, and Jagdish Handa (2003). 'Testing and Estimating Persistence in Canadian Unemployment.' Mimeo, University of Central Florida.

Montgomery, Alan, Victor Zarnovitz, Ruey Tsay, and George Tiao (1998). 'Forecasting the U.S. Unemployment Rate.' Journal of the American Statistical Association 93 pp. 478-493.

Rothman, Philip (1998). 'Forecasting Asymmetric Unemployment Rates.' Review of Economics and Statistics pp . 164-168.

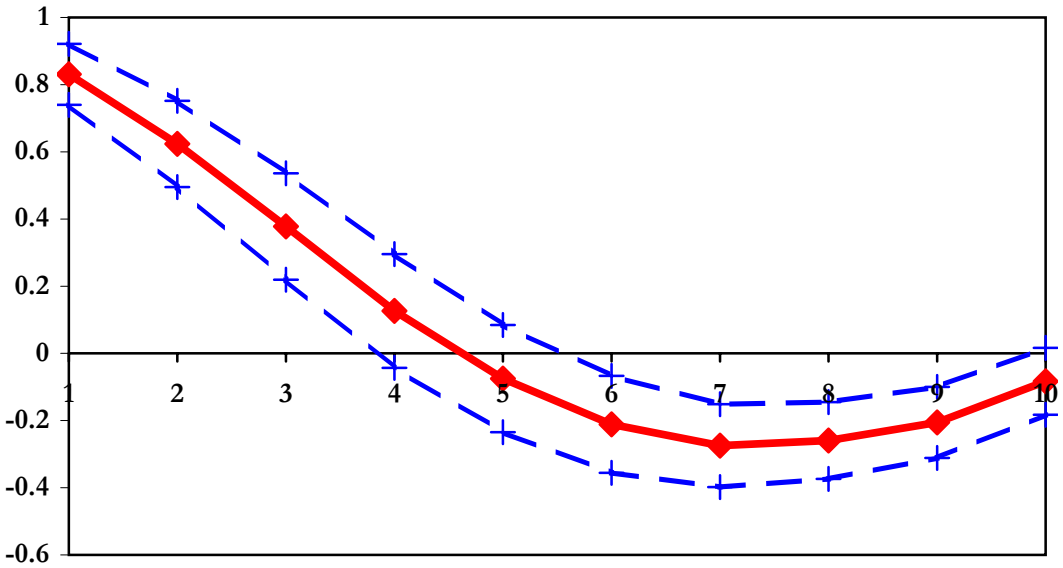
Appendix Figure B1: Auto-Covariance of Unemployment Rate at Ages 15-24, Regional Graduate Sample

Panel A: Cohorts 1982-1995



Year since Graduation

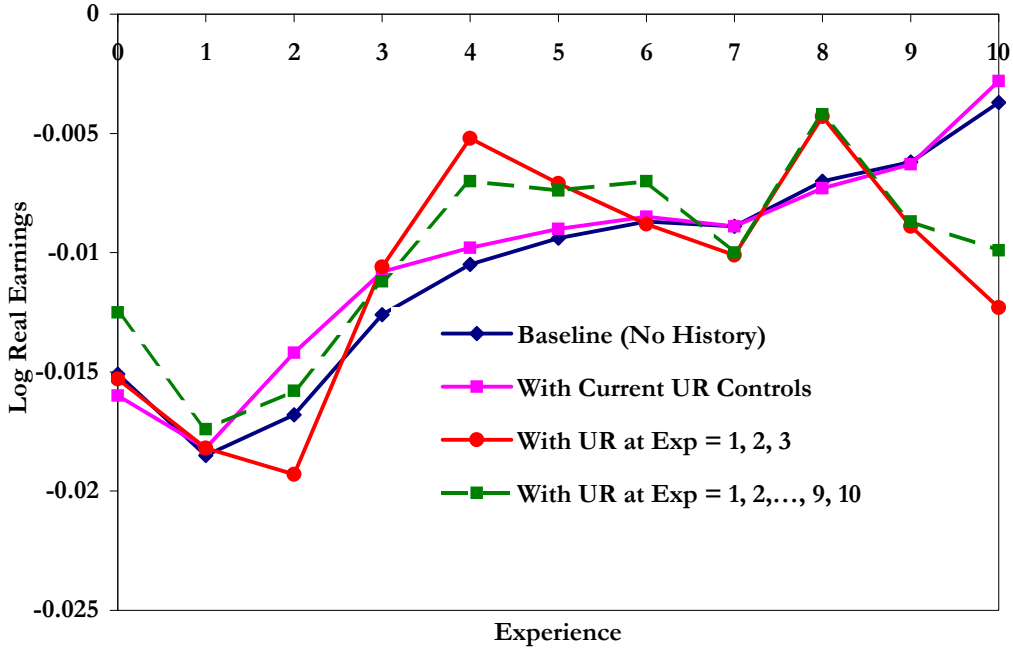
Panel B: Cohorts 1976-1995



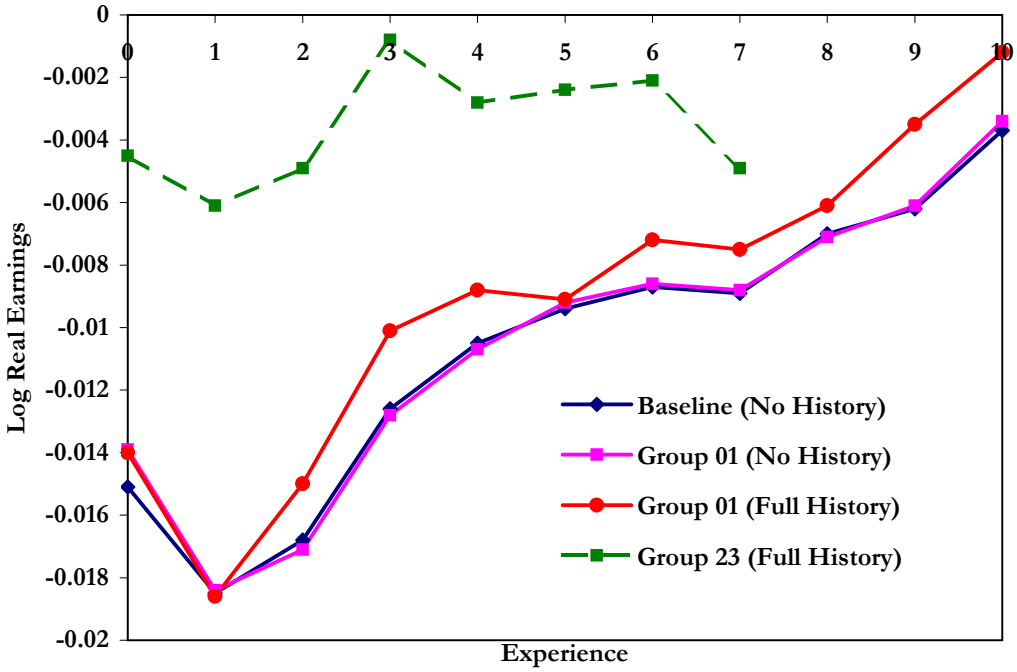
Year since Graduation

Notes: Figure displays regression coefficients of regional unemployment rates in given experience year on unemployment rate at graduation, controlling for fixed effects for region of first residence, region of current residence, and year of graduation. The regression are weighted by individuals present in the respective cell and cohort-range.

Appendix FigureB2 (A): Effect of Unemployment Rate at Time of Graduation on Log Real Earnings With Controls for Unemployment Rate History: 1982-1995 Cohorts, Full Sample



Appendix Figure B2 (B): Grouped Model of Effect of Unemployment Rate at Time of Graduation on Log Real Earnings With Controls for Unemployment Rate History: 1982-1995 Cohorts, Full Sample



Notes: See notes and discussion of Figure 5 in text.

Appendix Table B1: Effect of Unemployment Rate at time of Graduation With Controls for UR History, Basic and Grouped Model - Full Sample, Regional Model, Cohorts 1982-1995

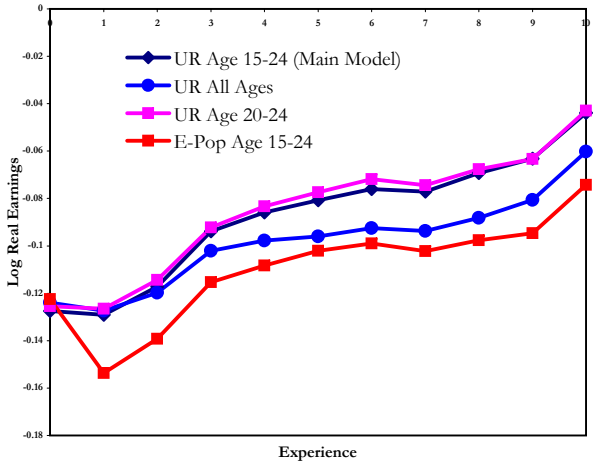
Model	Specification							
	Baseline (No UR History)	With Current UR Only	With History in Exp=1,2,3	With Full UR History	Baseline (No UR History)	Baseline Group 0-1 (No Hist.)	Group 01 With Full History	Group 23 With Full History
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Experience Year								
0	-0.0151	-0.016	-0.0153	-0.0125	-0.0151	-0.0139	-0.014	---
	[0.0032]***	[0.0032]***	[0.0031]***	[0.0029]***	[0.0032]***	[0.0034]***	[0.0036]***	---
1	-0.0185	-0.0182	-0.0182	-0.0174	-0.0185	-0.0184	-0.0186	---
	[0.0028]***	[0.0054]***	[0.0052]***	[0.0052]***	[0.0028]***	[0.0029]***	[0.0032]***	---
2	-0.0168	-0.0142	-0.0193	-0.0158	-0.0168	-0.0171	-0.015	-0.0045
	[0.0025]***	[0.0028]***	[0.0056]***	[0.0051]***	[0.0025]***	[0.0025]***	[0.0029]***	[0.0030]
3	-0.0126	-0.0108	-0.0106	-0.0112	-0.0126	-0.0128	-0.0101	-0.0061
	[0.0023]***	[0.0023]***	[0.0048]**	[0.0042]***	[0.0023]***	[0.0025]***	[0.0028]***	[0.0027]**
4	-0.0105	-0.0098	-0.0052	-0.007	-0.0105	-0.0107	-0.0088	-0.0049
	[0.0023]***	[0.0023]***	[0.0047]	[0.0038]*	[0.0023]***	[0.0024]***	[0.0027]***	[0.0033]
5	-0.0094	-0.009	-0.0071	-0.0074	-0.0094	-0.0092	-0.0091	-0.0008
	[0.0022]***	[0.0023]***	[0.0051]	[0.0040]*	[0.0022]***	[0.0023]***	[0.0034]***	[0.0052]
6	-0.0087	-0.0085	-0.0088	-0.007	-0.0087	-0.0086	-0.0072	-0.0028
	[0.0024]***	[0.0024]***	[0.0056]	[0.0045]	[0.0024]***	[0.0025]***	[0.0042]*	[0.0054]
7	-0.0089	-0.0089	-0.0101	-0.01	-0.0089	-0.0088	-0.0075	-0.0024
	[0.0025]***	[0.0025]***	[0.0055]*	[0.0045]**	[0.0025]***	[0.0027]***	[0.0042]*	[0.0042]
8	-0.007	-0.0073	-0.0043	-0.0042	-0.007	-0.0071	-0.0061	-0.0021
	[0.0024]***	[0.0024]***	[0.0050]	[0.0038]	[0.0024]***	[0.0026]***	[0.0034]*	[0.0040]
9	-0.0062	-0.0063	-0.0089	-0.0087	-0.0062	-0.0061	-0.0035	-0.0049
	[0.0024]**	[0.0024]**	[0.0051]*	[0.0041]**	[0.0024]**	[0.0026]**	[0.0036]	[0.0049]
10	-0.0037	-0.0028	-0.0123	-0.0099	-0.0037	-0.0034	-0.0012	-0.0015
	[0.0025]	[0.0025]	[0.0051]**	[0.0042]**	[0.0025]	[0.0027]	[0.0040]	[0.0047]
Constant	8.9864	9.0247	9.0278	8.9509	8.9864	8.9719	9.0123	---
	[0.1300]***	[0.1303]***	[0.1272]***	[0.1239]***	[0.1300]***	[0.1334]***	[0.1387]***	---
N	8304	8304	8304	7704	8304	8304	8038	---
R^2	0.97	0.97	0.97	0.97	0.97	0.97	0.97	---

Notes: Robust standard errors in brackets. See notes and discussion of Table 2 in text.

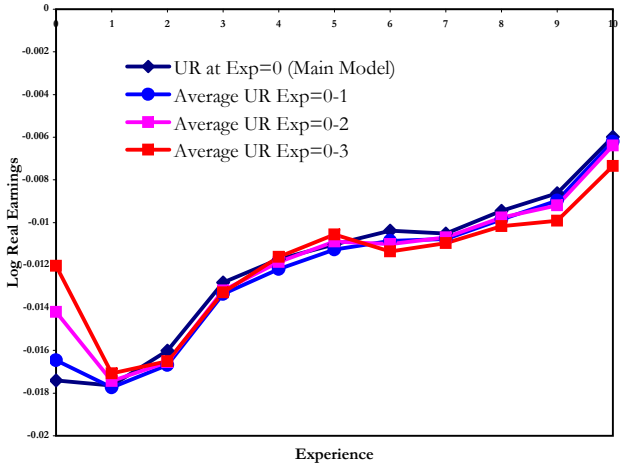
* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Figure C1: Effect of Unemployment Rate at Time of Graduation on Log Real Earnings, Alternative Models, Regional Graduate Models for Cohort 1982-1995 (Unless Otherwise Noted)

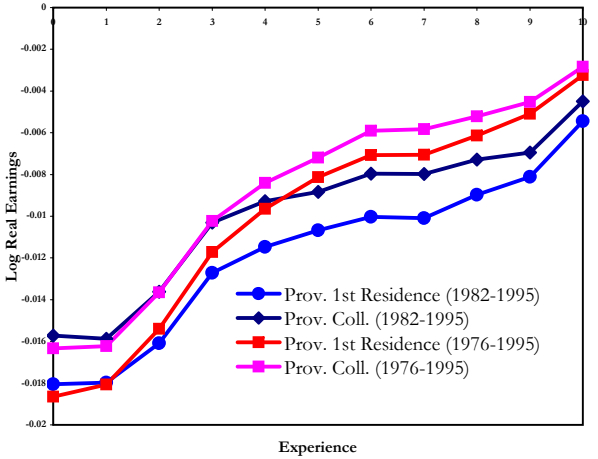
Panel A: Different Early Labor Market Conditions (2 Std.Dev. Shock)



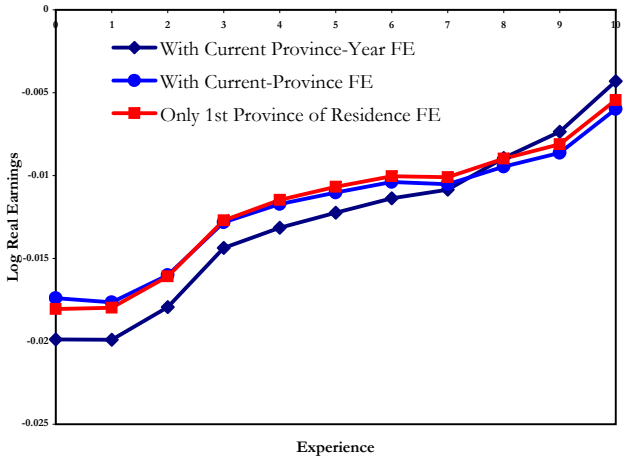
Panel B: Different Early Labor Market Horizons (Average UR)



Panel C: Shock in Region of College vs. Region of First Residence

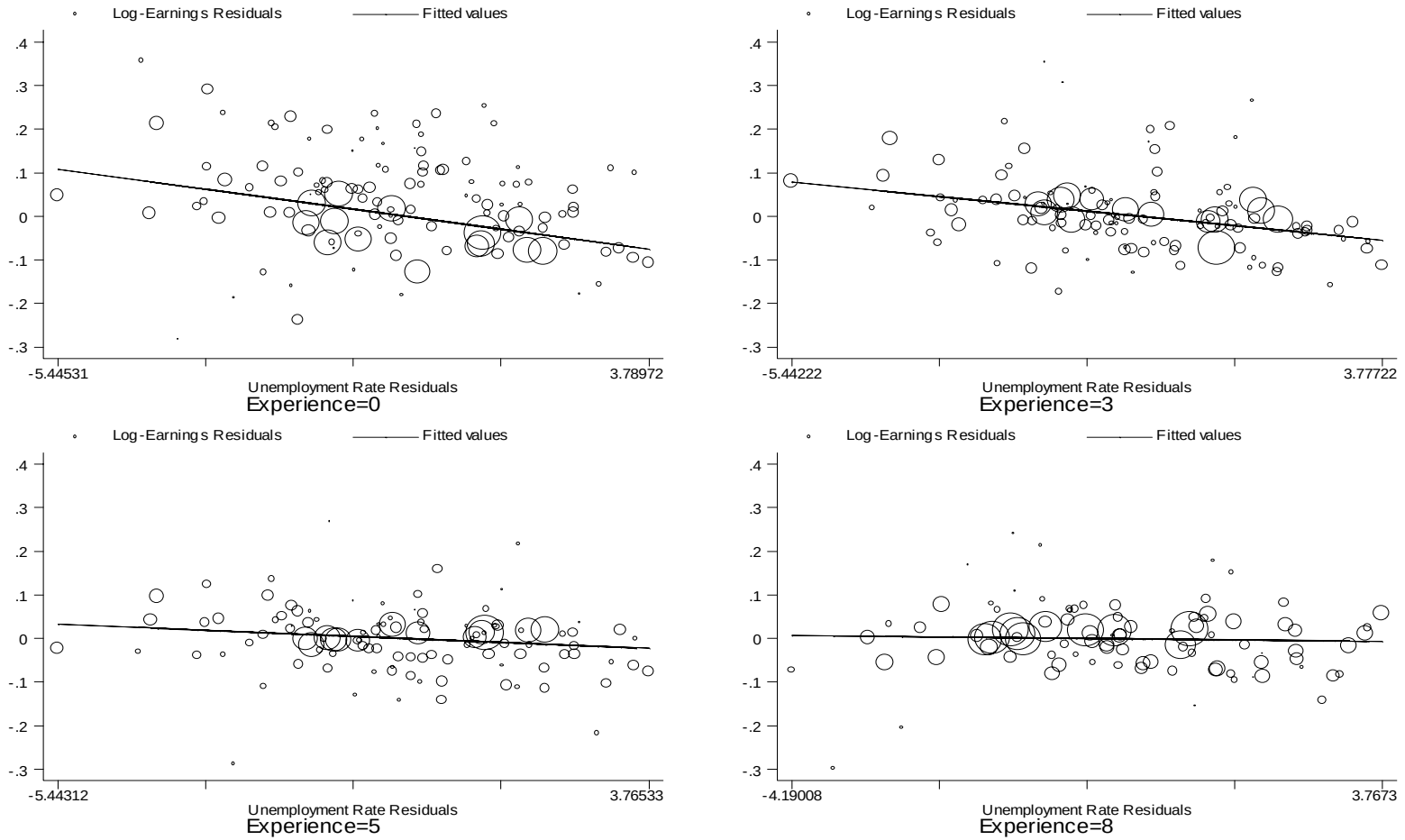


Panel D: Current Province and Current Province-Year Controls



Notes: Panel A shows the main coefficients from the basic regional regression specification using alternative measures of the state of the labor market. To make effects comparable, the figure shows the coefficients multiplied by two standard deviations of the respective measure. Panel A shows the main coefficients from a basic regional regression specification using the average unemployment rates in the first years of labor market experience. Panel C compare estimates of the effect of the regional unemployment rate in the year of graduation in the province of college attendande and the province of first residence for different cohort ranges. Panel D compares the main coefficients from the basic regional model with fixed effects for province of first residence with models when also fixed effects for either current-province or current-province-current-year are included.

