# The Long-term Effect of Macro Shocks at Labor Market Entry: Evidence from Taiwan

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Abstract. The hit of the pandemic brought out an increasing unemployment rate in the labor market. Young workers coming of age are hugely influenced when going through the school-to-work transition, an early life stage impacting future careers. Literature has pointed out scarring effects - long-term effects of unfavorable labor market entry due to macro shocks. This paper complement the literature by studying the case of Taiwan which has a relatively flexible labor market in East Asia. I investigate the long-run effects of initial labor market conditions on earnings and employment status for individuals entering the labor market between 1978 and 2017. Using data from Taiwan's Manpower Utilization Survey, I find both persistent wage reductions and temporary unemployment penalties, a distinguished result given the nature of the flexibility of the labor market in Taiwan. Moreover, the scarring effects are heterogeneous in that men experience more persistent but smaller wage losses than women, and highly-educated graduates experience earning reductions while lower-educated counterparts tend to endure a higher probability to be unemployed. Together, these results confirm that even after temporary shocks disappeared, long-term penalties exist.

# Contents

# 1  Introduction

With the outbreak of COVID-19, the unemployment rate hit its high records in a decade. The pandemic shock almost influences everywhere in the world, and one's everyday life. Meanwhile, for an individual, the school-to-work transition is one of the most indispensable stages in a life cycle. What would happen if an unlucky individual first enters the labor market at a bad time, for example, like during a historical pandemic? More generally, will an effect persistently affect one's later life even after the short-term event has been removed? To answer the question, this study will refer to recessions in history to estimate the long-term effects of a macro labor market shock at labor market entry on present labor market outcomes.

The school-to-work transition is a special stage in one's life cycle as it is the period between the completion of education and the status of stable employment when most individuals own a first formal job. This key stage is often linked with several activities such as searching, matching under uncertainty, and receiving professional training for career prospects. Consequently, experience at this early stage is highly likely to significantly influence future labor market outcomes. With the increasing levels of educational attainment and the rising number of people receiving higher education, this transitional period attracts more attention from young adults themselves. Nevertheless, public concerns for young workers coming of age have been around for a long time, particularly since the 2007 - 2009 Great Recession. Young workers who initially enter a weak labor market during a bad time are unluckier than their counterparts who happen to graduate a few years before when the labor market is stronger. For example, unlucky cohorts may find it harder to land an ideal first job, leading to a long-lasting impact even though the recession has gone itself.

The persistence of this impact – the so-called "scarring effect" has been under the economists' studies, as a part of hysteresis literature. Most past studies focus on college students and mostly males to estimate the long-run effects of bad entry on variables in the labor market such as earnings and employment. My study explores this effect on large demographic groups with different educational attainment and gender. More importantly, I study Taiwan, a relatively flexible labor market in East Asia to examine this scarring effect comparing to past empirical results in other areas. To specifically answer the research question, I use the pooled cross-sectional data from Taiwan's Manpower Utilization Survey 1999 - 2018. My study confirms a persistently negative effect of the initial labor market conditions on earnings. However, for employment prospects, a negative effect only exists in the starting periods then fades to zero fast. The scaring effect varies to a great extent in terms of gender and education level. Briefly, high-educated graduates endure a loss mainly via long-term earnings while low-educated workers experience temporary non-employment

as a result of first entering a depressed labor market. The adverse effect size in earnings is estimated to be larger for women but their loss is less persistent than men. Meanwhile, the temporary non-employment effect is more profound for male than female workers.

The rest of the thesis is organized as follows: Section 2 is a literature review about the scaring effect; Section 3 provides information on the data source, key measures, sample selection, and sample description; Section 4 discusses the estimation strategy, endogenous timing, and potential limitations in the study; Section 5 presents the results and discussion; Section 6 concludes; Section 7 references; Section 8 is an appendix which consists of alternative sensitivity tests, examination for schooling choices, and a probit model estimating the scarring effect on employment status.

# 2  Related Literature

In this section, I will first discuss potential mechanisms explaining how the early stage of school-to-work transition can hugely affect labor market outcomes in the future. It not only gives importance to the study but also lays a framework for empirical exploration. Then, I will turn to the "scarring effects" literature, summarizing the past studies in the topics. Next, the heterogeneous effects will be discussed to further explore possible differences regarding hysteresis effects. Last, Taiwan will be introduced to give a background and purpose of this study.

