AN EMPIRICAL ANALYSIS OF COHORT EFFECTS ON EARNINGS STEMMING FROM GRADUATION INTO A SLACK LABOUR MARKET

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Abstract:

This paper studies the effects of graduating from university or college during a recession on workers' annual earnings. Using data from the 2006 Census of Canada, individuals graduated between 1979 and 2004 are categorized into cohorts by age in five-year intervals. The estimated equations used in this paper predict a negative relationship between log earnings and the youth unemployment rate that prevailed in the year of their graduation. The results indicate that a 1% point increase of the unemployment rate will lead to a 3.1% decline in earnings, and these earnings losses tend to last for 23 years throughout an individual's career. In addition, individuals in different cohorts are affected disproportionally by the slack labour market. The results show that young workers with fewer years of potential work experience suffer larger wage losses compared to mature workers with at least ten years' potential experience.

1. Introduction

The 2008-09 financial crisis has significantly changed the labour market profile for young university and college graduates, an important group that drives productivity and consumption in the economy. One of the salient features of the global labour market is the high youth unemployment rate. In Canada, the youth unemployment rate peaked at 15.2% during the 2009 crisis and remained as high as 13.8% in 2013 (CANSIM database, Statistics Canada, 2013). Across OECD countries, the average unemployment rate of youth has risen from 13.4% in 2005 to 16.3% in 2012 (OECD Employment and Labour Market Statistics, 2013) – a rate of increase of as much as 21.6%. According to projections by the International Labour Organization (ILO), "the youth unemployment rate in [developed and EU] regions will not drop below 17% before 2016" (ILO, 2013).

As a result, in the aftermath of the financial crisis of 2008-2009, academic research on the impact of the Great Recession, as it is referred to by many U.S. economics researchers, has been surging, and labour economists are no exception. On the website of the National Bureau of Economic Research (NBER), there are 100 working papers contain the keyword " crisis" during 2009-2013 and 81 working papers contain the keyword "recession" during 2002-2014. The main reason that explains this research fervour is that the size and depth of the repercussions of the 2008-09 crisis regarding the GDP growth rate and the level of unemployment rate are the most serious ones in the post-war era, though not as severe as those of the 1929-33 Great Depression.

A recent report, "Crisis Squeezes Income and Puts Pressure on Inequality and Poverty", on the website of the Organization for Economic Co-operation and Development (OECD) suggests that the recent financial crisis has dramatically reduced households' income from work and from capital in most OECD countries. The study also suggests that the consequences of the

financial crisis are not shared equally among OECD countries. Indeed, of all age groups, youths occupy a particularly vulnerable position in the labour market. According to Bernard (2013), "the youth unemployment rate has historically been higher than that for adults", and young workers are more likely to be laid off compared to experienced workers with more seniority. During the recent financial crisis, the youth unemployment rate is not only soaring in many countries, but also is expected to remain at a high level until 2016 (International Labour Organization [ILO], 2013).

This paper is also motivated by the historical high level of youth unemployment rate in OECD countries during the financial crisis and the subsequent effects on youths' career profile and living standard in terms of their age-earnings profile. I use the most recent available data from the 2006 Census of Canada to analyze the effects of the recessions during 1979-2004 on young workers' earnings both during the recession and subsequently in order to determine whether the impacts persist.

The relationship between the wage level and the unemployment rate at time of entry into the labour force explains how an economic downturn could affect individuals' earnings profile of a life time. In general, individuals' living standards are depending on their purchasing power which in turn are determined by the wages earned from their labour market activities. In a broader sense, households' income is directly related to aggregate consumption spending, which represents a large component of a country's GDP. For instance, on average, the household final consumption expenditure represents 68% of the GDP in U.S. and 58% in Canada, during 2009-2012 (World Development Indicators, 2009-2012). Therefore, by destroying jobs in the labour market, an economic recession with long-lasting high unemployment rates could greatly impair a country's GDP.

For new labour force entrants, a depressed job market has various negative implications. The high youth unemployment rate indicates that there are fewer opportunities offered to young graduates than in a strong labour market. Consequently, many of them will either experience a longer job search period, or accept a position in a less-preferred field – a case of job mismatch. Many may remain in the state of unemployment longer than expected. More importantly, even those who successfully land a job are likely to earn lower salaries than they would have earned in expanding economies. As labour market entrants, young graduates might suffer more significant earnings losses than other age groups during a recession, and this initial wage loss could lead to a permanently low earnings profile.

A number of studies have suggested that young graduates, a large portion of which being considered as not having enough work experience, bear heavier burdens of a recession. Freeman (1975) suggests that during the 1970s economic downturn the American university and college graduates earned lower salaries and faced less favourable work opportunities than other groups. The author attributes that result to a decreasing demand for labour and an increase in labour supply that stems from a surge in enrolment of university and college students. Though Freeman's view represents the standard neoclassical view that there are not sticky wages under "a reasonably flexible price mechanism" (Freeman, 1975, p. 310), it does not answer the question of why the effects of a recession could be persistent. Recent empirical work (Kahn, 2010; von Watcher & Bender, 2006; Oreopoulos, von Wachter, & Heisz, 2012) has suggested that wage losses stemming from economic downturns appear to be hysteretic and persistent.

In terms of the distribution of the adverse effects of a recession among population groups, Hines Jr., Hoynes, and Krueger (2001) suggest that while an economic expansion may improve the living standard of all workers at a general level, a recession is more detrimental for the

low-skilled workers than for high-skilled workers. Their finding is consistent with the literature that "higher local unemployment rates lead to reductions in employment and earnings, with larger effects for blacks, younger workers, and less educated workers" (Hines Jr. et al., 2001, p.5). In addition, the study by Beaudry and DiNardo (1991) found that current wages are negatively correlated with the lowest unemployment rate that was observed during the prior career of a worker. Using data from the Current Population Survey (CPS) and the Panel Study of Income Dynamics (PSID) in the U.S., Beaudry and DiNardo (1991) predict that every 1% point increase in that particular unemployment rate will lead to a 3-7% drop in the entry-level wages. However, until then little literature has studied the long-term impacts of changes in labour market conditions.

Recently, a group of research papers has shed light on the topic of how adverse market conditions prevailing at the time of labour market entry affect wages and the career path of workers. Kahn (2010) analyzes the wage variation and the subsequent itineraries of white male workers in the U.S. who graduated from college during 1979-1988. Oreopoulos et al. (2012) examine the short-run and long-run wage outcomes of graduating with a university or college degree during a recession. Von Wachter and Bender (2006) explore the long-term effects of experiencing displacement occurring at the start of young German workers' careers. Oyer (2006) studies how the early labour market opportunities affect graduate students' career paths by the time they complete their MBA or Ph.D. degree.

Although the authors have used different datasets coming from different countries, those empirical works are consistent in conclusions. It appears that luck with respect to time of labour market entry indeed matters inasmuch as there is a negative statistical relationship between wages and external labour market conditions at the time when workers entered the workforce.

When the economy is in the recession phase, graduates from universities will earn a lower salary than those graduated into a prosperous job market, all other factors held constant.

This paper provides empirical results that tend to dovetail with the previous work by Oreopoulos et al. (2012) and add to it with updated Census data during 1979-2004, since they only follow the cohorts entering during 1976-1995. Using data from the 2006 Canadian Census, the estimated equations in this paper show that there exists a negative relationship between individuals' annual income and the youth unemployment rate that prevailed in the year that the cohorts graduated. For every 1% point increase in the youth unemployment rate, the annual income will reduce by 3.1%.