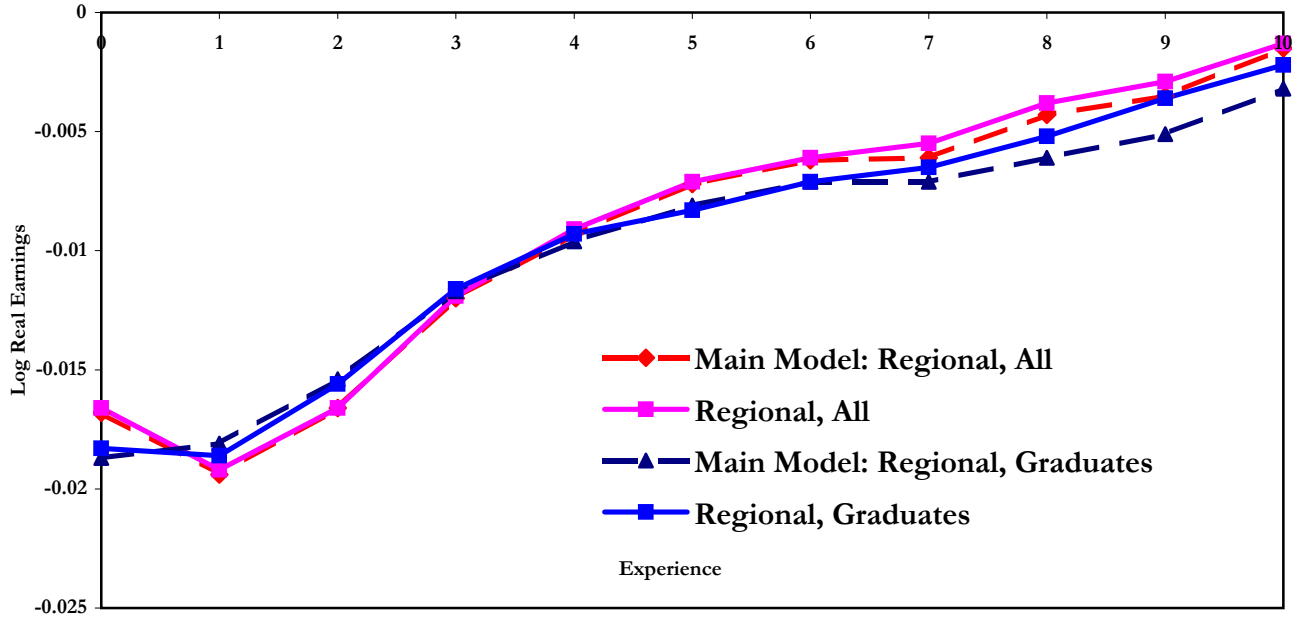
Appendix Figure C2: Regression Residuals of Separate Regressions of Log Annual Earnings and Unemployment Rates including Fixed Effect for Current Year, First Province of Residence, and Year of Graduation, Plotted for Various Experience Years with Corresponding Line of Regression of Earnings Residuals on Unemployment Rate Residuals



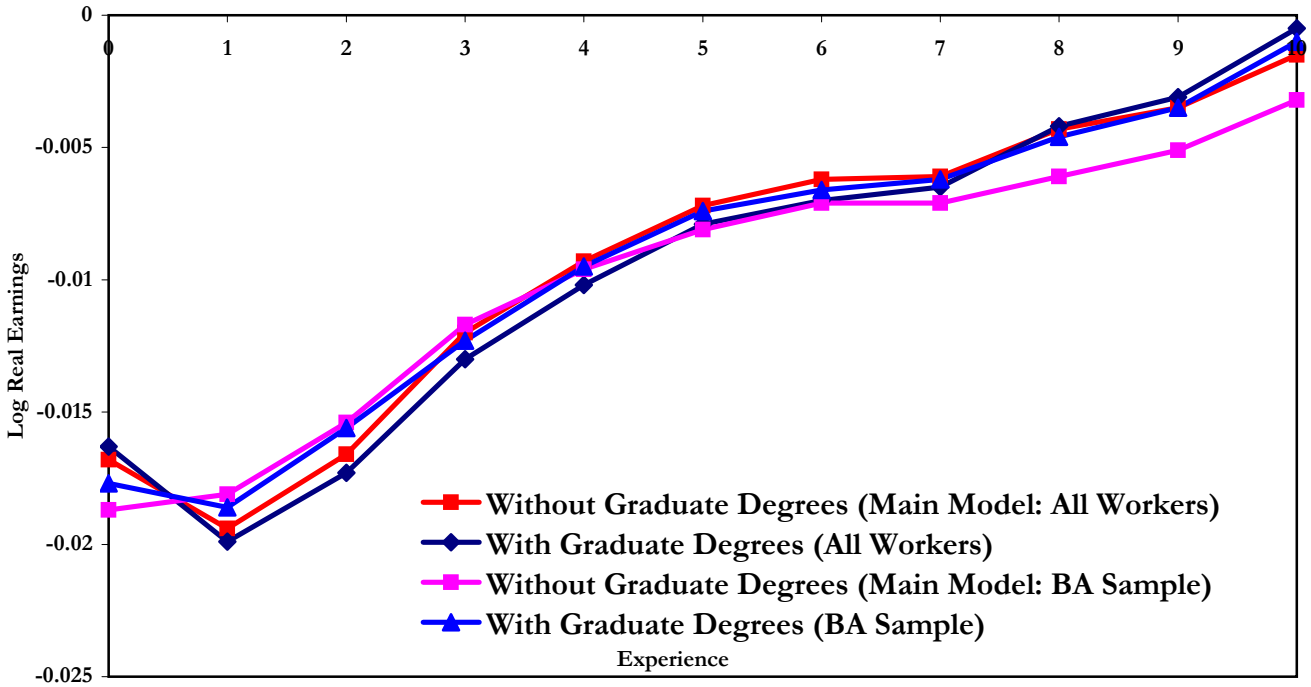
Notes: Circles correspond to cell sizes. "Fitted Residuals" refer to the predicted regression line of a regression of earnings residuals on unemployment rate residuals, weighted by cell sizes.

Appendix Figure C3: Effect of Unemployment Rate at Time of Graduation on Log Real Earnings for Different Samples: Regional Models, Some College (All) and Graduate Sample, All Cohorts

Panel A: Including Workers Who Stop Filing Income Taxes (Excluded From Main Models)



Panel B: Estimates for Sample Including Graduate Degrees



Appendix Table C1: Effect of Unemployment Rate at time of Graduation on Log Real Earnings by Potential Experience for Workers with Positive Earnings Every Period (Panel Sample)

	Specification					
National/Regional	**National**	**National**	**Regional**	**National**	**National**	**Regional**
Trend	**Linear**	**Quadratic**	**NA**	**Linear**	**Quadratic**	**NA**
D>=0?	**No**	**No**	**No**	**Yes**	**Yes**	**Yes**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Experience Year						
0	-0.0212	-0.0229	-0.0172	-0.0235	-0.0234	-0.0177
	[0.0058]***	[0.0038]***	[0.0027]***	[0.0042]***	[0.0033]***	[0.0025]***
1	-0.0153	-0.0167	-0.0186	-0.0134	-0.0135	-0.0156
	[0.0067]**	[0.0030]***	[0.0023]***	[0.0060]**	[0.0027]***	[0.0021]***
2	-0.0106	-0.0118	-0.0153	-0.0087	-0.0093	-0.0129
	[0.0045]**	[0.0025]***	[0.0021]***	[0.0039]**	[0.0020]***	[0.0019]***
3	-0.0066	-0.0072	-0.0111	-0.0031	-0.0039	-0.0096
	[0.0034]*	[0.0022]***	[0.0021]***	[0.0030]	[0.0013]***	[0.0017]***
4	-0.0052	-0.0049	-0.0084	-0.0019	-0.0024	-0.0079
	[0.0035]	[0.0023]*	[0.0020]***	[0.0034]	[0.0015]	[0.0016]***
5	-0.0046	-0.003	-0.0059	-0.0006	-0.0002	-0.0057
	[0.0035]	[0.0019]	[0.0020]***	[0.0030]	[0.0013]	[0.0017]***
6	-0.0018	-0.0011	-0.006	0.0001	0.0009	-0.0058
	[0.0040]	[0.0018]	[0.0021]***	[0.0032]	[0.0016]	[0.0018]***
7	-0.0023	-0.0019	-0.006	-0.0015	-0.0003	-0.0062
	[0.0052]	[0.0023]	[0.0020]***	[0.0041]	[0.0019]	[0.0018]***
8	-0.0004	0	-0.0048	-0.0017	0.0002	-0.0055
	[0.0059]	[0.0028]	[0.0020]**	[0.0040]	[0.0017]	[0.0017]***
9	0.0034	0.0034	-0.0045	0.0014	0.0034	-0.0052
	[0.0060]	[0.0027]	[0.0020]**	[0.0042]	[0.0017]*	[0.0018]***
10	0.0071	0.0041	-0.0035	0.005	0.0048	-0.004
	[0.0070]	[0.0027]	[0.0020]*	[0.0049]	[0.0021]**	[0.0018]**
Constant	7.1728	-7.4295	8.8027	7.4451	-5.1739	8.9846
	[0.3142]***	[2.2783]***	[0.0966]***	[0.2565]***	[0.7255]***	[0.0675]***
N	43728	43728	43728	26084	26084	26084
R-squared	0.74	0.75	0.78	0.89	0.89	0.91

Notes: Robust standard errors in brackets. See notes to Table 1 for information on regression specification. See also discussion and notes of Figure 5.

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

Appendix Table C2: Effect of Unemployment Rate at time of Graduation on Log Real Earnings by Potential Experience - Including Workers that Permanently Stop Filing Income Taxes

	Specification					
National/Regional	**National**	**National**	**Regional**	**National**	**National**	**Regional**
Trend	**Linear**	**Quadratic**	**NA**	**Linear**	**Quadratic**	**NA**
D>=0?	**No**	**No**	**No**	**Yes**	**Yes**	**Yes**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Experience Year						
0	-0.0195	-0.0211	-0.0166	-0.022	-0.0223	-0.0183
	[0.0045]***	[0.0037]***	[0.0026]***	[0.0035]***	[0.0036]***	[0.0023]***
1	-0.0168	-0.0181	-0.0192	-0.0169	-0.0171	-0.0186
	[0.0049]***	[0.0027]***	[0.0024]***	[0.0047]***	[0.0026]***	[0.0021]***
2	-0.0132	-0.0141	-0.0166	-0.0121	-0.0125	-0.0156
	[0.0032]***	[0.0024]***	[0.0022]***	[0.0029]***	[0.0018]***	[0.0020]***
3	-0.0085	-0.009	-0.0119	-0.0061	-0.0066	-0.0116
	[0.0023]***	[0.0021]***	[0.0021]***	[0.0023]**	[0.0015]***	[0.0018]***
4	-0.0063	-0.0062	-0.0091	-0.0037	-0.004	-0.0093
	[0.0026]**	[0.0025]**	[0.0019]***	[0.0029]	[0.0018]**	[0.0017]***
5	-0.0069	-0.0058	-0.0071	-0.0044	-0.0041	-0.0083
	[0.0030]**	[0.0020]***	[0.0019]***	[0.0027]	[0.0016]**	[0.0017]***
6	-0.0027	-0.0023	-0.0061	-0.0028	-0.0022	-0.0071
	[0.0032]	[0.0019]	[0.0020]***	[0.0026]	[0.0017]	[0.0018]***
7	-0.0022	-0.0019	-0.0055	-0.0019	-0.001	-0.0065
	[0.0041]	[0.0022]	[0.0020]***	[0.0031]	[0.0014]	[0.0018]***
8	0.0008	0.0009	-0.0038	-0.0001	0.0011	-0.0052
	[0.0049]	[0.0027]	[0.0020]*	[0.0033]	[0.0014]	[0.0018]***
9	0.0044	0.0041	-0.0029	0.0031	0.0042	-0.0036
	[0.0049]	[0.0028]	[0.0020]	[0.0034]	[0.0018]**	[0.0018]**
10	0.0073	0.005	-0.0013	0.0054	0.005	-0.0022
	[0.0049]	[0.0029]*	[0.0020]	[0.0034]	[0.0022]**	[0.0018]
Constant	7.0909	-3.9354	8.7626	7.4203	-2.112	9.0364
	[0.2579]***	[2.3657]	[0.1041]***	[0.2068]***	[0.7413]**	[0.0661]***
N	14645	14645	14645	1731	1731	1731
R-squared	0.76	0.76	0.79	0.97	0.97	0.99

Notes: Robust standard errors in brackets. See notes to Table 1 for information on regression specification. See also Appendix Figure C3, Panel A.

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

Appendix Table C3: Effect of Unemployment Rate at time of Graduation on Log Real Earnings by Potential Experience Including Workers With Post-Graduate Degrees

	Specification			
National/Regional	**Regional**	**Regional**	**Regional**	**Regional**
With Graduates	**No**	**Yes**	**No**	**Yes**
D>=0?	**No**	**No**	**Yes**	**Yes**
	(1)	**(2)**	**(3)**	**(4)**
Experience Year				
0	-0.0168	-0.0163	-0.0187	-0.0177
	[0.0026]***	[0.0025]***	[0.0024]***	[0.0023]***
1	-0.0194	-0.0199	-0.0181	-0.0186
	[0.0024]***	[0.0024]***	[0.0021]***	[0.0022]***
2	-0.0166	-0.0173	-0.0154	-0.0156
	[0.0022]***	[0.0021]***	[0.0019]***	[0.0021]***
3	-0.012	-0.013	-0.0117	-0.0123
	[0.0021]***	[0.0019]***	[0.0017]***	[0.0020]***
4	-0.0093	-0.0102	-0.0096	-0.0095
	[0.0020]***	[0.0018]***	[0.0016]***	[0.0018]***
5	-0.0072	-0.0079	-0.0081	-0.0074
	[0.0019]***	[0.0017]***	[0.0016]***	[0.0016]***
6	-0.0062	-0.007	-0.0071	-0.0066
	[0.0020]***	[0.0019]***	[0.0017]***	[0.0018]***
7	-0.0061	-0.0065	-0.0071	-0.0062
	[0.0020]***	[0.0018]***	[0.0017]***	[0.0017]***
8	-0.0043	-0.0042	-0.0061	-0.0046
	[0.0019]**	[0.0017]**	[0.0017]***	[0.0015]***
9	-0.0035	-0.0031	-0.0051	-0.0035
	[0.0019]*	[0.0018]*	[0.0017]***	[0.0016]**
10	-0.0015	-0.0005	-0.0032	-0.001
	[0.0020]	[0.0019]	[0.0017]*	[0.0017]
Constant	8.8017	8.7677	9.0456	9.0136
	[0.1012]***	[0.1024]***	[0.0668]***	[0.0649]***
N	14407	26219	8679	15941
R-squared	0.8	0.76	0.95	0.82

Notes: Robust standard errors in brackets. See notes to Table 1 for information on regression specification. See also Appendix Figure C3, Panel B.