## 2.1  Framework

Research has shown that early labor market entry can have an enormous impact on one's later careers. Lucky cohorts graduating at a prosperous time are more likely to land a better job in later careers than their unfortunate counterparts. For example, Kwon et al.(2010) find that by entering the labor market during a boom, workers have a higher probability to get promoted to higher ladders. Moreover, the quality of their first employers is likely to be better whereas poor situations at graduation come with lower quality of employers (Brunner and Kuhn, 2014). A dissatisfying first job at the starting stage has a huge impact on subsequent careers. One channel, as pointed out by (Arrow, 1973), is that a poorly qualified first job may have a depressing signal of one's ability, particularly at the time when screening cost is high. This Negative signal of a worker's quality and capability could adversely influence job hunting in one's later careers when one is searching for a higher position. Hence, unlucky entrants probably experience poorer life careers as a consequence of unfavorable entry, which would not have been the case if they had graduated in a normal economy or boom.

Human capital accumulation can also be undermined by weak entry conditions. First of all, unemployment itself can lead to the loss of skills so even temporary employment shock has a long-lasting effect on one's career (Pissarides, 1992). Moreover, unemployment conditions faced during the age 18 to 25, an early life period, are found to have a worse impact on skills than unemployment in later periods from 26 to 35 years old (Arellano-Bover,2020). The unlucky youth lose accumulation in employment-oriented human capital since adverse starting entry reduces their chance to obtain a full-time job (Kondo, 2007). Thus, by depressing skills accumulation, temporary labor market conditions at the time of graduating could have long-lasting effects on future outcomes.

However, these effects may vary with socioeconomic status. One possible disparity is that lower educated and less skilled people are more likely to be affected. Searching

theory shows that when looking for a job, people's searching intensity is positively affected by the expected returns of the job hunters (Shimer, 2004). If during a bad period, high-skilled youth confidently expect a quick recovery from the adverse entry, it's highly possible that they increase search intensity, thus landing better jobs than their low-skilled counterparts (Altonji et al., 2016). However, there is an insurance mechanism in the form of transfer and co-residence, which might at the same time mitigate the effects to some extent. Coresidence is particularly found to be valuable for young people from poor families (Kaplan 2012). It provides the youth with the means to search for better jobs that take a longer time to find but with higher wages in the long run. As a result, it remains unclear how lower-educated group would specifically experience scarring effects, and how particularly young adults coming of age in Taiwan's labor market would experience it. In short, the early unfavorable entry effect on earnings and employment could possibly vary with different groups.

## 2.2 Scarring Effects

Literature about scarring effects is rich in many ways. Much literature from the US highlights the negative effects on earnings, while literature in the EU heavily explores consequences on employment status, as these two labor markets have different institutions influencing long-term outcomes. Specifically, studies in US and Canada mostly found a persistently negative impact on earnings, but for employment status, an adverse effect is not confirmative or it is negligible. However, some studies in EU countries usually found smaller effects on wages but non-negligible effects on unemployment. Thus in the following, I briefly summarize representative studies in regions, although one would not expect a full comparison for the magnitude nor the persistence of the estimation since studies usually include ranges of recessions in different years and they applied distinguished methodologies. In general, recessions that typically raise the unemployment rate by 4 -5 percentage points tend to cause an initial reduction of 10%, which fades to 0 in 10 years (Von Wachter, 2020). However, the effect can vary as shown in Table 1.