In addition, the initial wage loss stemming from the slack labour market tend to sustain for a period of time that is long enough to influence a person's entire career profile. An individual would need 23 years of his/her career time to eventually recover from the initial earnings loss of graduating into a slack labour market, according to the empirical results in this paper. The negative relationship between the unemployment rate and individuals' earnings is consistent with the one found in Oreopoulos et al. (2012), which also suggests that students graduating during a recession suffer a great wage loss and the pain tends to persist for a decade.

This paper is most closely related to Oreopoulos et al. (2012) in terms of the research topic and the empirical model. Despite different database being used, the results I obtained from the regression models are qualitatively consistent with the main findings in Oreopoulos et al. (2012). Quantitatively, I find larger and more persistent effects for workers on average than that in their study. The prediction regarding the degree of persistence of wage losses in this paper (23 years) is substantially different from that estimated by Oreopoulos et al. (2012), which is reported as 10 years. This divergence can be attributed to the fact that the 2006 Census is a

cross-section dataset rather than a longitudinal dataset used by Oreopoulos et al. (2012). Moreover, due to the lack of the latest 2011 Census data, this paper is not able to take into account of the consequences of the 2008-09 financial crisis.

The rest of the paper proceeds as follows. The next section summarizes the existing literature on the theories of wage determination, with a detailed description of the theory and empirical strategy conducted in Oreopoulos et al. (2012). Section 3 presents the empirical models used in this paper, and discusses the potential biases involved in the estimation of these models. Section 4 presents the main results from the estimating equation. Section 5 offers the conclusions of this paper.

2. A Review of Wage Determination Theories and the Empirical Studies

2.1 A Review of Three Theories of Wage Determination

An important subject – unemployment – is missing out in the standard neo-classical wage determination theory. According to the neoclassical theory, the resulting high unemployment rate in a recession is a phenomenon in which workers become unemployed because they prefer more leisure time over accepting a wage rate lower than their reservation wage rate (Dullien, 2009). As Cahuc and Zylberberg (2004, p.108) state, "there is no place for an unemployed person" in the neoclassical story based on a simplified trade-off relationship between leisure time and hours of work. From the neo-classical point of view, one can hardly see any substantial or long-term costs of a recession from the strictly neo-classical perspective.

Recent theoretical models emphasize the importance of frictions in the labour market, which is composed of three classes of theory: the job search theory, the contract theory, and the job mobility theory. Although this paper may not be able to provide empirical justification for

each theory, it is helpful to have a comprehensive review of these theories.

First, the job search theory of unemployment offers an explanation for voluntary unemployment which is based on workers making decisions on whether to take part in the labour force. In a simple job search model, the decision to work is based on whether or not the prevailing wage is higher than the reservation wage. The reservation wage depends on the overall labour market conditions as well as other variables. Job search theory assumes that job searchers have imperfect information about work opportunities and the distribution of wage offers from the employers. Therefore, they may need to take time and effort to search for a well-paid job. Okun (1973) suggests that when the labour market tightens, more productive workers would accept low-quality jobs to avoid unemployment. Also, it is likely that the searching costs are so high that the would-be employees give up job search under slack economic conditions when good job opportunities are not available (Okun, 1973). Since more experienced workers are able to search for and move to high-paying firms or industries to avoid earning losses from an adverse shock (Oreopoulos et al., 2012), less-experienced workers may face a tougher job market where fewer job opportunities are left for them. Thus, inexperienced and young workers bear the most of a labour market recession.

Another framework that stresses frictions is the contract theory. Although this theory could explain a large part of the persistent effects of the slack labour market on wages, the dataset used in this paper is not able to prove this theory. In private sectors, it is common practice that employers and employees sign a contract of varying donations about the working periods and hours, the wage rate, and promotion opportunities, etc. According to this framework, the purpose of a labour contract is to reduce uncertainty and maximize workers' performance (Cahuc & Zylberberg, 2004, p.306). In the long-term contract model (Harris & Holmstrom, 1982),

workers face lower risks of unemployment, which helps to account for the persistent consequences on wages from an external shock. Contracts, especially in large firms in which they provide rents, insurance, and other benefits, tend to impede workers moving to other firms for higher wages (Oreopoulos et al., 2012). Also, evidence shows that real wages are procyclical, which means firms may cut wages and adjust their labour contracts with their employees during a recession and the opposite during a recovery period (Martins et al., 2009). Therefore, workers are likely to suffer a persistent wage drop when they are covered by a long-term contract.

Third, the efficiency wage theory offers an explanation for the existence of involuntary unemployment in equilibrium. Shapiro and Stiglitz (1984) develop a shirking model for which the equilibrium invokes involuntary unemployment. Individuals have the incentive to shirk when they expect zero risk of being unemployed (Cahuc & Zylberberg, 2004, p.356). Thus, firms would offer additional benefits to employees to give them incentives to exert adequate effort for work. Empirical studies have verified that large firms pay rents in the form of super-competitive wages in order to elicit better performance from their employees.

The fourth class of theory – job mobility theory – suggests that job mobility is driven by wage growth (Topel & Ward, 1992), which could explain how entrants manage to recover from wage losses. In the first few years of the careers of young graduates in Canada, wage growth is closely associated with frequent job changes (Oreopoulos et al., 2012). Job mobility is an alternative channel which explains why wage rates tend to rise with the accumulation of work experience. One way that young entrants regain their wage losses is by moving to a higher-paying employer or industry. Therefore, according to job mobility theory, the inability to move between firms and industries due to long-term work contracts keeps workers away from catching up the earnings lost due to a recession. This explains why workers in large firms tend to

have more persistent wage losses than workers in smaller firms during a recession.

These theories are the main foundation of the analysis of the impact of a slump at the time of labour market entry on workers' wages, particularly for university or college graduates. While the business cycle theory seems to explain the initial negative impact of an adverse shock, the contract theory and the efficiency wage theory together could explain the persistence of the impact of a recession on the wage profile. To show the application of these theories, the next section reviews recent empirical work on this issue.

2.2 Empirical Studies in the Literature

Recent empirical studies tend to agree on the findings of the negative and persistent impacts on individuals' careers caused by a recession, but the magnitude of wage losses and the duration of the consequences vary. Kahn (2010) finds that in the U.S., during the recession in the early 1980s, an increase of 1% point in the national unemployment rate led to a 6-7% reduction in graduates' wages; even after 15 years, the wage losses were still of 2.5% and statistically significant. Using data of graduates from Canada, Oreopoulos et al. (2012) find similar patterns as in the U.S.

The empirical approach used in this paper is similar to the one in Oreopoulos et al. (2012). Oreopoulos et al. (2012) conduct a thorough investigation on workers who graduated between 1976 and 1995. By using a unique matched university employer-employee data, they explained the source of wage losses stemming from a shock and examined the persistence of the wage losses, the catch-up patterns of regaining lost earnings, and the heterogeneity of earnings losses within cohorts.

The first empirical model in Oreopoulos et al. (2012) is expressed as:

$$\bar{y}_{crt} = \alpha + \beta_e UR_{cr0} + \phi_t + \theta_r + \gamma_e + \chi_c + u_{crt}$$

where $\bar{y}_{crt}$ is the cell mean of log earnings in the year of graduation (c), at the region of residence (r), and in the calendar year (t). $\emptyset_t$, γ_e, χ_c represents fixed effects for calendar year (t), year of potential work experience (e), and year of graduation (c). The coefficient α is the intercept form. The last parameter u_{crt} is the disturbance terms representing unobserved and omitted factors.