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

Appendix Table C4: Effect of Unemployment Rate at time of Graduation on Log Real Earnings by Potential Experience -- Different Graduation Cohorts

	Specification							
Area	**National**				**Regional**			
Trend	**Quadratic**				**N.A.**			
D>=0?	**Yes**				**Yes**			
Cohorts	**1978-1995**	**1982-1995**	**1978-1992**	**1982-1992**	**1978-1995**	**1982-1995**	**1978-1992**	**1982-1992**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Experience Year								
0	-0.0212	-0.0497	-0.0245	-0.0164	-0.0174	-0.0177	-0.0181	-0.0157
	[0.0036]***	[0.0069]***	[0.0034]***	[0.0025]***	[0.0032]***	[0.0045]***	[0.0024]***	[0.0026]***
1	-0.0127	-0.0277	-0.0163	-0.0168	-0.0164	-0.0203	-0.0164	-0.0188
	[0.0031]***	[0.0020]***	[0.0023]***	[0.0026]***	[0.0028]***	[0.0040]***	[0.0023]***	[0.0023]***
2	-0.0094	-0.0179	-0.0115	-0.0113	-0.0151	-0.0188	-0.0142	-0.0164
	[0.0032]**	[0.0030]***	[0.0022]***	[0.0027]***	[0.0022]***	[0.0029]***	[0.0020]***	[0.0022]***
3	-0.0054	-0.0103	-0.0067	-0.0071	-0.0127	-0.0141	-0.0115	-0.0134
	[0.0025]*	[0.0024]***	[0.0015]***	[0.0020]***	[0.0019]***	[0.0026]***	[0.0018]***	[0.0021]***
4	-0.005	-0.0069	-0.0054	-0.0053	-0.0124	-0.0118	-0.0103	-0.0117
	[0.0032]	[0.0021]**	[0.0019]**	[0.0033]	[0.0017]***	[0.0023]***	[0.0016]***	[0.0021]***
5	-0.0045	-0.0069	-0.0049	-0.0037	-0.0117	-0.009	-0.0089	-0.0104
	[0.0026]	[0.0018]***	[0.0015]***	[0.0029]	[0.0016]***	[0.0022]***	[0.0015]***	[0.0020]***
6	-0.0024	-0.0052	-0.0021	0.0002	-0.0111	-0.0081	-0.0078	-0.0089
	[0.0031]	[0.0015]***	[0.0022]	[0.0026]	[0.0017]***	[0.0023]***	[0.0016]***	[0.0021]***
7	-0.001	-0.003	-0.0009	0.0002	-0.0106	-0.0074	-0.0074	-0.0092
	[0.0028]	[0.0014]*	[0.0020]	[0.0023]	[0.0017]***	[0.0022]***	[0.0016]***	[0.0021]***
8	0.0016	-0.0039	0.0003	0.0003	-0.0096	-0.0059	-0.0065	-0.0097
	[0.0027]	[0.0019]*	[0.0015]	[0.0026]	[0.0018]***	[0.0022]***	[0.0016]***	[0.0021]***
9	0.0054	-0.0028	0.0032	0.002	-0.0088	-0.0046	-0.0054	-0.0104
	[0.0025]*	[0.0015]*	[0.0018]	[0.0023]	[0.0020]***	[0.0023]**	[0.0017]***	[0.0021]***
10	0.0079	-0.0026	0.0045	0.0057	-0.0062	-0.0038	-0.0036	-0.0073
	[0.0026]**	[0.0011]**	[0.0023]*	[0.0029]*	[0.0022]***	[0.0025]	[0.0017]**	[0.0020]***
Constant	-5.0063	-7.7747	-3.3741	1.2771	9.2186	8.7422	8.8482	9.3224
	[3.5595]	[4.2340]*	[1.4871]**	[2.9338]	[0.1125]***	[0.1251]***	[0.0782]***	[0.0666]***
N	1150	841	1551	1110	1150	841	1551	1110
R-squared	0.97	0.97	0.97	0.97	0.99	0.99	0.99	0.99

Notes: Robust standard errors in brackets. See notes to Table 1 for information on regression specification. See also discussion and notes of Figure 5.

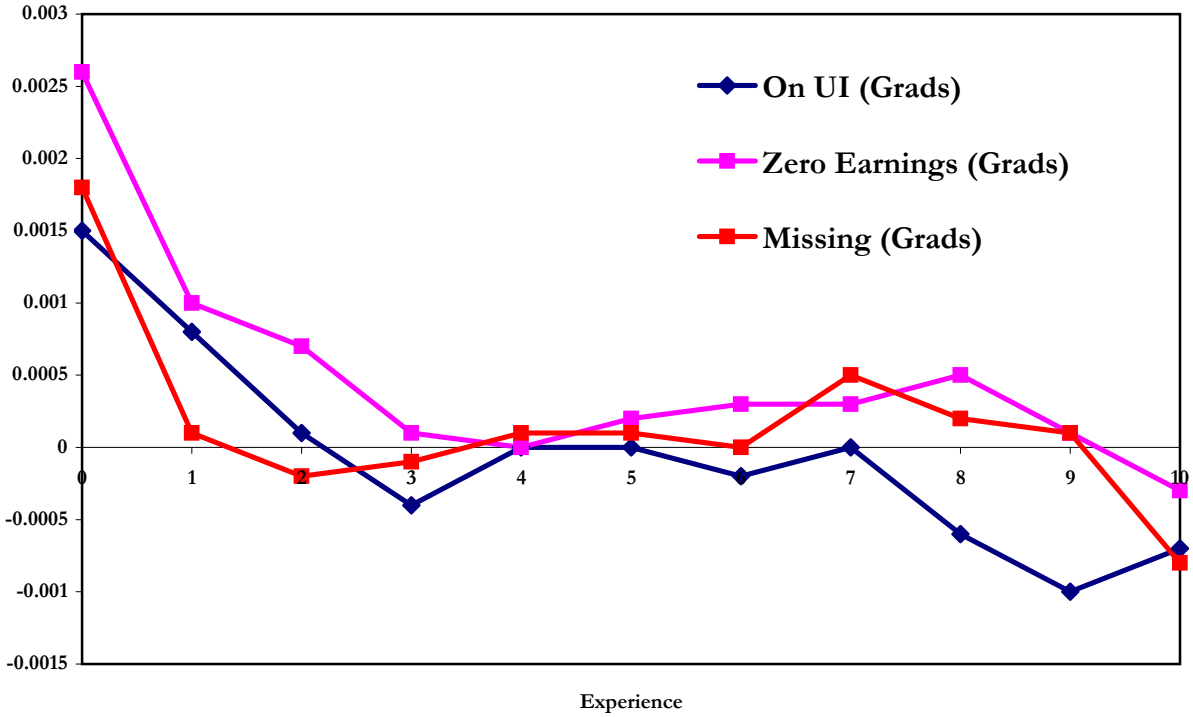
* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Table C5: Effect of UR at Time of Predicted Graduation on Log Weekly Wages and Log Weeks, Canadian Census 1981,9186,1991,1996

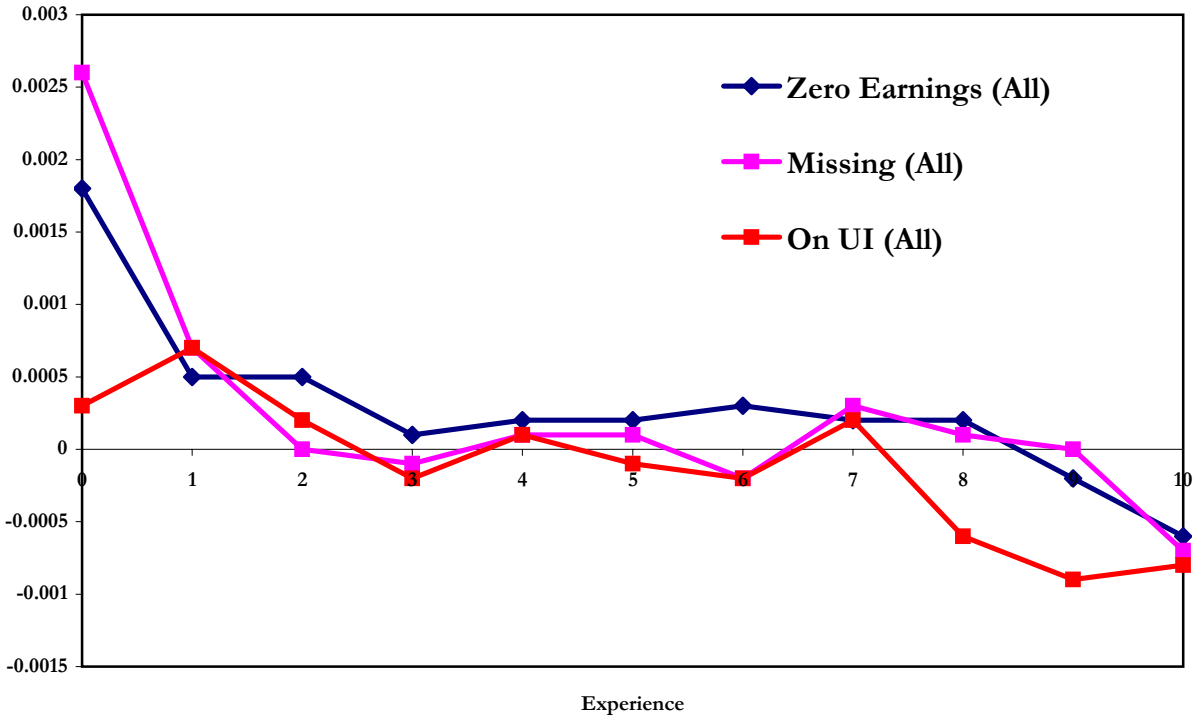
	Without Current Year FE			With Current Year FE		
Exp. Year	**Log Earn**	**Log Weekly Earn**	**Log Weeks**	**Log Earn**	**Log Weekly Earn**	**Log Weeks**
0	-0.013	-0.009	-0.004	-0.011	-0.002	-0.010
	(0.0084)	(0.0073)	(0.0026)	(0.0076)	(0.0074)	(0.0035)
1	-0.013	-0.009	-0.005	-0.011	-0.005	-0.005
	(0.0086)	(0.0048)	(0.0049)	(0.0095)	(0.0058)	(0.0057)
2	-0.012	-0.006	-0.006	-0.012	-0.005	-0.007
	(0.0060)	(0.0039)	(0.0031)	(0.0068)	(0.0037)	(0.0044)
3	-0.010	-0.008	-0.003	-0.009	-0.004	-0.005
	(0.0046)	(0.0033)	(0.0025)	(0.0054)	(0.0037)	(0.0029)
4	-0.012	-0.010	-0.002	-0.014	-0.008	-0.006
	(0.0046)	(0.0037)	(0.0020)	(0.0048)	(0.0036)	(0.0025)
5	-0.009	-0.008	-0.001	-0.011	-0.005	-0.006
	(0.0055)	(0.0042)	(0.0026)	(0.0047)	(0.0037)	(0.0029)
6	-0.007	-0.007	0.000	-0.012	-0.006	-0.005
	(0.0061)	(0.0043)	(0.0038)	(0.0065)	(0.0038)	(0.0047)
7	-0.011	-0.008	-0.003	-0.010	-0.002	-0.008
	(0.0053)	(0.0040)	(0.0024)	(0.0062)	(0.0041)	(0.0034)
8	-0.005	-0.008	0.003	-0.003	-0.003	-0.001
	(0.0048)	(0.0039)	(0.0026)	(0.0059)	(0.0044)	(0.0030)
9	-0.006	-0.007	0.002	-0.006	-0.002	-0.004
	(0.0045)	(0.0033)	(0.0020)	(0.0050)	(0.0032)	(0.0024)
10	0.002	-0.001	0.002	0.006	0.008	-0.002
	(0.0052)	(0.0037)	(0.0023)	(0.0065)	(0.0045)	(0.0030)

Notes: Replication of main estimates using Census data, see Sensitivity Appendix D.

Appendix Figure D1 (A): Effect of Unemployment Rate at Time of Graduation on Zero Earnings, on UI, and Missing - National Models, Cohorts 1976-1995



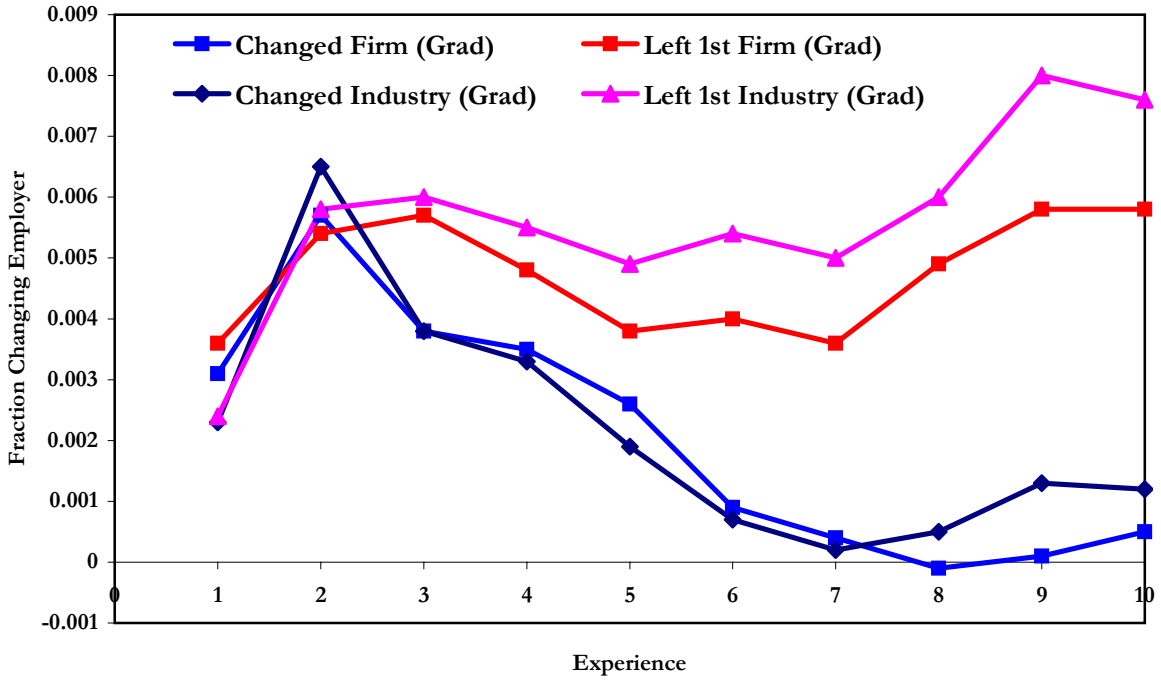
Appendix Figure D1 (B): Effect of Unemployment Rate at Time of Graduation on Provincial Mobility - Regional Models, Full Sample, Cohorts 1976-1995



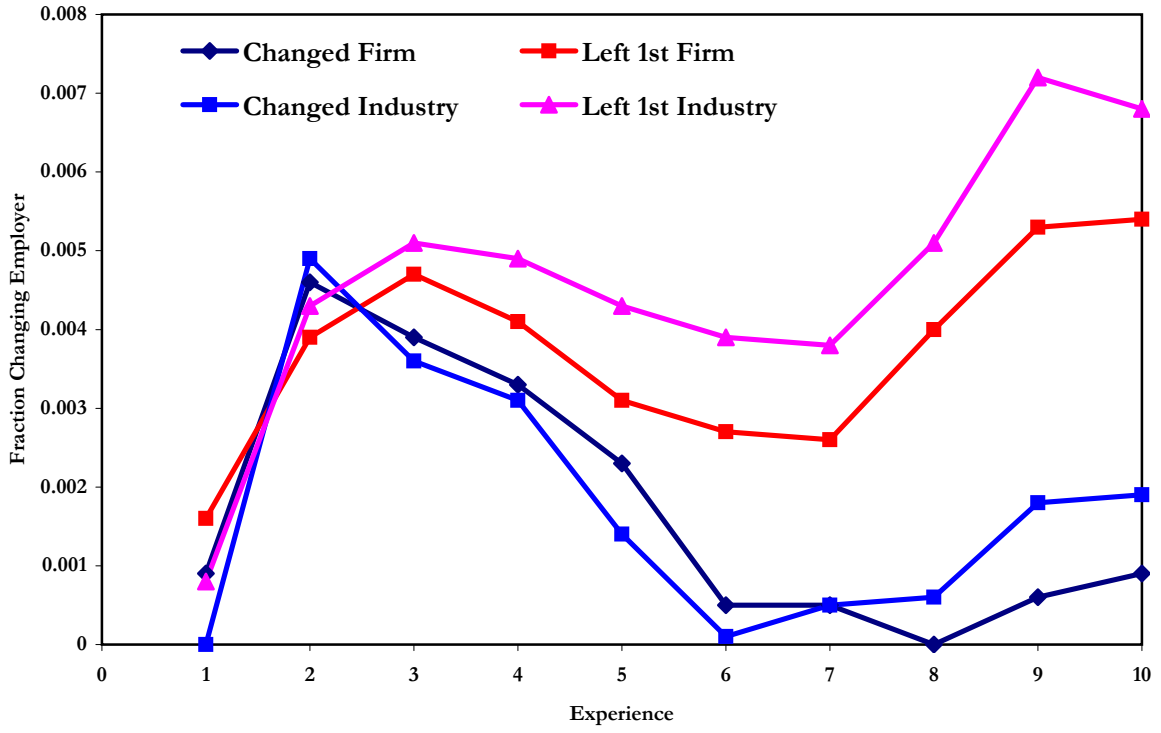
Notes: See text and notes to Figure 4.