Notably, results for the estimated effects on future labor supply are mixed. Different regions and demographic groups experience different nonemployment effects in terms of magnitude and persistence. For example, Rothstein (2020) studies the entry effect based on cohorts in periods from the Great Recession to the COVID19 outbreak. He finds there is a negative effect on employment that lasts persistently. However, the estimated magnitude of the relationships between entry unemployment and cohort employment could only account for a small part of the recent decline in employment rates. Khan (2010) focusing on white-male college graduates entering from 1979 to 1989 discovered that the wage effect is found to be persistent, 6% in the

Table 1: *A brief summary for the "scarring effect" literature*

| Paper | Years | Location | Findings |
|---|---|---|---|
| Schwandt and Von Watcher (2019) | 1976 to 2015 | US | 3-point rise in the unemployment rate leads to 11% initial reduction; 2.6% in the 10th year |
| Kahn (2010) | 1979 to 1989 | US | Wage loss of 6% to 7% for 1 percentage point increase in the unemployment rate; remain 15 years; labor supply is unaffected. |
| Cribb et al. (2017) | 1970 to 2015 | UK | Weekly earning drop by 10.4% averagely by 4 ppt increase of unemployment rate; 2.2% after five years |
| Oreopoulos et al. (2006) | 1982 to 1999 | Canada | Initial loss is 9% led by 5 percentage point rise of unemployment rate. |
| Umkehrer (2019) | 1992 to 1996 | Germany | Wage loss of 3.2% to 9.8% led by a two percentage point increase; fade to 0 within 10 years. |
| Choi et al. (2020) | 1989 to 2010 | South Korea | For male, 1.9% lower employment probability; 2.5% lower earnings during the first 10 years. |
| Escallonilla et al. (2021) | 2007 to 2009 | Spain | Initial wage penalty is 0.9%; totally reduced by 9% for graduates entering during 2007 to 2009. |
| Brunner and Kuhn (2014) | 1978 to 2000 | Austria | 0.9% drop of starting wage by 1% point rise in the unemployment rate; lifetime loss is 1.3%. |

first year, 2.5% after 15 years but the labor supply is unaffected as the probability of employment and weeks worked don't reduce.

Some studies in European countries point out that in a ridge labor market, wage loss could be buffered at the potential cost of employment. For example, Esalonila et al. (2021) examine the adverse effect of the Great Recession on long-run careers for the cohorts entering Spanish labor market from 2007 to 2015. Spain's labor market is a highly segmented market with collective bargaining system and dual employment protection legislation. The paper finds that high-skilled workers experience persistent wage loss, while the effect is insignificant for low-educated workers and vocational training graduates, which can be explained by the binding of a legal minimum wage. For less-qualified workers, the main loss is via unemployment. Likewise, Umkehrer (2019) finds that for service occupation graduates with the lowest coverage rates of collective bargaining losses are mainly by a drop in average wages. However, manual occupation graduates with high coverage only experience reduced employment stability.

Literature on the scarring effect also looks beyond earnings and employment to have a comprehensive examination. Kawaguchi and Kondo (2020) find a negative effect on hourly wages lasting for 18 years. But no impacts on homeownership and net asset holdings are found as unlucky cohorts who experience a bad entry tend to move to regions with lower living expenses. Similarly, Cribb et al. (2017) examine the scarring effect on a living standard proxied by net household incomes and household expenditures, using household survey data from the UK since the 1970s. It takes into consideration the function of insurance. Although in line with past negative results with regard to employment status and earnings, the paper doesn't find a significant result for net household incomes or consumption. In fact, tax and state transfer reliefs the effect of decreasing earned incomes. Young adults still live with their parents after they just enter the labor market. People who don't live with their parents have a reduction in household incomes and consumption. Kaplan (2012) further shows that co-residence with parents is an option for insurance against labor market shocks, which can also explain smaller consumption, higher labor elasticities, lower saving rates, and higher long-term earning growth for low-skilled young workers.

## 2.3   Heterogeneity

People with different socioeconomic backgrounds may respond differently to temporary macro labor market shocks at the time of graduation. In the short term, people can experience various severity of initial losses, and in the long run, their

capability and manner to adjust in labor markets could also vary, thus leading to heterogeneous scarring effects. First, the scarring effect is discovered to vary with gender. For example, Choi et al. (2020) find that males endure larger and more persistent effects over 12 years, specifically 1.9% lower employment, and 2% lower earnings during the beginning 10 years. They also detect a decline in their marriage, lower financial assets, more likelihood of co-residence with parents. Instead, women temporarily experience the negative effect on employment and wage within 2 years.