The key independent variable $\mathbf{UR_{cr0}}$ is essentially an interaction of the unemployment rate at the time of graduation and the binary variable of potential work experience, i.e. $\mathbf{UR_{cr0} = UR \cdot D_i}$. The binary variable $\mathbf{D_i = 1}$ if individuals possess $\mathbf{i}$ year(s) of work experience, and $\mathbf{D_i = 0}$ otherwise. β_e is the key coefficient of interest and represents the interaction effect: $\beta_e = {}^{\partial \bar{\mathbf{y}}_{\mathbf{crt}}}/_{\partial \mathbf{UR \cdot D_i}}$, which measures how the log annual income is influenced by the unemployment rate an. In interpreting the interaction effect, a value for $\mathbf{D_i}$ must be assigned. Since the income variable $\bar{\mathbf{y}}_{\mathbf{crt}}$ is actually in a log form, the magnitude of β_e therefore implies the rate of change of workers' income. If $\beta_e = 0$ or statistically insignificant, then there is no interaction effect. If $\beta_e < 0$, it implies that the higher the unemployment rate goes up, the larger the adverse effects are imposed on the income, given certain years of experience depending on $\mathbf{D_i}$. For example, the Table 1 in Oreopoulos et al. (2006), for labour market new entrants, $(\mathbf{i = 0, D_0 = 1})$, the estimate of β_e is -0.0187, which indicates that when the unemployment rate increases by 5% points, the wage rate will be reduced by about 9%, since $-0.0187 \times 5 = -0.0935 \approx 9\%$ (Table 1 in Oreopoulos et al., 2006). In the same table, for the cohort that has five years of experience since their graduation $(\mathrm{i} = 5, \mathbf{D_5 = 1})$, the estimate of β_e is -0.0081, thus when the unemployment rate increase by 5% points, workers still have a 4%

$(-0.0081 \times 5 = -0.0405 \approx 4\%)$ wage shortfall compared to those who entered the labour market under normal conditions.

To account for the persistent wage losses, Oreopoulos et al. (2012) analyze the role of the first employer in a graduate's career. Since firms determine the wage that is specified in their contracts with employees according to the labour market conditions (Beaudry & DiNardo, 1991), they may offer a lower wage rate than they would in a healthy economy. As larger firms also typically pay rents, provide insurance and other benefits, employees tend to be reluctant to change employers. As a result, people who start their careers in larger firms during periods of slack labour market conditions tend to have more persistent wage losses than people who initially choose to work in small firms where they could change employers without great difficulties and therefore could improve their financial situations.

In addition, the Canadian administrative data allow Oreopoulos et al. (2012) to capture the relationship between wage growth and job mobility, as job changes are observed. They suggest that job mobility between firms and industries is the critical channel for young graduates to recover from initial wage losses. The data indicate that during the first 5 years, job changes account for 40% wage regains. Oreopoulos et al. (2006) also provide an analysis of the heterogeneity of wages losses within cohorts. They estimate the predicted earnings based on the college of graduation, the major, and years of schooling, which together reflect the impacts of college quality (Oreopoulos et al. 2006). They find that graduates with low predicted earnings have larger initial wage losses than other peer graduates when they enter the job market. Those young entrants also suffer more persistent losses even after 10 years. On the contrary, those predicted to earn top level wages are only affected by a recession for about 4-5 years, after which they could fully recover by switching to another employer.

3. Data and Estimated Models

3.1 Data

In the previous section I suggested that a temporary economic contraction has substantial negative and persistent effects on university or college graduates' earnings. To verify this conjecture, it is necessary to conduct empirical tests using the appropriate dataset. For the construction of the database, the challenge is to ensure that one is not estimating based on a selected group which would not be representative of the underlying population. Ultimately, the reliability of the results of an empirical model is determined in part by the quality and appropriate processing the data. The most appropriate available dataset that is available to me is the Census of Population of Canada. The dataset employed in this paper is drawn from the 2006 Census of Canada Public Use Microdata File (PUMF) Individuals File. On the other hand, the type of data used in Oreopoulos et al. (2012) is the longitudinal dataset using matched university employer-employee data of the Statistics Canada.

The choice of the 2006 Census rather than the Survey of Labour and Income Dynamics (SLID) is based on a number of advantages. The Census is Canada's largest and most comprehensive data source. Although some variables in the SLID are more relevant to the estimation than are the variables in the Census (e.g. the number of years of work experience and the year in which the postsecondary diploma or degree is received), the sampling method for the SLID makes it less powerful in explaining the effects in which I am interested. The samples of the SLID are surveyed every year for a continuous of six years. There are two panels of respondents so that the two panels always overlap three years (SLID: A Survey Overview, n.d). On the contrary, the samples of the Census are not composed of rotation groups; they are

collected every five years from each household in May. Since this paper focuses on the long-term repercussions of economic fluctuations, the data from the Census offer a broader sample than the SLID, which enable me to draw more relevant conclusions for the theme of this paper. While the Census has a cross-sectional structure and does not have a longitudinal structure, it does contain some retrospective information that is required to investigate the potential effects that are the focus of this paper.

Another reason for choosing the Census as the source of data is the fact that there is a substantial sample size gap between the Census and the SLID, with samples of 844,476 in the Census and 50,900 samples in the SLID. Particularly, the risk of using a dataset with a small sample size is the potential failure of reflecting the representative features of the population and drawing reliable conclusions. Sufficiently large samples in a database help to produce precisely estimated, statistically significant results on one hand, and on the other hand limit the influence of extreme cases that would mislead the analysis ("The Importance of Quality Sample Size", n.d.).

The third advantage of the Census is its sampling method, which is critical in deciding whether the Census is suitable for delivering useful results. Since 1981, the Census accommodates one-in-five sampling rate. That is, a one-in-five sample of private dwellings receives a lengthy detailed questionnaire, while all individuals in other dwellings receive a short form (2006 Census Technical Report: Sampling and Weighting, 3.2). As participation is mandatory, in theory the Census incorporates information from everyone in Canada. This feature of representativeness is critical for the following analysis and conclusions.

3.2 The Basic Model

3.2.1 Assumptions

Since I have no access to the longitudinal data source of university or college students, I have to make some assumptions regarding individuals' age, years of work experience, and the timing and province of graduation. First, since age groups are categorized in five-year intervals in the 2006 Census, I choose the midpoint age of the five-year intervals as the benchmark age for each individual in the age group. For instance, for workers in the age group of 20- 24, the midpoint 22 is chosen as the average age; for workers in the age group 25-29, the average 27 is chosen, etc. Second, in the 2006 Census Public Use Microdata File (PUMF), there is no variable for the year in which university or college students graduated. Therefore, I assume that individuals graduated at the age of 20 if they have a university certificate or college diploma (their highest certificate or diploma). The estimated year of graduation, labelled $\mathbf{C}$, is the estimated year of which the individual received a university degree or a college diploma when he/she graduated at the age of 20 if. It is calculated as $\mathbf{C} = 2006 - (\text{age} - 20)$, and assumes only the values of 1979, 1984, 1989, 1994, 1999, 2004, because age is reported only in five-year intervals. Table 1 in the Appendix provides the distribution of the variable $\mathbf{C}$.