Appendix Figure D2: Effect of Unemployment Rate at Time of Graduation on Job and Insutry Mobility: National Models, Cohorts 1976-1995

Panel A: Graduate Sample

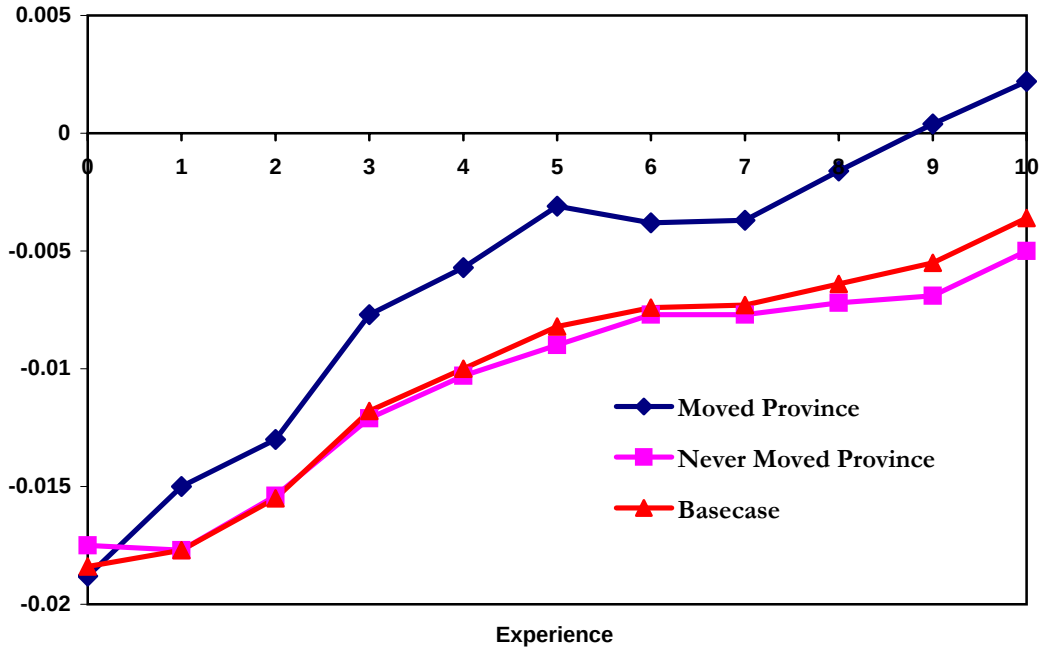


Panel B: Full Sample of Workers



Notes: See text and notes to Figure 4.

Appendix Figure D3: Effects of Initial Unemployment Rates on Earnings For Workers Who Moved Province at Least Once and Those Who Never Moved



Notes: See notes of Table 1 for regression specification.

Appendix Table D1: Effect of Unemployment Rate at time of Graduation on Labor Force Participation (All Workers with Some College vs. Graduate Sample)

	Specification					
Area	**Regional**			**Regional**		
D>=0?	**No**			**Yes**		
Outcome	**Fraction Zero Earnings**	**Fraction Not in Sample**	**Fraction on UI**	**Fraction Zero Earnings**	**Fraction Not in Sample**	**Fraction on UI**
	(1)	**(2)**	**(3)**	**(5)**	**(6)**	**(7)**
Experience Year						
0	0.0003	0.0018	0.0002	0.0008	0.0014	0.0017
	[0.0001]***	[0.0006]***	[0.0003]	[0.0001]***	[0.0005]***	[0.0003]***
1	0.0003	0.0005	0.0011	0.0003	0.0002	0.0011
	[0.0001]***	[0.0004]	[0.0002]***	[0.0001]***	[0.0003]	[0.0002]***
2	0.0003	-0.0003	0.0011	0.0002	-0.0001	0.0009
	[0.0001]***	[0.0003]	[0.0003]***	[0.0001]**	[0.0003]	[0.0002]***
3	0	-0.0003	0.0003	-0.0001	0	0
	[0.0001]	[0.0003]	[0.0003]	[0.0001]	[0.0003]	[0.0002]
4	0	-0.0005	0.0002	0	0.0001	0.0002
	[0.0001]	[0.0003]*	[0.0002]	[0.0001]	[0.0002]	[0.0001]
5	-0.0001	-0.0006	-0.0003	0	-0.0001	-0.0001
	[0.0001]	[0.0003]**	[0.0002]*	[0.0001]	[0.0003]	[0.0002]
6	0	-0.001	-0.0004	0	-0.0005	-0.0002
	[0.0001]	[0.0002]***	[0.0002]**	[0.0001]	[0.0003]*	[0.0002]
7	0	-0.0007	-0.0003	0	-0.0002	-0.0002
	[0.0001]	[0.0002]***	[0.0002]*	[0.0001]	[0.0002]	[0.0002]
8	-0.0001	-0.0006	-0.0007	0	-0.0002	-0.0005
	[0.0001]**	[0.0003]**	[0.0002]***	[0.0001]	[0.0003]	[0.0002]***
9	-0.0003	-0.0008	-0.001	-0.0002	-0.0004	-0.0007
	[0.0001]***	[0.0002]***	[0.0002]***	[0.0001]***	[0.0002]*	[0.0002]***
10	-0.0001	-0.0011	-0.001	0	-0.0008	-0.0005
	[0.0001]**	[0.0003]***	[0.0002]***	[0.0001]	[0.0003]***	[0.0002]***
Constant	0.0054	0.0334	0.0645	-0.0032	0.0227	0.0162
	[0.0022]**	[0.0121]***	[0.0093]***	[0.0025]	[0.0118]*	[0.0072]**
N	14407	14407	14407	8679	8679	8679
R^2	0.16	0.35	0.31	0.2	0.39	0.34

Notes: Robust standard errors in brackets. See text and notes to Table 3 for information on regression specification.

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

Appendix Table D2: Effect of Unemployment Rate at time of Graduation on Job and Industry Mobility (All Workers with Some College vs. Graduate Sample)

	Specification							
Area	**Regional**				**Regional**			
D>=0?	**No**				**Yes**			
Outcome	**Fraction Changed Firm**	**Fraction Changed Industry**	**Fraction Left First Firm**	**Fraction Left First Industry**	**Fraction Changed Firm**	**Fraction Changed Industry**	**Fraction Left First Firm**	**Fraction Left First Industry**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Experience Year								
0	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
1	0.0013	0.0007	0.0014	0.0005	0.0029	0.0021	0.0038	0.0025
	[0.0007]*	[0.0007]	[0.0009]	[0.0010]	[0.0008]***	[0.0007]***	[0.0010]***	[0.0011]**
2	0.0029	0.003	0.0029	0.0026	0.0031	0.0034	0.0046	0.0041
	[0.0007]***	[0.0007]***	[0.0010]***	[0.0010]**	[0.0007]***	[0.0006]***	[0.0011]***	[0.0011]***
3	0.0022	0.0022	0.0035	0.0035	0.0021	0.0023	0.0049	0.0045
	[0.0007]***	[0.0006]***	[0.0008]***	[0.0009]***	[0.0007]***	[0.0006]***	[0.0009]***	[0.0009]***
4	0.0018	0.0015	0.0039	0.0037	0.0018	0.0015	0.0052	0.0046
	[0.0007]**	[0.0007]**	[0.0008]***	[0.0009]***	[0.0006]***	[0.0006]**	[0.0009]***	[0.0009]***
5	0.0017	0.0014	0.0031	0.0032	0.0022	0.0019	0.0043	0.0039
	[0.0007]**	[0.0006]**	[0.0009]***	[0.0010]***	[0.0005]***	[0.0005]***	[0.0010]***	[0.0010]***
6	0.0009	0.0005	0.0029	0.003	0.0015	0.0011	0.0043	0.004
	[0.0006]	[0.0006]	[0.0009]***	[0.0009]***	[0.0005]***	[0.0005]**	[0.0010]***	[0.0010]***
7	0.0012	0.0014	0.0027	0.0029	0.0018	0.002	0.0041	0.0039
	[0.0007]*	[0.0007]**	[0.0009]***	[0.0010]***	[0.0006]***	[0.0006]***	[0.0011]***	[0.0010]***
8	0.0012	0.0012	0.0029	0.0032	0.0018	0.002	0.0044	0.0042
	[0.0009]	[0.0008]	[0.0010]***	[0.0009]***	[0.0008]**	[0.0007]***	[0.0011]***	[0.0010]***
9	0.0015	0.0016	0.0033	0.0039	0.0016	0.002	0.0047	0.0052
	[0.0011]	[0.0010]	[0.0009]***	[0.0009]***	[0.0010]	[0.0009]**	[0.0010]***	[0.0010]***
10	0.001	0.001	0.0036	0.0041	0.0013	0.0015	0.005	0.0055
	[0.0011]	[0.0010]	[0.0009]***	[0.0010]***	[0.0011]	[0.0011]	[0.0010]***	[0.0010]***
Constant	0.1485	0.1116	0.6686	0.5978	0.3407	0.3151	0.1391	0.523
	[0.0269]***	[0.0254]***	[0.0357]***	[0.0357]***	[0.0184]***	[0.0187]***	[0.0428]***	[0.0403]***
N	9629	9629	9611	9606	5871	5871	5863	5861
R^2	0.69	0.68	0.8	0.68	0.8	0.79	0.86	0.77

Notes: Robust standard errors in brackets. See text and notes to Table 5 for information on regression specification.

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

Appendix Table D3: Effect of Unemployment Rate at time of Graduation on Labor Force Participation, National Model

	Specification							
Area	**National**				**National**			
D>=0?	**No**				**Yes**			
Outcome	**Fraction Zero Earnings**	**Fraction Not in Sample**	**Fraction on UI**	**Father's Income**	**Fraction Zero Earnings**	**Fraction Not in Sample**	**Fraction on UI**	**Father's Income**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Experience Year								
0	0.0018	0.0026	0.0003	-0.0016	0.0026	0.0018	0.0015	-0.0049
	[0.0006]***	[0.0006]***	[0.0006]	[0.0038]	[0.0005]***	[0.0005]***	[0.0006]**	[0.0060]
1	0.0005	0.0007	0.0007	-0.003	0.001	0.0001	0.0008	-0.0044
	[0.0005]	[0.0003]**	[0.0003]**	[0.0042]	[0.0005]*	[0.0003]	[0.0003]***	[0.0059]
2	0.0005	0	0.0002	-0.0047	0.0007	-0.0002	0.0001	-0.0058
	[0.0004]	[0.0002]	[0.0003]	[0.0048]	[0.0004]	[0.0003]	[0.0003]	[0.0067]
3	0.0001	-0.0001	-0.0002	-0.0035	0.0001	-0.0001	-0.0004	-0.0057
	[0.0005]	[0.0002]	[0.0003]	[0.0050]	[0.0004]	[0.0003]	[0.0003]	[0.0069]
4	0.0002	0.0001	0.0001	-0.003	0	0.0001	0	-0.0051
	[0.0004]	[0.0003]	[0.0002]	[0.0049]	[0.0004]	[0.0004]	[0.0002]	[0.0070]
5	0.0002	0.0001	-0.0001	-0.0028	0.0002	0.0001	0	-0.0039
	[0.0005]	[0.0003]	[0.0002]	[0.0047]	[0.0005]	[0.0003]	[0.0002]	[0.0070]
6	0.0003	-0.0002	-0.0002	-0.0026	0.0003	0	-0.0002	-0.0034
	[0.0004]	[0.0002]	[0.0002]	[0.0047]	[0.0004]	[0.0003]	[0.0002]	[0.0069]
7	0.0002	0.0003	0.0002	-0.0032	0.0003	0.0005	0	-0.004
	[0.0005]	[0.0002]	[0.0003]	[0.0049]	[0.0004]	[0.0003]*	[0.0002]	[0.0072]
8	0.0002	0.0001	-0.0006	-0.002	0.0005	0.0002	-0.0006	-0.0024
	[0.0005]	[0.0003]	[0.0002]***	[0.0051]	[0.0004]	[0.0003]	[0.0002]***	[0.0073]
9	-0.0002	0	-0.0009	-0.001	0.0001	0.0001	-0.001	-0.001
	[0.0005]	[0.0002]	[0.0002]***	[0.0047]	[0.0004]	[0.0004]	[0.0002]***	[0.0068]
10	-0.0006	-0.0007	-0.0008	-0.0012	-0.0003	-0.0008	-0.0007	-0.0013
	[0.0004]	[0.0002]***	[0.0003]***	[0.0051]	[0.0004]	[0.0002]***	[0.0002]***	[0.0076]
Constant	0.1378	0.2133	0.0963	1.1904	0.1155	0.1942	0.0423	2.0907
	[0.0148]***	[0.0158]***	[0.0139]***	[0.3531]***	[0.0139]***	[0.0153]***	[0.0134]***	[0.5703]***
N	14989	14989	14989	11547	8989	8989	8989	6412
R^2	0.23	0.26	0.19	0.08	0.26	0.32	0.28	0.16

Notes: Robust standard errors in brackets. See text and notes to Table 1 for information on regression specification.

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

Appendix Table D4: Effect of Unemployment Rate at time of Graduation on Job and Industry Mobility, National Model

	Specification							
Area	**National**				**National**			
D>=0?	**No**				**Yes**			
Outcome	**Fraction Changed Firm**	**Fraction Changed Industry**	**Fraction Left First Firm**	**Fraction Left First Industry**	**Fraction Changed Firm**	**Fraction Changed Industry**	**Fraction Left First Firm**	**Fraction Left First Industry**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Experience Year								
0	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-
1	0.0009	0	0.0016	0.0008	0.0031	0.0023	0.0036	0.0024
	[0.0008]	[0.0007]	[0.0026]	[0.0021]	[0.0010]***	[0.0009]**	[0.0027]	[0.0022]
2	0.0046	0.0049	0.0039	0.0043	0.0057	0.0065	0.0054	0.0058
	[0.0010]***	[0.0010]***	[0.0023]	[0.0021]*	[0.0011]***	[0.0010]***	[0.0026]*	[0.0023]**
3	0.0039	0.0036	0.0047	0.0051	0.0038	0.0038	0.0057	0.006
	[0.0009]***	[0.0009]***	[0.0017]**	[0.0016]***	[0.0010]***	[0.0008]***	[0.0018]***	[0.0017]***
4	0.0033	0.0031	0.0041	0.0049	0.0035	0.0033	0.0048	0.0055
	[0.0011]**	[0.0011]**	[0.0012]***	[0.0013]***	[0.0009]***	[0.0009]***	[0.0013]***	[0.0014]***
5	0.0023	0.0014	0.0031	0.0043	0.0026	0.0019	0.0038	0.0049
	[0.0007]***	[0.0008]*	[0.0013]**	[0.0016]**	[0.0006]***	[0.0007]**	[0.0014]**	[0.0017]**
6	0.0005	0.0001	0.0027	0.0039	0.0009	0.0007	0.004	0.0054
	[0.0007]	[0.0006]	[0.0013]*	[0.0016]**	[0.0006]	[0.0005]	[0.0014]**	[0.0018]**
7	0.0005	0.0005	0.0026	0.0038	0.0004	0.0002	0.0036	0.005
	[0.0011]	[0.0011]	[0.0013]*	[0.0014]**	[0.0012]	[0.0012]	[0.0013]**	[0.0016]**
8	0	0.0006	0.004	0.0051	-0.0001	0.0005	0.0049	0.006
	[0.0020]	[0.0022]	[0.0013]**	[0.0014]***	[0.0015]	[0.0018]	[0.0012]***	[0.0014]***
9	0.0006	0.0018	0.0053	0.0072	0.0001	0.0013	0.0058	0.008
	[0.0025]	[0.0025]	[0.0018]**	[0.0019]***	[0.0025]	[0.0023]	[0.0017]***	[0.0017]***
10	0.0009	0.0019	0.0054	0.0068	0.0005	0.0012	0.0058	0.0076
	[0.0021]	[0.0021]	[0.0013]***	[0.0017]***	[0.0018]	[0.0018]	[0.0013]***	[0.0017]***
Constant	-0.0756	0.0933	0.5615	0.4969	-0.1821	0.0026	0.0905	0.3862
	[0.0314]**	[0.0288]***	[0.0902]***	[0.0879]***	[0.0358]***	[0.0310]	[0.1250]	[0.0890]***
N	9854	9848	9836	9829	6025.0000	6023	6014	6012
R^2	0.74	0.74	0.83	0.72	0.8300	0.83	0.86	0.77

Notes: Robust standard errors in brackets. See text and notes to Table 1 for information on regression specification.

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

Appendix Table D5: Average Wage Growth for Stayers and Movers Between Firms, Industries, and Provinces -- Regional Model, Cohorts 1982-1995

		Wage Growth by Movers Status					
	Overall Earnings Growth	Gains of Job Movers	Gains of Job Stayers	Gains of Industry Movers	Gains of Industry Stayers	Gains of Province Movers	Gains of Province Stayers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Experience Year	**Panel A: All Workers**						
1	0.469	0.485	0.4588	0.4594	0.4589	0.5562	0.4667
2	0.2145	0.2707	0.1858	0.2861	0.1858	0.2828	0.2128
3	0.1834	0.2488	0.155	0.2736	0.1552	0.244	0.182
4	0.1542	0.2244	0.1272	0.2128	0.1269	0.1957	0.1533
5	0.1245	0.1922	0.1026	0.2202	0.1028	0.165	0.1238
6	0.0952	0.131	0.0853	0.1021	0.0854	0.1166	0.0948
7	0.0829	0.1216	0.0736	0.1049	0.0736	0.1089	0.0825
8	0.0646	0.0831	0.0606	0.0613	0.0606	0.0848	0.0643
9	0.0606	0.0847	0.0559	0.075	0.0559	0.0952	0.0602
10	0.0615	0.0962	0.0549	0.0744	0.0549	0.0823	0.0612
Experience Year	**Panel B: Graduates**						
1	0.5571	0.5927	0.5363	0.5907	0.5364	0.6357	0.555
2	0.2186	0.2824	0.1908	0.2872	0.1907	0.278	0.2172
3	0.1614	0.2204	0.1395	0.2268	0.1395	0.2012	0.1606
4	0.128	0.1839	0.1099	0.1627	0.1096	0.1277	0.128
5	0.1051	0.1571	0.0907	0.1536	0.0908	0.1226	0.1048
6	0.0858	0.1107	0.0797	0.0744	0.0798	0.0788	0.0859
7	0.0769	0.1003	0.0719	0.0511	0.0716	0.0765	0.0769
8	0.0587	0.0716	0.0561	0.0444	0.0563	0.0714	0.0585
9	0.0578	0.0774	0.0542	0.0072	0.0541	0.0561	0.0578
10	0.0578	0.0762	0.0545	0.03	0.0543	0.0775	0.0575

Notes: See Oreopoulos et al. (2006) for discussion.