Third, there is no information on the number of years of work experience in the Census PUMF. Therefore, I assume that these individuals started gaining work experience as soon as they had graduated with a diploma or certificate. Thus, the potential work experience of these workers by 2006, labelled as $\mathbf{E}$, is equal to the number of years between the year of their graduation and the year 2006, i.e. $\mathbf{E_i} = 2006 - \mathbf{C_i}$. For instance, individuals who have graduated in 2004 ($\mathbf{C_i} = 2004$) should have 2 years ($\mathbf{E_i} = 2006 - 2004$) of potential work experience by 2006; the cohort that graduated in 1979 would have accumulated 27 years ($\mathbf{E_i} = 2006 - 1979$) of work experience by 2006. Table 2 provides a distribution of variable $\mathbf{E}$,

in which the number of years of potential work experience varies from 0 to 67 years. However, for people who are assumed to have 47 years or more work experience are mostly likely to retired from the work force. Therefore, the values of potential experience **E** that are greater than 42 are excluded from the dataset.

Fourth, the regions in which the workers obtained their certificate or diploma are assumed to be the same as their current place of residence by the time of the survey took place for the 2006 Census.

The estimated work experience could have one or two years' bias or deviation from the actual data, since the expected graduating age may divergent from the confidential information. Even with their credentials, these graduates might have already experienced a bout of unemployment, or a period of labour force withdrawal. Therefore, the value of the realized work experience can be less than the value of potential experience that I calculate. Unfortunately, the current Census PUMF does not provide me information on individuals' educational attainment or labour market history. Nonetheless, the employment income reported in the 2006 Census contains important information regarding an individual's demographic characteristics, financial status, and some information regarding their educational attainment.

3.2.2 The Basic Model

The regression models are estimated from the data of individuals who have a college (including community colleges, CEGEPs, private business colleges and technical institutes), university degree, or higher degrees, such as master's degrees, degrees in medicine, or doctorate degrees. Although I do not distinguish the individuals between whether have Master's degree (MA) or PhD degree when explain the effects, the data do show the same pattern of effect when

control for the degree level of MA or PhD. To measure the percent of decrease of workers' wages due to the shock of an economic recession and the degree of persistence of such wage losses, I adopt the same methodology used in Oreopoulos et al. (2012). A similar regression model could also be found in Hines et al. (2001).The specification of equation (1) exploits the variation of the youth unemployment rates during 1979- 2004. The estimating linear regression model is

$$\ln \mathbf{W_i} = \beta_0 + \beta_1 \mathbf{UR_{cri}} + \beta_2 \mathbf{UR_{cri}} \cdot \mathrm{E} + \beta_3 \mathbf{E_i} + \beta_4 \mathbf{E_i}^{\mathbf{2}} + \alpha \mathbf{D_{ci}} + \delta \mathbf{R_{ri}} + \epsilon_i \quad (1)$$

where the variables are

$\mathbf{UR_{cr}}$ = the unemployment rate prevailing in the graduation year $\mathbf{C}$,

(in which individual $\mathbf{i}$ graduated) at province $\mathbf{R}$1

$\mathbf{E}$ = the number of years of potential work experience

$\mathbf{E^2}$ = a quadratic form of $\mathbf{E_i}$, the number of years of potential work experience

$\mathbf{D_c}$ = 1 if the individual graduated in the calendar year $\mathbf{c}$, 0 if otherwise

$\mathbf{R_r}$ = 1 if the individual graduated in the region r, 0 if otherwise

The regression approach applied in this paper is the Ordinary Least Squares (OLS). In equation (1), the dependent variable **W** represents workers' wages or employment income, which "refers to total income received by persons 15 years of age and over during calendar year 2005 as wages and salaries, net income from a non-farm unincorporated business and/or professional practice, and/or net farm self-employment income" (2006 Census of Population. The expression $\ln \mathbf{W}$, is the logarithm of the employment income **W**. The reason of using the expression $\ln \mathbf{W}$ rather than variable **W** itself is that a regression in a semi-log form can model the growth rate (the rate of decrease in this paper) of an endogenous variable (Greene, 2012). Specifically, using

1 This variable is a numerical variable, the unit of which being percentage points.

$\ln \mathbf{W}$ this equation could measure the decrease rate of workers' earnings responding to 1% point increase in the youth unemployment rate.

The explanatory variable $\mathbf{UR_{cr}}$ is the youth unemployment rate in the calendar year of graduation ($\mathbf{C}$), at the region ($\mathbf{R}$), with zero years of potential work experience, indicating that the cohort had just graduated from school. $\mathbf{E}$ represents the number of years of potential work experience, $\mathbf{UR_{cr} \cdot E}$ is an interaction of $\mathbf{UR_{cr}}$ and the potential experience $\mathbf{E}$. The purpose of this specification is to examine the degree of persistence of wage losses of workers as well as the year by year pattern of regains in the wake of a recession. Additionally, a quadratic form $\mathbf{E^2}$ is added to the model, which is similar to the form of a human capital earnings function developed by Mincer (1974). Normally, the returns of experience are positive, but the quadratic term usually has a negative coefficient. That is, increasing years of experience will increase workers' earnings, but at a diminishing rate. The quadratic form could serve as an examination of the applicability of equation (1). If the estimated coefficient of $\mathbf{E^2}$ is indeed negative, then equation (1) might have the appropriate functional form.

$\mathbf{D_c}$ is a dummy variable that represents the cohorts that graduated during 1974-2004, where $\mathbf{c}$ represents the calendar year in which the cohorts graduated, $\mathbf{C}$ = 1979, 1984, …, 2004 in five-year intervals. The binary variables $\mathbf{D_c}$ are equal to 1 if an individual graduated in certain calendar years and 0 otherwise (e.g. $\mathbf{D_{80}}$=1 if an individual graduated in 1980, and 0 otherwise, and so on). The error term ϵ contains the influences that we cannot observe, and hopefully respects the assumptions of classical model.

It is necessary to clarify the units of the variables in terms of interpreting the results of the estimation equation. The annual income $\mathbf{W}$, including wages and salaries, is measured in dollars. The unit of the provincial unemployment rate $\mathbf{UR_{cr}}$ is in percentage points: the

magnitude of this variable varies from 11 to 25% points. This means that the average youth unemployment rate in Alberta was 11% while it was about 25% in Newfoundland and Labrador over the last three decades. The variable of potential work experience **E** is measured in the number of years. For instance, an individual who graduated in 1980 would have accumulated 26 years of potential work experience by 2006.

To assess the quality of the data, Table 2 provides a statistical summary of the key variables in the estimating equation. Using the statistics in Table 1, one can easily calculate the coefficient of variation for variable $\mathbf{UR_{cr}}$, which is 0.263 (by using the standard deviation divided by mean). This means that the dispersion of probability distribution of $\mathbf{UR_{cr}}$ relative to the sample mean is 26.3%, while a value exceeds one indicates a wide dispersion of probability distribution. The coefficients of variation of the interaction forms, **URcr2**, **URcr7**, etc. in the following empirical model, are all around four which indicate a high degree of dispersion in the variables. A high value of the coefficient of variation indicates a high degree of dispersion in the data for the variables, which helps to identify estimated coefficients. Note that the coefficient of variation does not depend on its measurement unit.

3.2.3 Implications of the Coefficients in Equation One

The intercept β_0 is a constant which does not contain much useful economic information. The coefficients that are most of interest are β_1 and β_2. The coefficient β_1 measures the percentage change in log wages caused by a 1% point increase in the youth unemployment rate prevailing at their year of graduation. β_2 gauges how persistent the influence tends to be on a worker's earnings as the worker gains experience. β_3 measures the rate of change of workers' expected earnings induced by a one-year increase of experience. β_4

represents the degree of the diminishing rate of the returns of experience. The coefficient α_c measures the fixed effects of graduating in different calendar years (**c**) on workers' earnings.

In interpreting the results of the estimating equation, the signs of the estimated coefficients play a critical part. Since I assume that an adverse economic shock generates substantial and persistent wage losses for labour market entrants, β_1 would take a negative sign, while β_2 would have a positive sign provided that these losses diminish with potential experience. Thus, by dividing β_0 by β_2, one obtains the number of years of potential work experience a new labour market entrant needs to accumulate to regain his/her initial wage losses, further being explained in the following. In addition, we would expect a positive sign for β_3 and a negative sign for β_4 the coefficient of the quadratic form, since the return of education is positive, in a diminishing rate.

The relationships between the explanatory variables and the dependent variable can be interpreted by taking partial derivatives of equation (1). If we take the derivative with respect to $(UR_{cr} \cdot E)$, it gives the full effect of the initial unemployment rate interacted with the potential work experience:

$$\frac{\partial \ln \mathbf{W}}{\partial \mathbf{UR_{cr} \cdot E}} = \beta_2 \qquad (2)$$

Here, the variable of potential experience (**E**) assumes the values of 2, 7, 12, 17, 22, 27 (years), a series of numbers with a five-year difference. The specification has a constant coefficient for the variable $\mathbf{UR_{cr} \cdot E}$, which indicates that we are implicitly assuming that people who have 2 years or 7 years of experience are equally influenced by the adverse shock. That is, given a certain level of the unemployment rate, it is the variations in the potential experience that are generating different effects on wages. Also, given a level of potential experience, it is the variation in the initial unemployment rate that generates the impact on wages. However, later on, we will modify

and extend this basic model into a dynamic function to examine differential effects for different cohorts.

To gauge the marginal effect of the regional unemployment rate, we take the derivative of the equation with respect to $\mathbf{UR_{cr0}}$:

$$\frac{\partial \ln \mathbf{W}}{\partial \mathbf{UR_{cri}}} = \beta_1 + \beta_2 \cdot \mathbf{E_i} \qquad (3)$$

Equation (3) implies that the marginal effect of the unemployment rate is an increasing function of potential work experience (**E**) because we expect for $\beta_2 > 0$. The rate of decrease in wages is depending on three factors: β_1, β_2, **E**. When $\mathbf{UR_{cr}}$ increases by one unit (i.e. a 1% point increase in the unemployment rate), it reduces workers' income by β_1 percent. However, this marginal effect also depends on years of potential experience: a one-year increase in the potential experience weakens the marginal effect of the unemployment rate (β_1 percent) by β_2 percentage point(s). If the value for **E** is large enough to make equation (3) equal to zero, then individuals can recover completely from the bad luck of graduating during a recession. That event occurs when $\frac{\partial \ln \mathbf{W}}{\partial \mathbf{UR_{cir}}} = 0$, so that $\mathbf{E} = -\frac{\beta_1}{\beta_2}$, which gives the number of years and indicates how persistent the adverse effects are.

Similarly, the marginal effect of the potential experience (**E**) also depends on the level of the unemployment ($\mathbf{UR_{cr}}$). By taking the derivative of equation (1) with respect to **E** we have:

$$\frac{\partial \ln \mathbf{W}}{\partial \mathbf{E_i}} = \beta_2 \mathbf{UR_{cri}} + \beta_3 + 2\beta_4 \mathbf{E_i} \qquad (4)$$

In equation (4), there are three terms, each of which has a different influence on the wage growth rate stemming from the increase in experience. Specifically, when the potential experience (**E**) increases by 1 year, the wage growth rate is $(\beta_2 \mathbf{UR_{cri}} + \beta_3 + 2\beta_4 \mathbf{E_i})$, where the main positive effect β_3 is strengthened by a positive term $\beta_2 \mathbf{UR_{cri}}$, where the unemployment

rate is given, and is weakened by the negative term of $2\beta_4\mathbf{E_i}$ .Therefore, the overall effect on earnings of the increase of work experience could be ambiguous.

3.3 Measuring Heterogeneity – Effects by Cohort

In section 3.2, the basic empirical model measures the effect of the unemployment rate on individuals' wages at the time of graduation for all subjects. The implicit assumption is that workers are equally affected by an economic downturn controlling for the fixed effects for year of graduation and region of residence. This means that mature workers with more than ten years' work experience would be experiencing the same amount of wage decline as the less-experienced workers during a recession.

Evidently, this seems not to be realistic, since new entrants and mature workers have different degrees of sensitivity to a recession. Mature workers appear to be more able to keep their job and maintain their earnings at a stable level over business cycles than new entrants. Mature workers may have acquired higher skills gained from their work experience and networking connections.

A recent study on unemployment dynamics of youths finds that young workers are twice as likely to be laid off than mature workers (Bernard, 2013). Thus it is necessary to use an unrestricted form of regression model to separate the impact on wages among different cohorts of experience. The following estimating equation attempts to show the year by year (here in five-year intervals) pattern of the recovery from the initial wage losses:

$$\ln \mathbf{W_i} = \gamma_0 + \gamma_1 \mathbf{UR_{cr2i}} + \gamma_2 \mathbf{UR_{cr7i}} + \gamma_3 \mathbf{UR_{cr12i}} + \gamma_4 \mathbf{UR_{cr17i}} + \gamma_5 \mathbf{UR_{cr22i}} + \gamma_6 \mathbf{UR_{cr27i}} + \gamma_7 \mathbf{E_i} + \gamma_8 \mathbf{E_i}^2 + \alpha \mathbf{D_{ci}} + \delta \mathbf{R_{ri}} + \sigma_i \qquad (5)$$

where the variables are

$$\mathbf{UR_{cr2}} = \mathbf{UR_{cr}} \cdot \mathbf{PE_2}$$

$$\mathbf{UR_{cr7}} = \mathbf{UR_{cr}} \cdot \mathbf{PE_7}$$

...

$$\mathbf{UR_{cr27}} = \mathbf{UR_{cr}} \cdot \mathbf{PE_{27}}$$

$\mathbf{PE_2} = 1$ if the number of years of potential experience $\mathbf{E_i} = 2, 0$ otherwise

$\mathbf{PE_7} = 1$ if the number of years of potential experience $\mathbf{E_i} = 7, 0$ otherwise

...

$\mathbf{PE_{27}} = 1$ if the number of years of potential experience $\mathbf{E_i} = 27, 0$ otherwise

$\mathbf{E} =$ the number of years of potential work experience

$\mathbf{E^2} =$ a quadratic form of $\mathbf{E}$, the number of years of potential work experience

$\mathbf{G_c} = 1$ if the individual graduated in the calendar year $\mathbf{c}$, 0 if otherwise

$\mathbf{R_r} = 1$ if the individual graduated in the region r, 0 if not

The variables $\ln \mathbf{W}$, $\mathbf{E}$, $\mathbf{E^2}$, $\mathbf{D_c}$ are defined in the same way as in regression equation (1). The interaction form $\mathbf{UR_{cr}} \cdot \mathbf{PE_e}$ represents the product of the unemployment rate and the set of potential experience dummies. For clarification purposes, $\mathbf{E}$ in equation (1) represents a numerical variable which takes values of 0, 2, 7, 12, 17, 22, 27, while $\mathbf{PE_e}$ stands for dummy variables which equals to 1 when $\mathbf{E}$ takes certain values**.** $\mathbf{PE_e}$ stands for potential work experience (**PE**), for which the nodes are $\mathbf{E}$=2, 7, 12, 17, 22, 27 (consistent with the five-year intervals of age groups). $\mathbf{PE_2} = 1$ if $\mathbf{E_i}$=2 (individuals who have two years of work experience); $\mathbf{PE_2} = 0$ if $\mathbf{E}$ takes any other values of the number of work experience. For the cohort that has two years of work experience ($\mathbf{E_i}$=2) by 2006, they must have graduated in 2004 and fall into the age group of 20-24 years old. Similarly, $\mathbf{PE_7} = 1$ if $\mathbf{E_i}$=7 (for the cohort that has 7 years of work experience) and $\mathbf{PE_7} = 0$ otherwise. This represents individuals who have seven years of

potential work experience who graduated in 1999, and belong to the age group of 25-29 years old. Thus, this flexible-form equation will generate different estimates for the coefficients $\gamma_1, \gamma_2, \ldots, \gamma_6$ that distinguish between cohorts by the number of years of potential experience **E**.