Appendix Table D6: Effect of Unemployment Rate at time of Graduation on Gains from Job, Industry, and Regional Mobility -- Regional Model for All Workers, Cohorts 1982-1995

		Marginal Effect on Wage Growth by Movers Status					
	Effect on Overall Earnings Growth	Effect on Gains of Job Movers	Effect on Gains of Job Stayers	Effect on Gains of Industry Movers	Effect on Gains of Industry Stayers	Effect on Gains of Province Movers	Effect on Gains of Province Stayers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Experience Year							
1	-0.0017	0.0011	-0.0039	0.0065	-0.0039	0.0115	-0.0024
	[0.0019]	[0.0027]	[0.0018]**	[0.0058]	[0.0018]**	[0.0070]	[0.0020]
2	0.0047	0.0062	0.0034	0.0071	0.0033	0.0006	0.0047
	[0.0010]***	[0.0015]***	[0.0011]***	[0.0050]	[0.0010]***	[0.0055]	[0.0010]***
3	0.0063	0.0089	0.0049	0.0153	0.0049	0.0042	0.0063
	[0.0007]***	[0.0015]***	[0.0007]***	[0.0056]***	[0.0007]***	[0.0053]	[0.0007]***
4	0.0044	0.006	0.0037	-0.0007	0.0036	-0.0076	0.0047
	[0.0007]***	[0.0018]***	[0.0005]***	[0.0061]	[0.0005]***	[0.0058]	[0.0007]***
5	0.0039	0.007	0.0029	0.0054	0.0029	-0.0037	0.0042
	[0.0007]***	[0.0022]***	[0.0006]***	[0.0054]	[0.0006]***	[0.0054]	[0.0007]***
6	0.0028	0.0057	0.0021	0.0051	0.002	-0.0181	0.0033
	[0.0007]***	[0.0016]***	[0.0007]***	[0.0056]	[0.0007]***	[0.0058]***	[0.0007]***
7	0.0026	0.0036	0.0023	0.0062	0.0022	0.0006	0.0028
	[0.0008]***	[0.0023]	[0.0006]***	[0.0068]	[0.0006]***	[0.0066]	[0.0008]***
8	0.0044	0.007	0.0035	0.0047	0.0034	-0.0054	0.0046
	[0.0008]***	[0.0020]***	[0.0006]***	[0.0066]	[0.0006]***	[0.0069]	[0.0008]***
9	0.0025	-0.0003	0.0025	-0.0095	0.0025	-0.0053	0.0027
	[0.0007]***	[0.0023]	[0.0006]***	[0.0066]	[0.0005]***	[0.0092]	[0.0008]***
10	0.004	0.0052	0.0034	-0.0038	0.0035	-0.0052	0.0042
	[0.0009]***	[0.0026]**	[0.0007]***	[0.0076]	[0.0007]***	[0.0070]	[0.0009]***
Constant	[0.0380]***	[0.0512]	[0.0175]***	[0.1588]	[0.0373]***	[0.2047]	[0.0198]***
	39648	23240	16408	10654	18084	8587	31061
N	0	0	0	0	0	0	0
R-squared	0	0	0	0	0	0	0

Notes: Robust standard errors in brackets. See Oreopoulos et al. (2006) for a discussion.

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

Appendix Table E1: Effect of Unemployment Rate at time of Graduation on Firm Size and Firm Wages (All Workers with Some College vs. Graduate Sample)

	Specification							
Area	**Regional**				**Regional**			
D>=0?	**No**				**Yes**			
Outcome	**Log Firm Size**	**Fraction Firm Size > 1000**	**Average Median Firm Wage**	**Average Log Firm Payroll**	**Log Firm Size**	**Fraction Firm Size > 1000**	**Average Median Firm Wage**	**Average Log Firm Payroll**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Experience Year								
0	-0.0051	-0.0012	-0.0107	-0.0135	-0.008	-0.0016	-0.0097	-0.0169
	[0.0051]	[0.0008]	[0.0013]***	[0.0058]**	[0.0050]	[0.0008]*	[0.0014]***	[0.0058]***
1	-0.0084	-0.0016	-0.0105	-0.0186	-0.0115	-0.002	-0.0096	-0.0224
	[0.0052]	[0.0008]**	[0.0011]***	[0.0057]***	[0.0049]**	[0.0009]**	[0.0011]***	[0.0055]***
2	-0.0043	-0.0013	-0.0074	-0.0118	-0.0088	-0.002	-0.0073	-0.0173
	[0.0050]	[0.0008]*	[0.0011]***	[0.0055]**	[0.0050]*	[0.0008]**	[0.0011]***	[0.0056]***
3	0.0013	-0.0004	-0.0057	-0.0047	-0.0034	-0.0012	-0.0057	-0.0107
	[0.0047]	[0.0008]	[0.0010]***	[0.0051]	[0.0047]	[0.0008]	[0.0010]***	[0.0052]**
4	0.0025	-0.0003	-0.004	-0.0015	-0.0022	-0.0009	-0.0044	-0.008
	[0.0048]	[0.0008]	[0.0010]***	[0.0052]	[0.0048]	[0.0008]	[0.0011]***	[0.0054]
5	0.0061	0	-0.0032	0.0034	0.0025	-0.0003	-0.0039	-0.0023
	[0.0048]	[0.0008]	[0.0010]***	[0.0053]	[0.0051]	[0.0009]	[0.0012]***	[0.0057]
6	0.0048	-0.0002	-0.0039	0.0011	0.0014	-0.0005	-0.0049	-0.0046
	[0.0047]	[0.0008]	[0.0011]***	[0.0052]	[0.0050]	[0.0009]	[0.0012]***	[0.0056]
7	0.005	-0.0002	-0.0039	0.0014	0.0013	-0.0007	-0.005	-0.0047
	[0.0050]	[0.0008]	[0.0011]***	[0.0055]	[0.0054]	[0.0009]	[0.0012]***	[0.0060]
8	0.008	0.0002	-0.0029	0.0055	0.0029	-0.0003	-0.0044	-0.0022
	[0.0051]	[0.0008]	[0.0011]***	[0.0056]	[0.0054]	[0.0009]	[0.0011]***	[0.0060]
9	0.0095	0.0004	-0.002	0.0075	0.0044	0.0001	-0.0035	0.0002
	[0.0051]*	[0.0008]	[0.0011]*	[0.0057]	[0.0055]	[0.0009]	[0.0011]***	[0.0063]
10	0.0122	0.001	-0.0002	0.0119	0.0048	0.0002	-0.002	0.0021
	[0.0057]**	[0.0009]	[0.0013]	[0.0063]*	[0.0068]	[0.0010]	[0.0015]	[0.0077]
Constant	7.5036	0.6255	0.702	6.4307	8.1745	0.719	0.8069	7.2971
	[0.1883]***	[0.0280]***	[0.0500]***	[0.2252]***	[0.1953]***	[0.0283]***	[0.0368]***	[0.2203]***
N	13978	13978	13978	13978	8435	8435	8435	8435
R^2	0.36	0.32	0.53	0.4	0.53	0.47	0.75	0.6

Notes: Robust standard errors in brackets. See text and notes to Table 5 for information on regression specification.

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

Appendix Table E2: Effect of Unemployment Rate at time of Graduation on Firm Size and Firm Wages - National Sample with Linear Cohort Trends

	Specification							
Area	**National**				**National**			
D>=0?	**No**				**Yes**			
Outcome	**Log Firm Size**	**Fraction Firm Size > 1000**	**Average Median Firm Wage**	**Average Log Firm Payroll**	**Log Firm Size**	**Fraction Firm Size > 1000**	**Average Median Firm Wage**	**Average Log Firm Payroll**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Experience Year								
0	-0.0283	-0.0045	-0.014	-0.0382	-0.0428	-0.006	-0.0143	-0.0543
	[0.0088]***	[0.0012]***	[0.0043]***	[0.0095]***	[0.0088]***	[0.0012]***	[0.0043]***	[0.0099]***
1	-0.0333	-0.0049	-0.011	-0.0432	-0.0438	-0.0059	-0.0112	-0.0549
	[0.0052]***	[0.0008]***	[0.0037]***	[0.0070]***	[0.0070]***	[0.0010]***	[0.0035]***	[0.0083]***
2	-0.0347	-0.0054	-0.0075	-0.0431	-0.042	-0.0061	-0.0074	-0.0508
	[0.0058]***	[0.0009]***	[0.0026]***	[0.0073]***	[0.0072]***	[0.0010]***	[0.0027]**	[0.0086]***
3	-0.0295	-0.0045	-0.0066	-0.0377	-0.0336	-0.005	-0.0057	-0.041
	[0.0063]***	[0.0009]***	[0.0017]***	[0.0069]***	[0.0072]***	[0.0010]***	[0.0020]**	[0.0079]***
4	-0.0266	-0.0043	-0.0046	-0.0323	-0.0267	-0.0042	-0.0035	-0.032
	[0.0052]***	[0.0008]***	[0.0016]***	[0.0060]***	[0.0062]***	[0.0008]***	[0.0020]	[0.0073]***
5	-0.0239	-0.0039	-0.006	-0.0306	-0.0238	-0.0035	-0.0046	-0.0297
	[0.0058]***	[0.0009]***	[0.0021]***	[0.0071]***	[0.0058]***	[0.0010]***	[0.0022]*	[0.0072]***
6	-0.0271	-0.0042	-0.0074	-0.0353	-0.0267	-0.0037	-0.0061	-0.0345
	[0.0050]***	[0.0008]***	[0.0023]***	[0.0062]***	[0.0048]***	[0.0008]***	[0.0022]**	[0.0059]***
7	-0.0199	-0.0029	-0.0064	-0.0264	-0.0237	-0.0035	-0.0062	-0.0311
	[0.0050]***	[0.0008]***	[0.0027]**	[0.0066]***	[0.0048]***	[0.0007]***	[0.0025]**	[0.0064]***
8	-0.0115	-0.0013	-0.004	-0.0147	-0.0226	-0.0027	-0.0051	-0.0282
	[0.0057]*	[0.0009]	[0.0031]	[0.0073]*	[0.0055]***	[0.0008]***	[0.0029]*	[0.0072]***
9	-0.003	0.0002	0.0001	-0.0028	-0.0183	-0.0016	-0.0015	-0.0205
	[0.0080]	[0.0012]	[0.0031]	[0.0096]	[0.0076]**	[0.0012]	[0.0029]	[0.0091]**
10	0.0028	0.0016	0.0049	0.007	-0.0116	0	0.0031	-0.0096
	[0.0071]	[0.0011]	[0.0030]	[0.0092]	[0.0080]	[0.0012]	[0.0024]	[0.0096]
Constant	12.0757	1.2584	1.8382	11.9304	13.1274	1.445	1.9796	13.2333
	[0.3681]***	[0.0570]***	[0.1541]***	[0.4772]***	[0.2838]***	[0.0460]***	[0.1542]***	[0.3754]***
N	13978	13978	13978	13978	8435	8435	8435	8435
R^2	0.29	0.25	0.45	0.35	0.42	0.38	0.64	0.51

Notes: Robust standard errors in brackets. See text and notes to Table 1 for information on regression specification.

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

Appendix Table E3: Effect of Unemployment Rate at time of Graduation on Firm and Industry Wages (2-Digit), Graduate Sample

Outcome	Specification				
	Average Median Firm Wage	Average Median Firm Wage Controlling for Region	Average Median Firm Wage Controlling for Experience	Average Industry Wage	Average Industry Wage Controlling for Experience
	(1)	(2)	(3)	(4)	(5)
Experience Year					
0	-0.0097	-0.0087	-0.009	-0.0028	-0.0027
	[0.0014]***	[0.0015]***	[0.0010]***	[0.0005]***	[0.0005]***
1	-0.0096	-0.0089	-0.0082	-0.0025	-0.0024
	[0.0011]***	[0.0012]***	[0.0009]***	[0.0005]***	[0.0005]***
2	-0.0073	-0.007	-0.006	-0.0019	-0.0018
	[0.0011]***	[0.0011]***	[0.0008]***	[0.0005]***	[0.0005]***
3	-0.0057	-0.0057	-0.005	-0.0014	-0.0013
	[0.0010]***	[0.0011]***	[0.0007]***	[0.0004]***	[0.0004]***
4	-0.0044	-0.0044	-0.0041	-0.0009	-0.0009
	[0.0011]***	[0.0011]***	[0.0008]***	[0.0004]**	[0.0004]**
5	-0.0039	-0.004	-0.0037	-0.0011	-0.0011
	[0.0012]***	[0.0012]***	[0.0008]***	[0.0005]**	[0.0004]**
6	-0.0049	-0.005	-0.0043	-0.0015	-0.0014
	[0.0012]***	[0.0012]***	[0.0008]***	[0.0005]***	[0.0004]***
7	-0.005	-0.0052	-0.0043	-0.0013	-0.0013
	[0.0012]***	[0.0012]***	[0.0008]***	[0.0005]***	[0.0004]***
8	-0.0044	-0.0045	-0.0043	-0.0009	-0.0009
	[0.0011]***	[0.0012]***	[0.0008]***	[0.0005]**	[0.0005]**
9	-0.0035	-0.0036	-0.0034	-0.0009	-0.0008
	[0.0011]***	[0.0011]***	[0.0009]***	[0.0005]*	[0.0005]*
10	-0.002	-0.0022	-0.0027	-0.0004	-0.0004
	[0.0015]	[0.0015]	[0.0009]***	[0.0005]	[0.0005]
Constant	0.8069	1.1159	0.0244	9.1073	0.0053
	[0.0368]***	[0.0407]***	[0.0284]	[0.0160]***	[0.0149]
N	8435	8512	8507	8479	8479
R^2	0.75	0.75	0.61	0.49	0.5

Notes: Robust standard errors in brackets. See text and notes to Table 5 for information on regression specification.

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

Appendix Table F1: Effect of Unemployment Rate at time of Graduation on Log Real Earnings Controlling for Fixed Effects for First Industry or First Firm and by Size of Average Median Firm Wage and Average Log Firm Payroll

	Specification					
	Fixed Effects for First Firm/ Industry		By Average Median Firm Wage		By Average Log Firm Payroll	
			Main Effect	Difference	Main Effect	Difference
	Firm	Industry	<75th Percentile	>=75th Percentile	<75th Percentile	>=75th Percentile
	(1)	(2)	(3)	(4)	(5)	(6)
Experience Year						
0	-0.0091	-0.0091	-0.0146	-0.0021	-0.0157	-0.0025
	[0.0033]***	[0.0033]***	[0.0028]***	[0.0022]	[0.0028]***	[0.0020]
1	-0.0111	-0.0111	-0.0159	-0.0036	-0.0159	-0.0038
	[0.0028]***	[0.0028]***	[0.0026]***	[0.0023]	[0.0024]***	[0.0021]*
2	-0.009	-0.009	-0.0134	-0.0053	-0.0136	-0.0058
	[0.0027]***	[0.0027]***	[0.0024]***	[0.0022]**	[0.0024]***	[0.0021]***
3	-0.0069	-0.0069	-0.0109	-0.0051	-0.0101	-0.0068
	[0.0025]***	[0.0025]***	[0.0025]***	[0.0023]**	[0.0023]***	[0.0023]***
4	-0.0051	-0.0051	-0.0096	-0.0039	-0.0096	-0.0044
	[0.0027]*	[0.0027]*	[0.0020]***	[0.0019]**	[0.0021]***	[0.0018]**
5	-0.0032	-0.0032	-0.0082	-0.0026	-0.0088	-0.0026
	[0.0024]	[0.0024]	[0.0018]***	[0.0016]*	[0.0020]***	[0.0017]
6	-0.0031	-0.0031	-0.0067	-0.0043	-0.007	-0.0041
	[0.0025]	[0.0025]	[0.0021]***	[0.0017]***	[0.0020]***	[0.0017]**
7	-0.0027	-0.0027	-0.0052	-0.0058	-0.0069	-0.0039
	[0.0027]	[0.0027]	[0.0019]***	[0.0016]***	[0.0019]***	[0.0014]***
8	-0.0005	-0.0005	-0.005	-0.0033	-0.0073	-0.0006
	[0.0023]	[0.0023]	[0.0020]**	[0.0018]*	[0.0021]***	[0.0016]
9	-0.0013	-0.0013	-0.0036	-0.006	-0.0061	-0.0013
	[0.0027]	[0.0027]	[0.0023]	[0.0017]***	[0.0022]***	[0.0020]
10	0.0028	0.0028	-0.0011	-0.0049	-0.0022	-0.0034
	[0.0030]	[0.0030]	[0.0026]	[0.0016]***	[0.0025]	[0.0021]
Constant	15.3696	15.3696	8.9546	--	8.8768	--
	[.]	[.]	[0.0908]***	--	[0.0664]***	--
N	418600	418600	12700	--	14614	--
R-squared	0.8	0.8	0.93	--	0.93	--

Note: First two columns indicate models with firm or industry fixed effects. The remainign columns display coefficients from two interacted regression models, respectively. Each columns shows the unemployment rate and experience interactions from regressing log annual earnings on the youth unemployment rate in the province of first residence, interacted with experience years 0 to 10, plus province of first residence fixed effects, experience fixed effects, and year of graduation fixed effects. One, two, and three asterix indicates statistical significance at the 10 percent, 5 percent, and 1 percent levels respectively. See text for more details.