The explanatory variables, for instance, $\mathbf{UR_{cr2}}$ only contains data for individuals that have two years of work experience, and $\mathbf{UR_{cr7}}$ only contains data for individuals that have seven years of work experience, etc. Therefore, the coefficients $\gamma_1, \gamma_2, \ldots, \gamma_6$ represent the respective coefficients that measure the respective effect of an external shock on individuals' income for cohorts of experience. From equation (5), one can see that for workers who have two years of work experience, if the youth unemployment rate in region **R** in the year **C** goes up by one percentage point on average, the workers' employment income generally falls by $(100 \cdot \gamma 1)\%$. For those who have seven years of experience, it is $(100 \cdot \gamma 2)\%$, and for those with 27 years' experience, the rate of decline being $(100 \cdot \gamma_6)\%$, and so on.

Now the question comes of whether there is a certain pattern in the magnitude of the estimates for the coefficient, since I expect for the estimates to display a descending order referring to different values of years of potential experience. In the preceding section, I indicated that the literature suggests that young university or college graduates are influenced more by a slack labour market in terms of wage earnings than mature workers who have more years of work experience. Consequently, the estimated coefficients' values for the cohorts with more years of experience are expected to be bigger in size than the estimates for fewer years' experience cohorts. For instance, for parameters γ_1 and γ_2, it should be $|\gamma_1| > |\gamma_2|$, assuming that individuals with seven years' experience seem to be less influenced than individuals with two years' work experience. Thus, we are expecting that the simple relationship between $\gamma_1, \gamma_2, \ldots, \gamma_6$ to be $|\gamma_1| > |\gamma_2| > \cdots > |\gamma_6|$.

3.4 Potential Empirical Problems

The regression approach applied in this paper is the Ordinary Least Squares (OLS). This method is extensively used in regression analysis. Given the assumptions underlying the classical model, the least squares estimators could be a powerful instrument in measuring the impact of adverse market conditions on young graduates' earnings. One of the key assumptions is that the independent variables, i.e. $\mathbf{UR_{cr}}, \mathbf{UR_{cre}}$, and $\mathbf{E}$, should be uncorrelated with the error term ϵ, i.e. $\text{cov}(\epsilon, \mathbf{UR_{cr}}) = \text{cov}(\epsilon, \mathbf{UR_{cre}}) = \text{cov}(\epsilon, \mathbf{E}) = 0$. This assumption can also be interpreted as the independent variables being exogenous. Otherwise, the estimates drawn from the regression models will either underestimate or overestimate the true marginal variation. For example, workers' incomes could also be associated with ambition, work attitude, family support, or networking connections. Another potential problem is omitted variables (individual capability or different locations of residence), which will again cause correlation between the explanatory variables and the error term.

First, examine the selective graduation. Some may argue that, under slack labour market conditions, students who are approaching graduation may choose to stay in school longer than otherwise and hence accumulate more human capital. Indeed, anticipating the difficulty of finding employment in a depressed job market, some of the high school graduates may select themselves into university or college education to avoid potential unemployment. Similarly, some university students may also select themselves into Master or Ph.D. programs. If more able students, who tend to have better grades in school, choose to delay their graduation, then the estimating results may lead to an overestimation of the effects of a recession on workers' wages. Under these circumstances, the time variable of graduation $\mathbf{c}$ becomes endogenous, and therefore the variable of experience $\mathbf{E}$ also becomes endogenous; the assumption underlined in

the regression is violated, $\text{cov}(\epsilon, \mathbf{E}) \neq 0$.

Another possible adverse selection mechanism is selective participation in the labour force. If workers select themselves into or out of the labour force based on labour market conditions, the regression equations are likely to be estimated from a selected sample. This potential problem violates the assumption $\text{cov}(\epsilon, \mathbf{UR_{cr}}) = 0$, because the unobserved individual characteristics in the error term ϵ are correlated with the initial unemployment rate. For example, more able workers might decide to leave the labour force to get a MBA degree because they do not want to get paid less during a recession. These more able workers expect that when they re-enter the labour force later they could get paid more than they did without a MBA degree. Thus, the results may have overestimated the adverse effects of a recession on workers' earnings. However, if less able workers choose to leave the labour market, then the estimated results will be underestimating the adverse influence of a recession on graduates' career. University graduates might be considered as inexperienced workers in the sense that they have lower professional skills and less training from work than mature workers.

Although these two types of adverse selection could lead the results to estimation biases, the universal criteria of sampling and the large sample size (160,604) samples for the regression model) of Census 2006 seem to minimize such potential biases. Therefore, I believe that the main results are not dominated by the problem of adverse selection.

4. Empirical Results

4.1 Results of the Basic Regression Model

The assumption underlying the basic regression model (1) is that the effects of increasing potential work experience are identical across different cohorts. Table 4 reports the empirical

results of the first regression equation. Based on the data drawn from the 2006 Census, column 2 gives the values of the coefficients for each explanatory variable. Thus, the realized regression model becomes the following equation:

$$\widehat{\ln \mathbf{W_i}} = 9.2749 + (-.03113)\mathbf{UR_{cri}} + (.00135)\mathbf{UR_{crei}} + (.1293)\mathbf{E_i} + (-.00326)\mathbf{E_i}^{\mathbf{2}} + \alpha\mathbf{G_{ci}} + \delta\mathbf{R_{ri}} \qquad (6)$$

all the p-values of the coefficients being 0.000, and therefore all the estimated coefficients are statistically significant.

The two numbers $\widehat{\beta_1} = -0.03113$ and $\widehat{\beta_2} = 0.00135$ are of the most interest, since $\widehat{\beta_1}$ measures by how much workers' annual income are reduced by a recession, and β_2 measures how persistent these earnings losses could be as the worker gains experience. The results obtained from the basic regression model are consistent with previous hypotheses of their signs, $\beta_1 < 0$ and $\beta_2 > 0$. The signs of the parameter estimates indicate that workers' earnings are indeed significantly negatively impacted by the youth unemployment rate and positively related to the interaction term $\mathbf{UR_{cr}} \cdot \mathbf{E}$. Therefore, the higher the unemployment rate, the more workers' income declines. Recall from the previous section, equation (3), $\frac{\partial \ln \mathbf{W_i}}{\partial \mathbf{UR_{cri}}} = \beta_1 + \beta_2 \cdot \mathbf{E_i}$, represents the rate of change of workers' earnings. For newly graduated university or college students, $\mathbf{E_i} = \mathbf{0}$, thus the growth rate of earnings is $(100 \cdot \beta_1)\%$. The estimate β_1= -.03113 indicates that if the youth unemployment rate goes up by 1% point, individuals' employment income will decrease by 3.1%. In the case of a recession during which the youth unemployment rate could rise by 4% points, like what occurred in Canada from 2008 to 2009, the model predicts a loss of 12.4% for an individual's annual earnings. In 2013, the average weekly earnings of Canadians are $910.74 (CANSIM, table 281-0027, 2013), which indicate annual income of $49,348 ($910.74×52 weeks). Thus, a 12.4% wage loss represents $6,119 reduction

of an individual's earnings due to an economic downturn.