Appendix Table F2: Effect of Unemployment Rate at time of Graduation on Log Real Earnings Controlling for Fixed Effects for First Industry or First Firm

	Specification							
National/Regional	**National**	**National**	**Regional**	**Regional**	**National**	**National**	**Regional**	**Regional**
Trend	**Linear**	**Linear**	**NA**	**NA**	**Linear**	**Linear**	**NA**	**NA**
D>=0?	**No**	**No**	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**
Fixed Effects for First Firm/ Industry	**Firm**	**Industry**	**Firm**	**Industry**	**Firm**	**Industry**	**Firm**	**Industry**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Experience Year								
0	-0.0067	-0.0141	-0.0079	-0.0119	-0.0077	-0.0077	-0.0091	-0.0091
	[0.0046]	[0.0030]***	[0.0033]**	[0.0026]***	[0.0048]	[0.0048]	[0.0033]***	[0.0033]***
1	-0.0058	-0.013	-0.0111	-0.0144	-0.0061	-0.0061	-0.0111	-0.0111
	[0.0049]	[0.0037]***	[0.0029]***	[0.0023]***	[0.0046]	[0.0046]	[0.0028]***	[0.0028]***
2	-0.0035	-0.0091	-0.0093	-0.0128	-0.0036	-0.0036	-0.009	-0.009
	[0.0040]	[0.0033]**	[0.0030]***	[0.0021]***	[0.0034]	[0.0034]	[0.0027]***	[0.0027]***
3	-0.0005	-0.0047	-0.0056	-0.0087	-0.001	-0.001	-0.0069	-0.0069
	[0.0026]	[0.0024]*	[0.0028]**	[0.0021]***	[0.0023]	[0.0023]	[0.0025]***	[0.0025]***
4	-0.0006	-0.0027	-0.0035	-0.0066	-0.0001	-0.0001	-0.0051	-0.0051
	[0.0035]	[0.0028]	[0.0027]	[0.0020]***	[0.0032]	[0.0032]	[0.0027]*	[0.0027]*
5	-0.0021	-0.0039	-0.0019	-0.0056	-0.0004	-0.0004	-0.0032	-0.0032
	[0.0038]	[0.0028]	[0.0023]	[0.0019]***	[0.0031]	[0.0031]	[0.0024]	[0.0024]
6	0	-0.0022	-0.0011	-0.0051	0.0006	0.0006	-0.0031	-0.0031
	[0.0047]	[0.0031]	[0.0027]	[0.0022]**	[0.0045]	[0.0045]	[0.0025]	[0.0025]
7	-0.0011	-0.0027	-0.0015	-0.0051	0.0011	0.0011	-0.0027	-0.0027
	[0.0047]	[0.0031]	[0.0029]	[0.0023]**	[0.0041]	[0.0041]	[0.0027]	[0.0027]
8	0.001	-0.0003	0.0005	-0.0036	0.0024	0.0024	-0.0005	-0.0005
	[0.0041]	[0.0031]	[0.0026]	[0.0021]*	[0.0025]	[0.0025]	[0.0023]	[0.0023]
9	0.0032	0.0013	0.0001	-0.0036	0.0035	0.0035	-0.0013	-0.0013
	[0.0044]	[0.0029]	[0.0028]	[0.0022]*	[0.0028]	[0.0028]	[0.0027]	[0.0027]
10	0.0068	0.0041	0.0038	-0.0014	0.0075	0.0075	0.0028	0.0028
	[0.0035]*	[0.0023]*	[0.0031]	[0.0023]	[0.0025]**	[0.0025]**	[0.0030]	[0.0030]
Constant	6.8467	7.6874		10.1806	13.8693	13.8693	15.3696	15.3696
	[.]	[0.1990]***		[0.0825]***	[5.4863e+11]	[5.4863e+11]	[.]	[.]
N	596931	60212	596931	60212	418600	418600	418600	418600
R-squared	0.79	0.85	0.8	0.86	0.8	0.8	0.8	0.8

Notes: Robust standard errors in brackets. Basic regression models described in text and notes to Table 1 with firm or industry fixed effects.

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

Appendix Table F3: Effect of Unemployment Rate at time of Graduation by Initial Firm Type - Regional Sample with D>=0

	Firm Size		Firm Size		Average Median Firm Wage		Average Log Firm Payroll	
	Level <1000	Difference >=1000	Level <5000	Difference >=5000	Level <75th Percentile	Difference >=75th Percentile	Level <75th Percentile	Difference >=75th Percentile
	(3)	(4)	(1)	(2)	(5)	(6)	(7)	(8)
Experience Year								
0	-0.0168	-0.0025	-0.0174	-0.0028	-0.0146	-0.0021	-0.0157	-0.0025
	[0.0025]***	[0.0020]	[0.0024]***	[0.0024]	[0.0028]***	[0.0022]	[0.0028]***	[0.0020]
1	-0.0154	-0.0038	-0.0162	-0.0036	-0.0159	-0.0036	-0.0159	-0.0038
	[0.0024]***	[0.0021]*	[0.0021]***	[0.0023]	[0.0026]***	[0.0023]	[0.0024]***	[0.0021]*
2	-0.0119	-0.0058	-0.013	-0.0055	-0.0134	-0.0053	-0.0136	-0.0058
	[0.0023]***	[0.0021]***	[0.0021]***	[0.0019]***	[0.0024]***	[0.0022]**	[0.0024]***	[0.0021]***
3	-0.0074	-0.0068	-0.0091	-0.0055	-0.0109	-0.0051	-0.0101	-0.0068
	[0.0025]***	[0.0023]***	[0.0020]***	[0.0017]***	[0.0025]***	[0.0023]**	[0.0023]***	[0.0023]***
4	-0.0072	-0.0044	-0.0082	-0.0036	-0.0096	-0.0039	-0.0096	-0.0044
	[0.0020]***	[0.0018]**	[0.0018]***	[0.0015]**	[0.0020]***	[0.0019]**	[0.0021]***	[0.0018]**
5	-0.0065	-0.0026	-0.007	-0.0022	-0.0082	-0.0026	-0.0088	-0.0026
	[0.0021]***	[0.0017]	[0.0019]***	[0.0017]	[0.0018]***	[0.0016]*	[0.0020]***	[0.0017]
6	-0.0046	-0.0041	-0.006	-0.0025	-0.0067	-0.0043	-0.007	-0.0041
	[0.0020]**	[0.0017]**	[0.0018]***	[0.0017]	[0.0021]***	[0.0017]***	[0.0020]***	[0.0017]**
7	-0.0046	-0.0039	-0.006	-0.0024	-0.0052	-0.0058	-0.0069	-0.0039
	[0.0018]**	[0.0014]***	[0.0017]***	[0.0016]	[0.0019]***	[0.0016]***	[0.0019]***	[0.0014]***
8	-0.006	-0.0006	-0.0063	-0.0002	-0.005	-0.0033	-0.0073	-0.0006
	[0.0020]***	[0.0016]	[0.0018]***	[0.0017]	[0.0020]**	[0.0018]*	[0.0021]***	[0.0016]
9	-0.0046	-0.0013	-0.0049	-0.0011	-0.0036	-0.006	-0.0061	-0.0013
	[0.0023]*	[0.0020]	[0.0020]**	[0.0019]	[0.0023]	[0.0017]***	[0.0022]***	[0.0020]
10	-0.0012	-0.0034	-0.0008	-0.005	-0.0011	-0.0049	-0.0022	-0.0034
	[0.0025]	[0.0021]	[0.0022]	[0.0020]**	[0.0026]	[0.0016]***	[0.0025]	[0.0021]
Constant	8.8768		8.943		8.9546		8.8768	
	[0.0664]***		[0.0664]***		[0.0908]***		[0.0664]***	
N	14614		14569		12700		14614	
R^2	0.93		0.93		0.93		0.93	

Note: Columns indicate the sample selected on for each regression. Each columns shows the unemployment rate and experience interactions from regressing log annual earnings on the youth unemployment rate in the province of first residence, interacted with experience years 0 to 10, plus province of first residence fixed effects, experience fixed effects, and year of graduation fixed effects. One, two, and three asterix indicates statistical significance at the 10 percent, 5 percent, and 1 percent levels respectively. See text for more details.

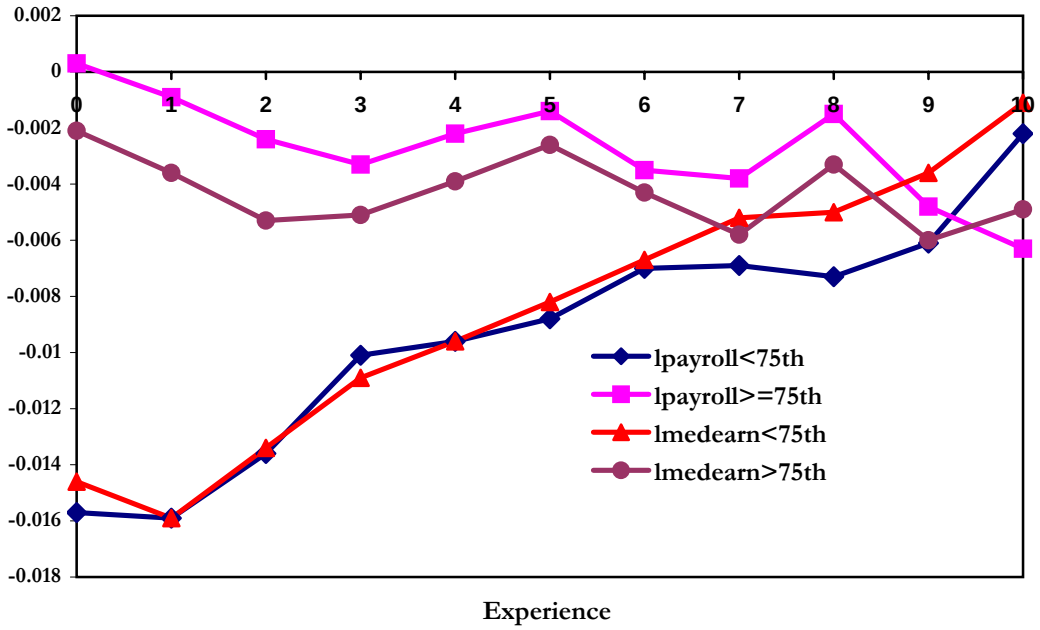
Appendix Table F4: Effect of Unemployment Rate at time of Graduation by Average Industry Turnover Rate- Regional Sample with D>=0

	Average Turnover Rate at 2-Digit Industry Level, Controlling for Year Effects	
	Bottom Quintile	**Top Quintile**
	(1)	**(2)**
Experience Year		
0	-0.0165	-0.0206
	(0.003)	(0.004)
1	-0.0176	-0.0208
	(0.003)	(0.004)
2	-0.0149	-0.0161
	(0.003)	(0.003)
3	-0.0132	-0.0118
	(0.002)	(0.003)
4	-0.0110	-0.0091
	(0.002)	(0.003)
5	-0.0102	-0.0067
	(0.002)	(0.003)
6	-0.0100	-0.0049
	(0.002)	(0.003)
7	-0.0103	-0.0050
	(0.003)	(0.003)
8	-0.0090	-0.0052
	(0.002)	(0.003)
9	-0.0097	-0.0014
	(0.002)	(0.003)
10	-0.0085	-0.0021
	(0.002)	(0.003)

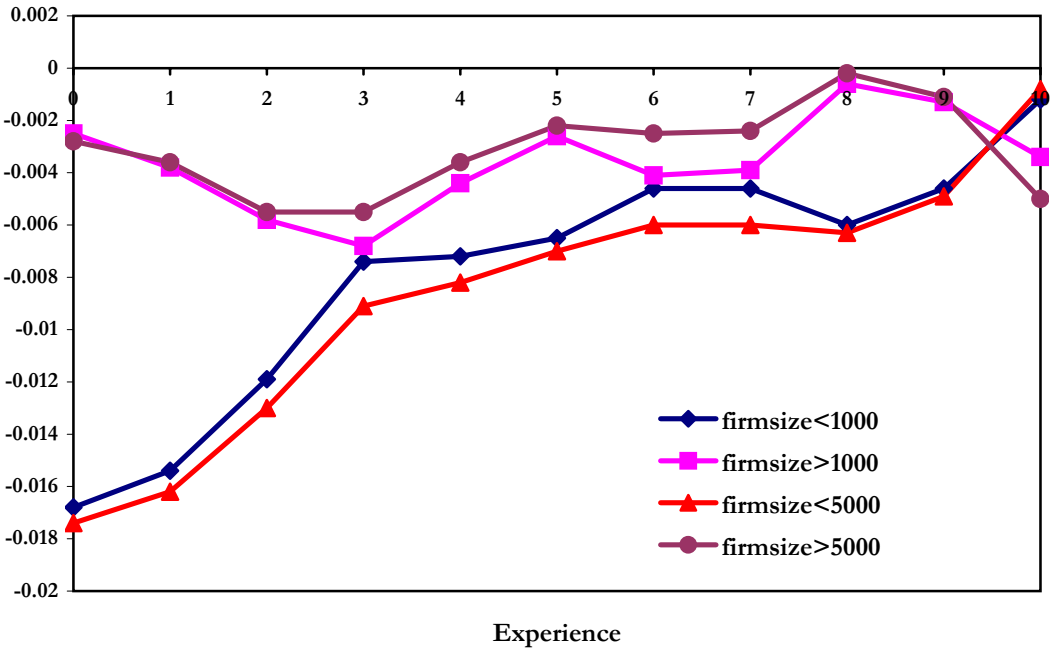
Note: Columns indicate the sample selected on for each regression. Each columns shows the unemployment rate and experience interactions from regressing log annual earnings on the youth unemployment rate in the province of first residence, interacted with experience years 0 to 10, plus province of residence fixed effects, experience fixed effects, and year of graduation fixed effects. See text for more details.

Appendix Figure F1: Effects of Initial Unemployment Rates on Wages by Initial Firm Type

Panel A: Losses and Reversion by Payroll and Median Earning

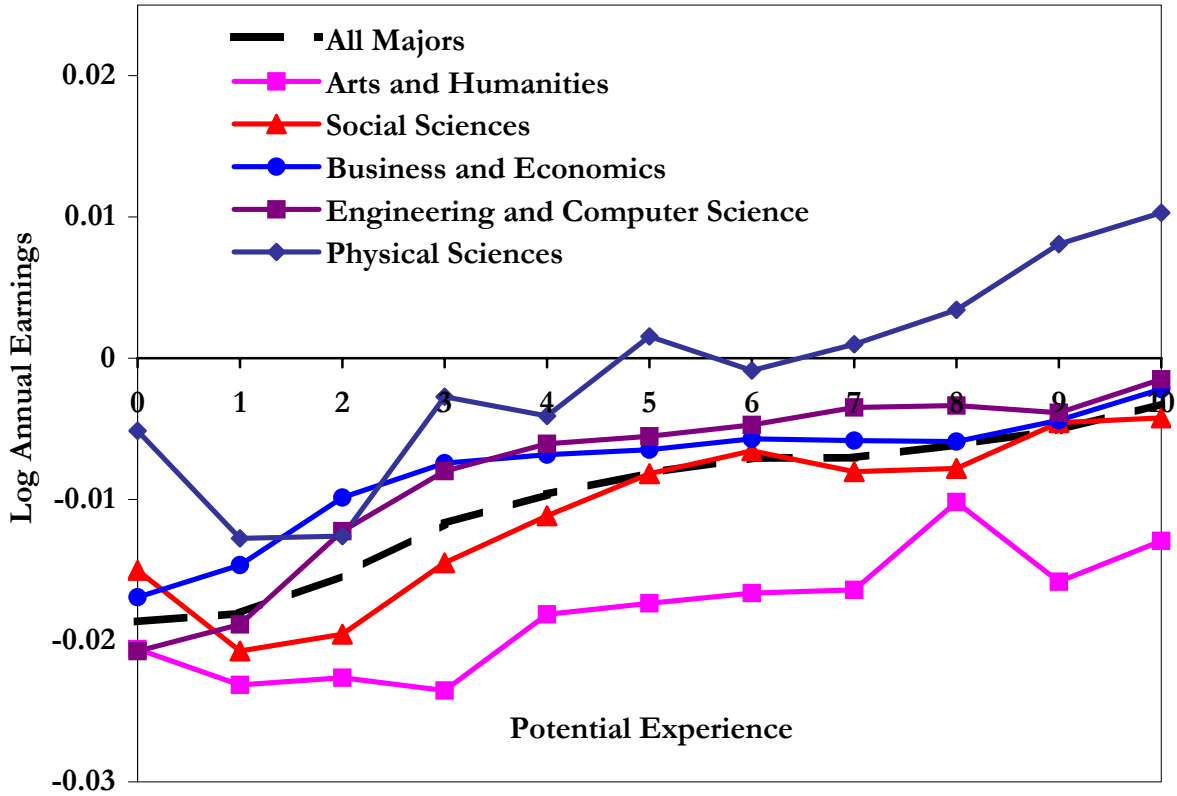


Panel B: Losses and Reversion by Firm Size



Notes: See notes in Appendix Table F3.

Appendix Figure G1: Effect of Graduating in Recession on Annual Earnings by Major of Study (Graduates Only)



Notes: See notes of Table 1 and text for regression specification.

Appendix Table G1: Heterogeneity in Initial Loss and Reversion for Workers from Top, Middle, and Bottom Colleges [Classified by Average Wage of Graduates]

Outcome Variable		All Graduates	Position in Average Annual Earnings by Colleges		
			Bottom Third	Middle Third	Top Third
Annual Earnings	**Drop**	-0.0183	-0.0212	-0.0202	-0.0165
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Slope	0.0020	0.0015	0.0017	0.0024
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Fade	0.0015	0.0011	0.0013	0.0018
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
Average Firm Median Log Earnings	**Drop**	-0.0094	-0.0097	-0.0140	-0.0092
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Slope	0.0010	0.0007	0.0010	0.0012
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Fade	0.0007	0.0003	0.0006	0.0009
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
Average Firm Employment	**Drop**	-0.0104	0.0347	-0.0177	-0.0245
		(0.0000)	(0.0003)	(0.0001)	(0.0000)
	Slope	0.0021	0.0019	0.0020	0.0034
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Fade	0.0016	0.0001	0.0020	0.0028
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
Fraction Changed Employer	**Jump**	0.0032	0.0023	0.0021	0.0061
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Slope	0.0002	-0.0004	0.0007	0.0002
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Fade	0.0001	0.0000	0.0004	-0.0001
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
Fraction Left 1st Employer	**Drop**	0.0030	-0.0018	0.0027	0.0067
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Slope	-0.0002	0.0004	0.0001	-0.0009
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Fade	-0.0001	0.0004	0.0000	-0.0006
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
Fraction Zero Earnings	**Drop**	0.0013	0.0016	0.0012	0.0012
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Slope	-0.0003	-0.0002	-0.0002	-0.0003
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Fade	-0.0002	-0.0001	-0.0001	-0.0002
		(0.0000)	(0.0000)	(0.0000)	(0.0000)

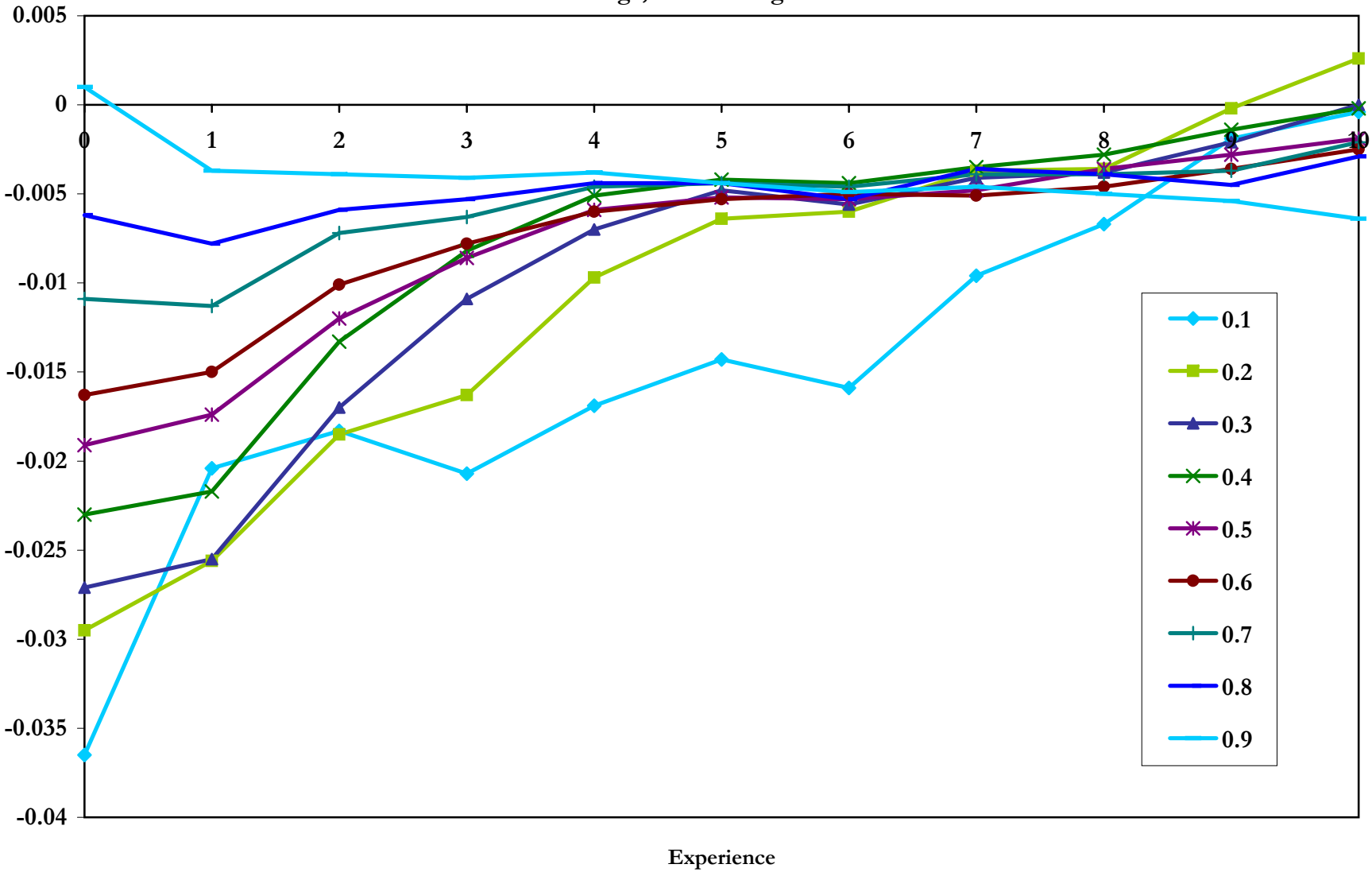
Notes: Coefficients from separate regression models. The initial loss (DROP) is the effect of unemployment at graduation (UR) at experience zero and one, the first phase of the catch up (SLOPE) is the coefficient on the interaction of UR with linear experience for experience years two to six, and the second phase (FADE) of the catch up is same interaction for experience years seven to ten.

Appendix Table G2: Heterogeneity in Initial Loss and Reversion by Major of Study

Outcome Variable		All Graduates	Classification of Major							
			Arts and Humanities	Social Sciences	Other	Physical Sciences	Teachers	Business and Economics	Engineering and Computer Science	Health Sciences
Fraction in Sample			10.09	13.86	13.6	10.06	3.55	26.34	21.37	1.13
Average Log Annual Earnings			9.51	9.69	9.78	9.9	9.94	9.96	10.19	10.25
Annual Earnings	**Drop**	-0.0183	-0.0228	-0.0194	-0.0182	-0.0106	-0.0218	-0.0146	-0.0180	-0.0098
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0001)
	Slope	0.0020	0.0009	0.0020	0.0019	0.0019	0.0026	0.0017	0.0025	-0.0003
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Fade	0.0015	0.0010	0.0015	0.0017	0.0019	0.0022	0.0012	0.0018	0.0001
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Average Firm Median Log Earnings	**Drop**	-0.0093	-0.0085	-0.0064	-0.0099	-0.0112	-0.0146	-0.0062	-0.0086	0.0014
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0001)
	Slope	0.0010	0.0002	0.0010	0.0007	0.0014	0.0009	0.0008	0.0016	-0.0004
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Fade	0.0007	0.0001	0.0008	0.0005	0.0008	0.0004	0.0006	0.0010	-0.0002
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Fraction Left 1st Employer	**Drop**	0.0030	-0.0015	-0.0007	0.0026	0.0031	0.0093	0.0021	0.0079	-0.0022
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Slope	-0.0002	0.0009	0.0006	-0.0001	-0.0003	-0.0007	-0.0001	-0.0014	0.0000
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Fade	-0.0001	0.0003	0.0003	0.0000	-0.0001	-0.0003	-0.0001	-0.0009	0.0002
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Fraction Zero Earnings	**Drop**	0.0013	0.0018	0.0011	0.0013	0.0017	0.0008	0.0004	0.0019	0.0074
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Slope	-0.0003	0.0001	-0.0002	-0.0002	-0.0003	-0.0001	-0.0003	-0.0005	0.0001
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Fade	-0.0002	-0.0001	-0.0001	-0.0001	-0.0002	-0.0001	-0.0001	-0.0003	-0.0002
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Notes: Coefficients from separate regression models. The initial loss (DROP) is the effect of unemployment at graduation (UR) at experience zero and one, the first phase of the catch up (SLOPE) is the coefficient on the interaction of UR with linear experience for experience years two to six, and the second phase (FADE) of the catch up is same interaction for experience years seven to ten.

Appendix Figure G2: Effect of Unemployment Rate at Graduation on Deciles of Distribution of Annual Real Earnings, Male College Graduates



Appendix G (Part 2): Quantile Regressions

We also examined whether the negative effects from graduating in a recession differ for college graduates over different parts of the income distribution using quantile regression. The main results consist of OLS coefficient estimates for the effects of the initial entry unemployment rate on log annual earnings. These coefficients indicate the expected change in the average log wage from a one point increase in the initial unemployment rate over different experience levels. In comparison, Appendix Figure G1 shows the expected change in the log wage at each decile along the earnings distribution from a one point increase in the initial unemployment rate, also over different experience levels. These coefficients come from estimating the same regression model as before, but using quantile regressions for each decile instead of ordinary least squares.

The pattern in Appendix Figure G1 clearly reveals that differences in unemployment conditions at time of entry into the labor market affect the bottom part of the earnings distribution more than the top part. The catch-up process occurs everywhere so that after 10 years in the labor market, the earnings distribution looks the same regardless of initial economic conditions. But those in the lower part of the distribution suffer larger and longer earnings losses. At the 10th percentile in the earnings distribution, for example, a 5 percentage point increase in the initial unemployment rate (about a two standard deviation increase) decreases earnings by about 18 percent in the first year in the labor market. Five years later, earnings are still 7.5 percent lower. This gap eventually fades to zero, but not until the tenth year. Each higher earnings decile is less affected by initial unemployment conditions. The 90th percentile in the earnings distribution one year out is only about 2.5 percent lower from a 5 percentage point increase in the initial unemployment rate. While individuals in the upper part of the income distribution appear partially protected by the influences of the initial unemployment rate in the first five years, this does not translate to greater protection six to ten years out. The catch-up process occurs most strongly over the lower deciles. By the sixth year, the lingering effects from the initial unemployment rate on log earnings are about the same for all deciles except the lowest, and they fade to about zero by the tenth year.

Appendix Table H1: Effect of Unemployment Rate on Duration of College -- National, Regional, and Predicted

	All Workers			Workers D>=0		
	Fraction D>=0	Fraction D not equal 0	Fraction D outside -1,1	Fraction D >0	Fraction D >1	Fraction D >2
Average	0.67	0.68	0.36	0.36	0.14	0.06
Panel A: National, All Workers						
Unemployment Rate	0.0007	-0.0031	-0.0028	-0.0032	-0.0022	0.0001
	[0.0041]	[0.0018]*	[0.0022]	[0.0038]	[0.0027]	[0.0013]
N	1514	1514	1514	957	957	957
R^2	0.01	0	0	0.01	0.01	0
Panel B: Regional, All Workers						
Unemployment Rate	-0.0022	0.0057	0.0046	0.0063	0.005	0.0027
	[0.0028]	[0.0022]**	[0.0023]*	[0.0032]*	[0.0023]**	[0.0011]**
N	1514	1514	1514	957	957	957
R^2	0.06	0.02	0.04	0.04	0.03	0.02
Panel C: Regional, Predicted UR, All Workers						
Unemployment Rate	-0.0021	0.0024	0.0003	0.0029	-0.0007	-0.0009
	[0.0130]	[0.0063]	[0.0087]	[0.0045]	[0.0018]	[0.0019]
N	1489	1489	1489	932	932	932
R^2	0.12	0.04	0.09	0.6	0.7	0.59

Panel D: Distribution of Actual and Predicted Durations and Deviations in Years

Years	Actual Duration	Predicted Duration	Difference Between Actual and Predicted (D)	
1	0.18	0.05	**-3<=**	0.10
2	0.13	0.01	**-2**	0.12
3	0.19	0.29	**-1**	0.11
4	0.30	0.60	**0**	0.32
5	0.17	0.05	**1**	0.22
6	0.04	0.00	**2**	0.08
7	0.01	0.00	**>=3**	0.06

Robust standard errors in brackets

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

Appendix Table H2: Distribution of Years of College Among All Entrants and in Graduate Sample

	Entire Sample (Some College)		Graduates (Actual ≥ Predicted Year)	
Years of College	**N**	**Percent**	**N**	**Percent**
1	30,420	17.03	818	0.69
2	21,922	12.27	3,474	2.92
3	34,745	19.45	23,953	20.13
4	53,803	30.12	52,973	44.53
5	30,172	16.89	30,160	25.35
6	6,200	3.47	6,197	5.21
7	1,391	0.78	1,388	1.17
Total Exiting College	178,653	100	118,963	100

Appendix Table H3: Effect of Unemployment Rate on Duration of College -- National, Regional, and Predicted

	Years Until BA	Fraction Above Grade	Fraction < 4 Years	Fraction > 4 Years	In Graduate Sample	Difference (D)
Panel A: National, All Workers						
Unemployment Rate	0.007	-0.0019	-0.0018	0.001	0.0012	-0.0006
	[0.0138]	[0.0039]	[0.0039]	[0.0025]	[0.0043]	[0.0157]
N	1591	1591	1591	1591	1591	1591
R^2	0.01	0.02	0.01	0.02	0.01	0.02
Panel B: Regional, All Workers						
Unemployment Rate	0.0072	0.0046	0.0003	0.0041	-0.0032	0.0034
	[0.0074]	[0.0028]	[0.0024]	[0.0020]**	[0.0028]	[0.0108]
N	1591	1591	1591	1591	1591	1591
R^2	0.08	0.05	0.06	0.09	0.09	0.06
Panel C: Regional, Predicted UR, All Workers						
Unemployment Rate	0.0001	-0.0003	0.0019	0.0025	-0.0048	-0.0042
	[0.0410]	[0.0101]	[0.0115]	[0.0081]	[0.0112]	[0.0523]
N	1566	1566	1566	1566	1566	1566
R^2	0.14	0.07	0.15	0.1	0.16	0.11
Panel D: National, D>=0						
Unemployment Rate	0.0062	-0.0025	-0.0012	0.0017	0.0001	-0.0052
	[0.0063]	[0.0043]	[0.0010]	[0.0025]	[0.0014]	[0.0082]
N	955	955	955	955	955	955
R^2	0.01	0.02	0.04	0.01	0	0.01
Panel E: Regional, D>=0						
Unemployment Rate	0.011	0.0083	-0.0002	0.0061	-0.0007	0.0157
	[0.0052]**	[0.0035]**	[0.0009]	[0.0027]**	[0.0015]	[0.0065]**
N	955	955	955	955	955	955
R^2	0.22	0.04	0.27	0.15	0.38	0.04
Panel F: Regional, Predicted UR, D>=0						
Unemployment Rate	0.006	0.0024	-0.0001	0.0042	-0.0002	0
	[0.0042]	[0.0038]	[0.0008]	[0.0026]	[0.0016]	[0.0000]***
N	930	930	930	930	930	930
R^2	0.83	0.64	0.46	0.71	0.54	1

Note: The sample includes males in Canada leaving university between 1976 and 1995. 'D' indicates the difference between the actual year left and the predicted year of graduation based on year of entry and program. The dependent variable is indicated in the column heading. The national model regresses the dependent variable on the youth unemployment rate in the country at the year of college exit, plus province of residence fixed effects, and a linear or quadratic graduation cohort trend. The regional model regresses log annual earnings on the youth unemployment rate in the province of first residence, plus province of residence fixed effects, and year of graduation fixed effects. One, two, and three asterix indicates statistical significance at the 10 percent, 5 percent, and 1 percent levels respectively. See text for more details.

Appendix Table H4: Effect of Unemployment Rate at Time of Predicted Graduation on Log Real Earnings by Potential Experience (Reduced Form) and Instrumental Variable Estimates, Regional Model

	Specification			
Model	**Reduced Form**		**Instrumental Variables**	
D>=0?	**No**	**Yes**	**No**	**Yes**
	(1)	**(2)**	**(3)**	**(4)**
First Stage Coefficient	---	---	0.8841	0.8984
	---	---	[0.0502]***	[0.0391]***
Experience Year				
0	-0.0119	-0.0134	-0.0162	-0.0186
	[0.0023]***	[0.0023]***	[0.0030]***	[0.0034]***
1	-0.0154	-0.0134	-0.0215	-0.0179
	[0.0030]***	[0.0024]***	[0.0041]***	[0.0033]***
2	-0.0145	-0.0114	-0.0204	-0.0147
	[0.0030]***	[0.0021]***	[0.0042]***	[0.0028]***
3	-0.0117	-0.0086	-0.0165	-0.0106
	[0.0027]***	[0.0019]***	[0.0038]***	[0.0024]***
4	-0.0093	-0.0072	-0.013	-0.0086
	[0.0025]***	[0.0019]***	[0.0035]***	[0.0023]***
5	-0.0068	-0.0059	-0.0093	-0.0069
	[0.0024]***	[0.0017]***	[0.0034]***	[0.0021]***
6	-0.0054	-0.0045	-0.0072	-0.0053
	[0.0027]**	[0.0019]**	[0.0038]*	[0.0024]**
7	-0.0059	-0.0046	-0.0079	-0.0058
	[0.0026]**	[0.0018]**	[0.0036]**	[0.0023]**
8	-0.0053	-0.0045	-0.0073	-0.0061
	[0.0024]**	[0.0018]**	[0.0034]**	[0.0023]***
9	-0.0046	-0.0041	-0.0065	-0.0056
	[0.0024]*	[0.0020]**	[0.0034]*	[0.0024]**
10	-0.0027	-0.003	-0.0043	-0.0044
	[0.0025]	[0.0020]	[0.0034]	[0.0024]*
Constant	6.9933	8.7117	7.0555	8.7857
	[0.1012]***	[0.0668]***	[0.0981]***	[0.1075]***
N	14223	8495	14223	8495
R-squared	0.92	0.95	0.92	0.95

Note: The sample includes males in Canada leaving university between 1976 and 1995. 'D' indicates the difference between the actual year left and the predicted year of graduation based on year of entry and program. The reduced form model regresses log annual earnings on the predicted youth unemployment rate in the province of first residence when D=0, interacted with experience years 0 to 10, plus province of residence fixed effects, experience fixed effects, and year of graduation fixed effects. The instrumental variable model regresses log annual earnings on the instrumented youth unemployment rate in the province of first residence, interacted with experience years 0 to 10, plus province of residence fixed effects, experience fixed effects, and year of graduation fixed effects. One, two, and three asterix indicates statistical significance at the 10 percent, 5 percent, and 1 percent levels respectively. See text for more details.