Moreover, the wage losses tend to be persistent for decades. Since $\beta_2 > 0$, this means that the initial wage losses can be regained after a certain number years of work experience. $\beta_2 = 0.00135$, recall from equation (3), $\frac{\partial \ln \mathbf{W_i}}{\partial \mathbf{UR_{cri}}} = \beta_1 + \beta_2 \cdot \mathbf{E_i}$. Set equation (3) equal to zero, then we could obtain the value of $\mathbf{E}$, $\mathbf{E_i} = 0.03113 \div 0.00135 \cong 23$. This value of $\mathbf{E}$ implies that in order to recover from the initial wage losses due to a recession, an individual would need at least 23 years of work experience. This surprisingly large value indicates that the impact of a recession on workers' income could be permanent. If the individual starts career at the age of 20 and retires at 65, then 23 years represents 51% of the person's entire career time. Thus, the regression results suggest that the impact of an adverse economic shock could be permanently detrimental to a worker's career and financial earning's situation.

Compared to the results in Oreopoulos et al. (2012), the first empirical model in this paper predicts a larger wage loss for Canadian workers when they entered the labour force during an economic downturn. Oreopoulos et al. (2012) found that a 5% point increase in the youth unemployment rate is associated with a 9% fall in their earnings. This difference in magnitude of estimates could be attributed to the use of different datasets.

Nevertheless, the effects on individuals' income of the recessions explored by this paper are qualitatively supported by other research studies. New graduates have obvious financial and career disadvantages when entering the labour force during a recession (Palin, 2013). From October 2008 to March 2009, "Canada lost 357,000 jobs. The job losses of the first three months of 2009 were greater than those in the US, if scaled to the size of the US labour market." (Yalnizyan, 2009). According to a recent report on market income by OECD, households' income has fallen dramatically during the 2008-09 financial crisis (OECD, 2013). Moreover,

these less lucky university or college graduates could be stuck in part-time work or low-paid work, and insecure jobs for a long time. During the recent recession, while the job market lost a large number of full-time jobs, "the creation of 30,000 part-time jobs in this period scarcely offset the loss of 387,000 full time jobs — 2.8% of the full-time job market in Canada" (Yalnizyan, 2009). This pattern had also been seen in the 1980s and 1990s recessions, when the labour market saw 1-2% of total jobs vanish in the first several months of the recessions but there were also substantial number of part-time jobs were created offsetting the loss of full-time jobs (Yalnizyan, 2009).

In terms of returns to experience, the estimated value of $\beta_3 = 0.129$ indicates that obtaining one more year in potential experience will contribute to a 12.9% increase in earnings. However, recall from equation (4),

$$\frac{\partial \ln \mathbf{W_i}}{\partial \mathbf{E_i}} = \beta_2 \cdot \mathbf{UR_{cri}} + \beta_3 + 2\beta_4 \cdot \mathbf{E_i}.$$

Substitute the parameters with the estimates from Table 3, and we obtain:

$$\frac{\partial \ln \mathbf{W_i}}{\partial \mathbf{E_i}} = .00135 \cdot \mathbf{UR_{cri}} + .129 - 2 * .00326 * \mathbf{E_i} \quad (7)$$

We can see from equation (7) that the growth rate of income due to rising potential experience is also determined by other elements in equation (4). The marginal effect is positively affected by $\mathbf{UR_{cr}}$ since $\beta_2 > 0$, and negatively affected by $\mathbf{E}$ since $\beta_4 < 0$. Thus, the growth rate of income corresponding to an increase of potential experience also depends on the market conditions $\mathbf{UR_{cr}}$ and the individual's own work history $\mathbf{E}$. If the economy is in a deep downturn (when $\mathbf{UR_{cr}}$ is very high), then the individual will enjoy higher wage increase because of obtaining one more year of work experience than when the economy is booming, i.e. $\mathbf{UR_{cr}}$ is relatively low. Intuitively, in a slump when work experience is a highly valuable asset

that is hard to obtain, a margin of increase of experience will make a larger difference for workers under employment.

4.2 Implications of the Flexible-Form Equation

Table 4 provides the OLS estimates for the flexible-form equation (6). By substituting the results in column 2 in for the parameters, I obtain the realized flexible-form regression model:

$$\widehat{\ln \mathbf{W_i}} = 9.6885 + (-.0496)\mathbf{UR_{cr2i}} + (-.0188)\mathbf{UR_{cr7i}} + (-.00054)\mathbf{UR_{cr12i}} + (-.0027)\mathbf{UR_{cr17i}} + (-.0012)\mathbf{UR_{cr22i}} + (-.00108)\mathbf{UR_{cr27i}} + (.0533)\mathbf{E_i} + (-.00096)\mathbf{E_i}^2 + \alpha\mathbf{G_{ci}} + \delta\mathbf{R_i} \quad (8)$$

and all the estimated coefficients are statistically significant, all the p-values being 0.000.

Results obtained from equation (8) imply that adverse economic conditions could induce disproportionate effects across different cohorts of experience. The rising unemployment rate has stronger negative impact on new entrants than on the cohorts that have more years of potential work experience. Moreover, the magnitudes of these estimates appear to display a certain pattern that is related to workers' years of work experience. The values of the estimated coefficients are smaller for more mature workers than that of relatively less experienced workers, which implies that there is a weaker relationship between the workers' annual earnings and the youth unemployment rate prevailing in the year of their graduation. For instance, for workers who have more years (22 to 27 years of work experience) of potential work experience, the magnitude of the estimate is smaller than those with fewer years (two to seven years) potential work experience. Thus, consistent with the results from equation (6), individuals who have more years of potential work experience seem to be less influenced by an adverse shock than workers who have fewer years of work experience.

I expect that the absolute values of the coefficients in equation (3) should exhibit the following pattern: $|\gamma_1| > |\gamma_2| > \cdots > |\gamma_6|$. However, in the estimated regression equation, if we add fixed effects of potential work experience, only the first two estimates are statistically significant: $\gamma_2 = -0.0496$ and $\gamma_3 = -0.0188$. For individuals who have more than ten years' potential work experience, from 12 to 27 years, the negative impact is not significant and not very large. We could interpret this phenomenon as workers who have more than ten years' work experience as entering stable career phase. However, that does not mean that more mature workers are not affected by the adverse economic conditions. This means that workers who have only two years of potential work experience will experience a fall of nearly 5% ($\gamma_1 = -0.0496 \approx 5\%$) in their income if they were to graduate during an economic recession. For workers who have seven years of potential work experience, the fall in their income is about 1.8% ($\gamma_2 = -0.0188 \approx 1.8\%$), which seems to be only half of the former group. For the cohort of individuals who have 27 years of potential work experience, the wage losses are much smaller: on the order of 1% loss, but the estimates are not statistically significant. The implication is that the influence of a financial crisis, for example, has unequal effects on different cohorts that differ in years of potential work experience.

For workers who are between 42 and 47 years old, who have 22 to 27 years of potential experience, an increase of 5% points in the unemployment rate reduces annual earnings by 5-9%. Although the estimates of $\gamma_3, \gamma_4, \gamma_5$ are not statistically significant, the results indicate that workers have even 12-27 years of experience cannot completely avoid the effects of an adverse shock.This outcome is consistent with the findings in the literature. For instance, a number of studies, including Beaudry and DiNardo (1991), McDonald and Worswick (1999), Grant (2003), and Schmieder and von Wachter (2010), have suggested that "labour market conditions have

persistent effects on earnings even for more experienced workers on the job" (Oreopoulos et al., 2012).