Appendix Table I1: Accounting for Sources of Catch-Up After Early Unemployment Exposure at the Cell-Level, Graduates Only

	Based on Year-State-Cohort Cells				Based on Year-State-Cohort-Skill Group Cells			
Exp. Year	Basic Model	With UR History	With Firm Quality	With Firm Quality and UR History	Basic Model	With UR History	With Firm Quality	With Firm Quality and UR History
1	-0.0177 [0.0026]***	-0.016 [0.0027]***	-0.0107 [0.0023]***	-0.0085 [0.0023]***	-0.0177 [0.0026]***	-0.0162 [0.0027]***	-0.0089 [0.0021]***	-0.0078 [0.0022]***
2	-0.0181 [0.0021]***	-0.017 [0.0024]***	-0.0092 [0.0017]***	-0.0083 [0.0019]***	-0.0181 [0.0021]***	-0.0171 [0.0024]***	-0.0059 [0.0016]***	-0.0057 [0.0018]***
3	-0.0169 [0.0019]***	-0.0155 [0.0024]***	-0.0095 [0.0015]***	-0.0083 [0.0021]***	-0.0168 [0.0018]***	-0.0157 [0.0024]***	-0.0069 [0.0014]***	-0.0066 [0.0020]***
4	-0.0134 [0.0017]***	-0.0111 [0.0022]***	-0.0083 [0.0015]***	-0.0065 [0.0019]***	-0.0134 [0.0017]***	-0.0112 [0.0022]***	-0.0062 [0.0014]***	-0.0048 [0.0019]**
5	-0.0113 [0.0016]***	-0.0077 [0.0022]***	-0.0074 [0.0013]***	-0.0043 [0.0019]**	-0.0113 [0.0015]***	-0.008 [0.0022]***	-0.006 [0.0014]***	-0.0033 [0.0018]*
6	-0.0095 [0.0015]***	-0.006 [0.0024]**	-0.0068 [0.0013]***	-0.0026 [0.0019]	-0.0095 [0.0014]***	-0.0063 [0.0024]***	-0.0053 [0.0013]***	-0.0016 [0.0017]
7	-0.0087 [0.0016]***	-0.0028 [0.0029]	-0.0052 [0.0013]***	0.0007 [0.0019]	-0.0087 [0.0016]***	-0.0036 [0.0028]	-0.0033 [0.0013]***	0.0017 [0.0017]
8	-0.0085 [0.0017]***	-0.0034 [0.0030]	-0.0044 [0.0013]***	0 [0.0022]	-0.0085 [0.0017]***	-0.0041 [0.0029]	-0.0024 [0.0012]**	0.0009 [0.0020]
9	-0.0075 [0.0017]***	-0.0028 [0.0028]	-0.0034 [0.0013]**	-0.0012 [0.0021]	-0.0075 [0.0017]***	-0.0035 [0.0027]	-0.0013 [0.0012]	-0.0007 [0.0019]
10	-0.0062 [0.0018]***	-0.0015 [0.0028]	-0.0027 [0.0014]*	-0.0017 [0.0023]	-0.0062 [0.0017]***	-0.002 [0.0027]	-0.001 [0.0012]	-0.0014 [0.0021]

Notes: Regressions in columns 1 to 4 at level of graduation cohort, state of first residence, state of current residence, and calendar year. Columns 5 to 8 add interaction with predicted earnings at time of graduation. All regressions include dummies for graduation cohort, state of residence at graduation, state of current residence, calendar year, and experience. Where appropriate, we also include skill-group dummies. The analysis is replicated by skill-group in the Appendix. All regressions weighted by cell size. Standard errors clustered at cohort-state of first residence level.

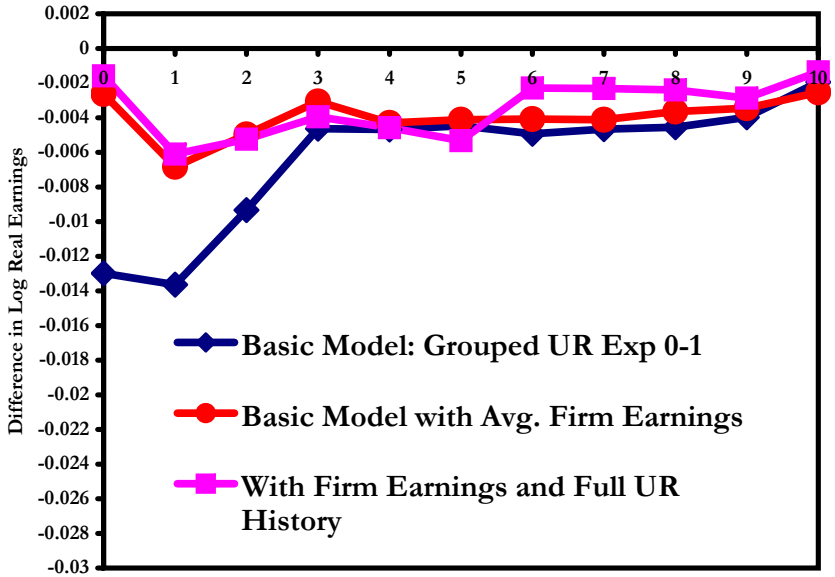
Appendix Table I2: Accounting for Sources of Catch-Up After Early Unemployment Exposure At the Cell Level, Separately By Skill Group, Graduates Only

	Top 20% Predicted Earnings				Middle 20% Predicted Earnings				Bottom 20% Predicted Earnings			
Exp. Year	Basic Model	With UR History	With Firm Quality	With Firm Quality and UR History	Basic Model	With UR History	With Firm Quality	With Firm Quality and UR History	Basic Model	With UR History	With Firm Quality	With Firm Quality and UR History
1	-0.013	-0.011	-0.0026	-0.0016	-0.0209	-0.0194	-0.0126	-0.0111	-0.0228	-0.0252	-0.0179	-0.0209
	[0.0039]***	[0.0039]***	[0.0042]	[0.0042]	[0.0040]**	[0.0041]**	[0.0036]**	[0.0038]***	[0.0065]**	[0.0072]**	[0.0056]**	[0.0064]***
2	-0.0136	-0.012	-0.0068	-0.0061	-0.0267	-0.0261	-0.0133	-0.0129	-0.0295	-0.0324	-0.0234	-0.0269
	[0.0025]***	[0.0026]***	[0.0028]**	[0.0029]**	[0.0038]**	[0.0038]**	[0.0033]**	[0.0034]***	[0.0064]**	[0.0067]**	[0.0052]**	[0.0056]***
3	-0.0093	-0.009	-0.005	-0.0052	-0.0245	-0.0224	-0.0162	-0.0148	-0.0256	-0.0313	-0.0193	-0.0255
	[0.0022]***	[0.0029]***	[0.0021]**	[0.0029]*	[0.0032]**	[0.0039]**	[0.0030]**	[0.0037]***	[0.0056]**	[0.0060]**	[0.0044]**	[0.0052]***
4	-0.0046	-0.005	-0.0031	-0.0039	-0.0191	-0.016	-0.0128	-0.0107	-0.021	-0.0247	-0.0169	-0.0192
	[0.0019]**	[0.0025]*	[0.0020]	[0.0025]	[0.0030]**	[0.0036]**	[0.0027]**	[0.0031]***	[0.0055]**	[0.0054]**	[0.0045]**	[0.0043]***
5	-0.0047	-0.005	-0.0043	-0.0046	-0.0171	-0.0124	-0.013	-0.0081	-0.0142	-0.0184	-0.0104	-0.0126
	[0.0020]**	[0.0028]*	[0.0019]**	[0.0025]*	[0.0025]**	[0.0033]**	[0.0024]**	[0.0030]***	[0.0054]**	[0.0064]**	[0.0047]**	[0.0055]**
6	-0.0045	-0.005	-0.0041	-0.0053	-0.0132	-0.0085	-0.0102	-0.004	-0.0134	-0.0195	-0.0077	-0.0128
	[0.0019]**	[0.0027]*	[0.0018]**	[0.0026]**	[0.0025]**	[0.0033]**	[0.0023]**	[0.0029]	[0.0050]**	[0.0054]**	[0.0040]*	[0.0046]***
7	-0.0049	-0.002	-0.0041	-0.0023	-0.0114	-0.0044	-0.0077	0.0002	-0.0128	-0.0175	-0.0057	-0.0078
	[0.0019]***	[0.0032]	[0.0017]**	[0.0030]	[0.0027]**	[0.0038]	[0.0024]**	[0.0031]	[0.0056]**	[0.0068]**	[0.0047]	[0.0059]
8	-0.0047	-0.001	-0.0041	-0.0023	-0.0113	-0.0045	-0.0075	-0.0007	-0.0121	-0.0127	-0.0076	-0.0052
	[0.0020]**	[0.0035]	[0.0018]**	[0.0034]	[0.0030]**	[0.0045]	[0.0024]**	[0.0035]	[0.0055]**	[0.0068]*	[0.0045]*	[0.0059]
9	-0.0046	0.000	-0.0036	-0.0024	-0.0099	-0.0037	-0.0051	-0.0001	-0.0107	-0.0121	-0.0049	-0.0042
	[0.0021]**	[0.0033]	[0.0019]*	[0.0031]	[0.0029]**	[0.0040]	[0.0024]**	[0.0034]	[0.0054]*	[0.0068]*	[0.0044]	[0.0057]
10	-0.004	0.000	-0.0034	-0.0029	-0.0064	-0.0022	-0.0021	0.0005	-0.018	-0.0175	-0.0109	-0.0109
	[0.0021]*	[0.0032]	[0.0019]*	[0.0033]	[0.0031]**	[0.0039]	[0.0025]	[0.0032]	[0.0069]**	[0.0068]**	[0.0057]*	[0.0060]*

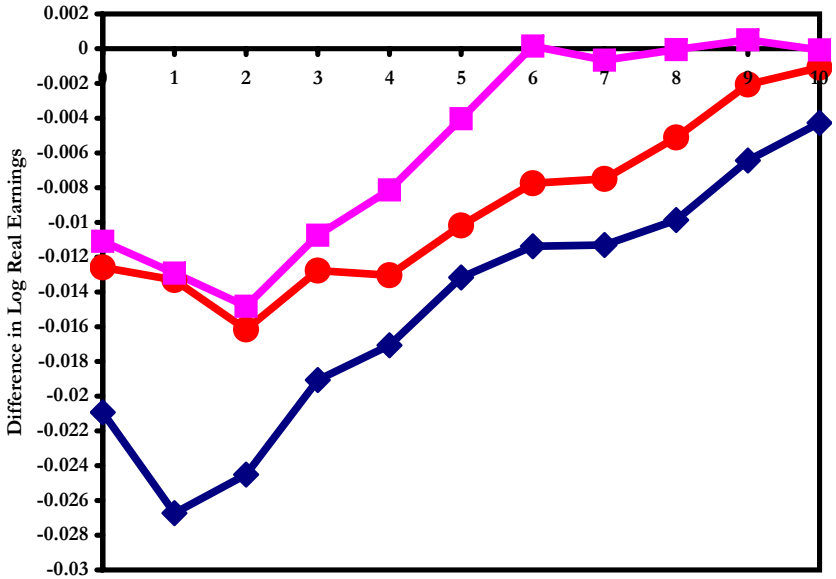
Notes: Regression at level of graduation cohort, state of first residence, and calendar year. All regressions weighted by cell size. Standard errors clustered at cohort-state of first residence level. See notes to Appendix Table I1 and text.

Appendix Figure I1: Sources of Catch-Up After Early Unemployment Exposure by Skill-Group, Cell Level Models

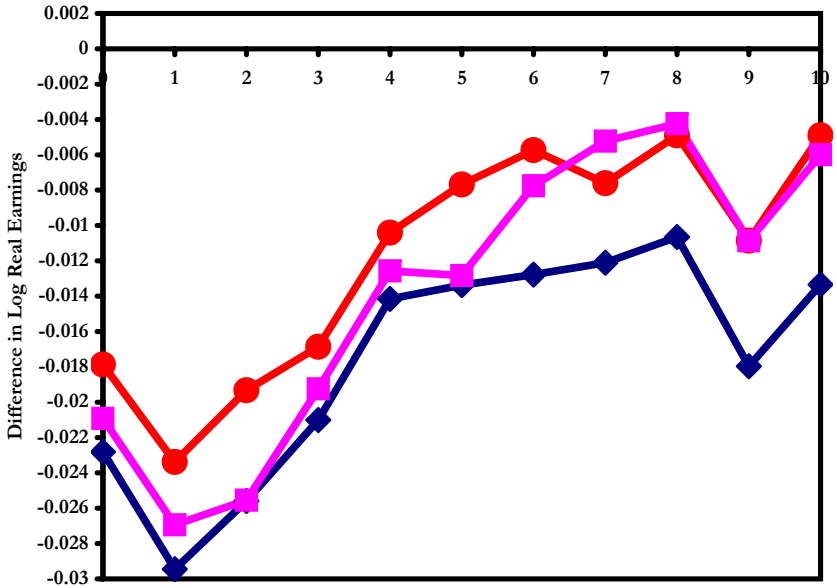
Panel A: Top 20% of Predicted Earnings at Graduation



Panel B: Middle 20% of Predicted Earnings at Graduation

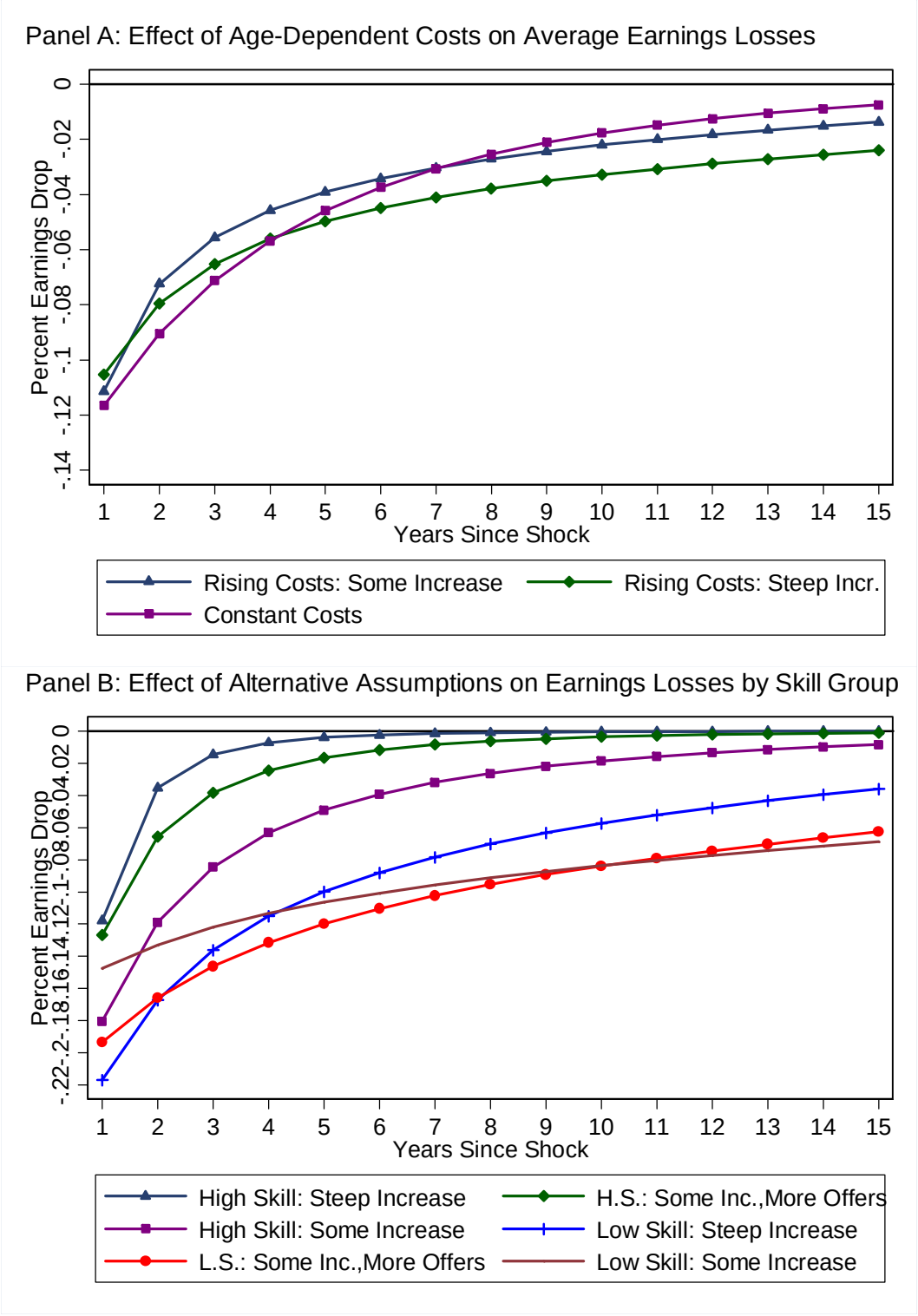


Panel C: Bottom 20% of Predicted Earnings at Graduation



Notes: See notes of Figure 8 and discussion in text.

Appendix Figure J1: Simulation of Predicted Effect of Decline in Initial Hiring Rate at Good Firms on Earnings in our Model of Endogenous Job Search



Notes: See discussion in Sensitivity Appendix E.