Simply working harder is not able to make a big difference, because workers who are currently employed are very likely to work even harder to keep their job or stable earnings. Lazear, Shaw, and Stanton (2013) find that the productivity during the financial crisis rose. Lazear et al. (2013) used panel data of 23,000 individuals in a large firm and found that workers' effort tend to fluctuate along with business cycles. Workers tend to work harder during a recession, since firms "make do with less" by using currently hired workers to complete tasks that used to be done by displaced workers. It seems that a best strategy of avoiding substantial wage losses is to start at the top, being very resourceful to find a well-paid job when starting a career (Goolsbee, 2006). In the process of climbing the career ladder, it is better to start with a better job, since other workers are also progressing during this same climbing career ladder process (Goolsbee, 2006).

5. Conclusion

Throughout Canada's economic history, there were a total of 13 recessions dating back to 1926. There are three major economic downturns during the last three decades since 1976: the 1981-82 recession, the 1990-91 recession, and the recent 2008-09 financial crisis. These recessions are characterized not only by significantly declining GDP, but by a high unemployment rate. Among all the parties influenced by an economic downturn, newly graduated university or college students are especially vulnerable in terms of career frofile. The disadvantages that the graduates face are obvious in that there are fewer job openings in the market, and they are less experienced or skilled compared to more mature workers. Therefore,

this paper attempts to quantify the cost of entering the job market during a recession. The outcome variable is the wage losses of the individuals and the age-earnings profile thereafter.

The empirical analysis is based on the regression models developed in Oreopoulos et al. (2006). Together, the two models in this paper estimate the magnitude and the long-term effects of a recession on individuals' annual earnings in the 2006 Census. The first basic model is a restricted model since the unemployment rate variable is interacted with a linear specification of the potential experience variable. The results from the restricted model indicate that young graduates entering the labour force suffer from substantial earning losses as much as 12.4% of their annual income during a recession (technically defined as a 4% point increase of the youth unemployment rate). Moreover, these adverse effects on earnings tend to be persistent, lasting up to 23 years throughout an individual's career on average. The flexible-form equation's specification has the unemployment rate variable interacted with a set of binary variables for the potential experience variable. On average, the estimates imply that individuals with less than 10 years' potential experience bear larger earnings decline than mature workers.

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Appendix:

TABLE 1: DISTRIBUTION OF THE VARIABLE C, THE ESTIMATED YEAR OF GRADUATION.

The Year of graduation	Frequency in the Population Sample	Percent of the Population Sample	Cumulative Percent of the Population Sample
1939	1,965	0.72	0.72
1944	3,231	1.18	1.9
1949	5,237	1.91	3.81
1954	6,989	2.55	6.36
1959	9,947	3.63	9.99
1964	15,725	5.74	15.73
1969	23,129	8.44	24.18
1974	27,381	10	34.17
1979	31,235	11.4	45.57
1984	34,519	12.6	58.18
1989	32,470	11.85	70.03
1994	31,258	11.41	81.44
1999	28,830	10.52	91.96
2004	20,187	7.37	99.33
2006	1,606	0.59	99.92
2009	218	0.08	100
Total	273,927	100	

TABLE 2: SUMMARY STATISTICS OF VARIABLES $UR_{cr}, UR_{cr2}, UR_{cr7}$.

Variable	Number of Observations	Mean	Std. Dev.	Min	Max
URcr	177997	14.05655	3.703508	6.3	32.4
URcr2	177997	1.546554	4.38485	0	22.7
URcr7	177997	2.272359	5.249989	0	26.8

TABLE 3: DISTRIBUTION OF THE VARIABLE E, POTENTIAL WORK EXPERIENCE.

Potential Work Experience	Frequency	Percent	Cumulative Percent
0	1,606	0.59	0.59
2	20,187	7.38	7.96
7	28,830	10.53	18.5
12	31,258	11.42	29.92
17	32,470	11.86	41.78
22	34,519	12.61	54.39
27	31,235	11.41	65.8
32	27,381	10	75.81
37	23,129	8.45	84.26
42	15,725	5.75	90
47	9,947	3.63	93.63
52	6,989	2.55	96.19
57	5,237	1.91	98.1
62	3,231	1.18	99.28
67	1,965	0.72	100
Total	273,709	100	

Note: The values of potential work experience that exceed 42 years are excluded from the sample.

TABLE 4: REGRESSION RESULTS FOR THE BASIC EMPIRICAL MODEL.

	Estimated Coefficients	Standard Errors	t-values	P-values
Effects of The Unemployment Rate and the Interaction Form				
URcr	-0.03113	0.004165	-7.47	0
URcr*E	0.001353	0.000166	8.18	0
Effects of The Potential Work Experience				
e	0.129301	0.002958	43.71	0
e^2	-0.00327	8.34E-05	-39.14	0
Fixed Effects Controlled for the Year of Graduation and Province of Residence				
dc79	0	(omitted)		
dc84	-0.12873	0.012516	-10.29	0
dc89	-0.1834	0.016885	-10.86	0
dc94	0	(omitted)		
dc99	0.129095	0.010991	11.75	0
dc04	0	(omitted)		
r1	6.47E-05	0.065137	0	0.999
r2	-0.02379	0.040889	-0.58	0.561
r3	0.043799	0.042877	1.02	0.307
r4	0.077208	0.039626	1.95	0.051
r5	0.152038	0.04464	3.41	0.001
r6	0.057205	0.049895	1.15	0.252
r7	0.042913	0.051551	0.83	0.405
r8	0.181609	0.048505	3.74	0
r9	-0.00339	0.041381	-0.08	0.935
Constant	9.274863	0.086988	106.62	0

Note: In Table 3, "dc" represents fixed effects of graduating in different years from 1979 to 2004; "r_i" represents region dummies including ten provinces in Canada.

TABLE 5: REGRESSION RESULTS FOR THE FLEXIBLE-FORM EQUATION.

	Estimated Coefficients	Standard Errors	t-values	P-values
Effects of Different Graduated Cohorts				
URcr2	-0.04962	0.005454	-9.1	0
URcr7	-0.01887	0.004918	-3.84	0
URcr12	-0.00547	0.004187	-1.31	0.191
URcr17	-0.00272	0.003152	-0.86	0.388
URcr22	-0.00122	0.002655	-0.46	0.645
URcr27	0.001089	0.003136	0.35	0.728
Effects of The Potential Work Experience				
e	0.053312	0.014666	3.64	0
e^2	-0.00097	0.000454	-2.13	0.033
Fixed Effects Controlled for the Year of Graduation and Province of Residence				
dc79	0	(omitted)		
dc84	-0.00254	0.057602	-0.04	0.965
dc89	-0.04488	0.065358	-0.69	0.492
dc94	0	(omitted)		
dc99	0.077429	0.070475	1.1	0.272
dc04	0	(omitted)		
r1	0.013919	0.065566	0.21	0.832
r2	-0.01384	0.041294	-0.34	0.738
r3	0.054756	0.043679	1.25	0.21
r4	0.0958	0.040604	2.36	0.018
r5	0.174671	0.045857	3.81	0
r6	0.070162	0.051447	1.36	0.173
r7	0.054966	0.053247	1.03	0.302
r8	0.190792	0.050377	3.79	0
r9	0.015309	0.042925	0.36	0.721
Constant	9.688547	0.112805	85.89	0

Note: Although the estimated coefficients for URcr12, URcr17, URcr22, URcr27 are not statistically significant, the effects of a recession on the earnings for individuals who have 12 years and over seem to be minimal.