Secondly, education leads to an unequal effect of entry conditions regarding both the magnitude and persistence due to various reasons. One argument is that education helps buffer the negative effect as well-educated people endure fewer losses in general. For example, Genda et al. (2010) compare the scarring effect on less-educated and well-educated men in Japan and US from 1986 to 2005. For less-educated young men in Japan, the effect is persistent, a drop of 3 - 4 percentage points of employment over 12 years, and earning loss by 5 - 7%. The loss is due to the decreasing likelihood to get full-time employment in the first few years. For more-educated Japanese, the loss is 4.6% then fades to 2.3%. In contrast, less-educated men in America only experience temporary loss. Institution features in Japan, such as strict dismissal rules and schools-involved matching process, lead to a more profound divergence among the lower and higher educated. Likewise, blue-collar workers experience lasting effects because they are easier to be trapped in low-paying jobs, and their lower-qualified first employer accounts for three-quarters of the observed loss (Brunner and Kuhn, 2014). Furthermore, using Eurobarometer data, Culer et al. (2015) find that weak labor market entry is associated with losses - wage loss and health loss such as greater obesity, more drinking, and lower life satisfaction that are particularly lower for more educated graduates.

Thirdly, people with different skill levels respond variously to recessions even within the same level of educational attainment. Altonji et al. (2016) study the effects across majors and skills for college students graduating from 1976 to 2011 in the US. The initial wage effect is estimated to be a 2.3% loss due to a 1% unemployment rate increase fading out in the first five years. However, high-skilled college graduates experience a relatively smaller effect than low-skilled majors. No effect on employment is identified in general, but, in response to a 1% higher unemployment rate, there is a 2.6% drop in the probability to work full-time in the first year. Oreopoulos et al. (2006) argue that job mobility and firm placement are heterogeneously influenced by initial labor market conditions. Usually, top workers at the distributions of wage can quickly find better firms. However, the low-ranked labor trap in low-paying firms, as persistent reductions in employer quality account for 40% - 50% of their earning losses. Likewise, Umkehrer (2019) studies effect

heterogeneities following the dimensions of skills by studying male West-German apprenticeship graduates from 1992 - 1996. He divides the sample into four groups of manual, service, technical, and commercial occupations, which vary with skills and downward wage rigidity. High-skilled occupants (i.e commercial occupation graduates) are not negatively impacted.

## 2.4   Taiwan

I choose Taiwan as the interest of study mainly for two reasons. First of all, as mentioned in section 2.2, scarring effects have variations in regions with different labor market structures. Wage loss and unemployment effect in certain labor markets have been found to be a consequence of adversely initial entry, but the dynamic of wage and unemployment itself varies in terms of labor market flexibility in the first place when there are no scarring effects. For example, comparing Europe and U.S, Bertola and Ichino (1995) pointed out that wage differentials and fluctuations of employment are decreased by institutional rigidities in Europe, in contrast to a more flexible labor system where labor pay mobility expenses and wage dispersion is necessary to trigger labor reallocation. Hence, given the difference of labor market structures, scarring effects and local adjustments to the effects are highly likely to vary.

On the other hand, in history East Asian countries have special system in terms of employment relations such as long-time employment and seniority-based compensation. Jung and Cheon (2006)'s paper described the change of this traditional employment system after the financial crisis in 1997 when employment stability in Japan and South Korea began to weaken. Taiwan, however, was distinguished with the two countries even before 1997, where lifetime employment and seniority pay system was uncommon, although its firms also experienced similar restructuring such as increasing turnover and downsizing after 1997. Particularly, away from traditions of lifetime employment, Taiwan's firms typically applied layoff instead of real wage cuts for adjustment (Rodger and Nataraj, 1999). Also, in the scarring effect literature, unlike Japan, Taiwan is remained to be explored. Hence I picked Taiwan as the main interest of the study to explore its scarring effects and how the labor market outcomes respond to this scarring effects given the flexibility of the local labor market. The graph shows the national unemployment rates between 1978 and 2018 in Taiwan. My study will focus on the periods from 1995 to 2017.

In sum, this study intends to specifically examine how labor market conditions at entry affect incomes and labor supply intensively and extensively in the long run. In addition, potential mechanisms about how to account for the wage loss will be
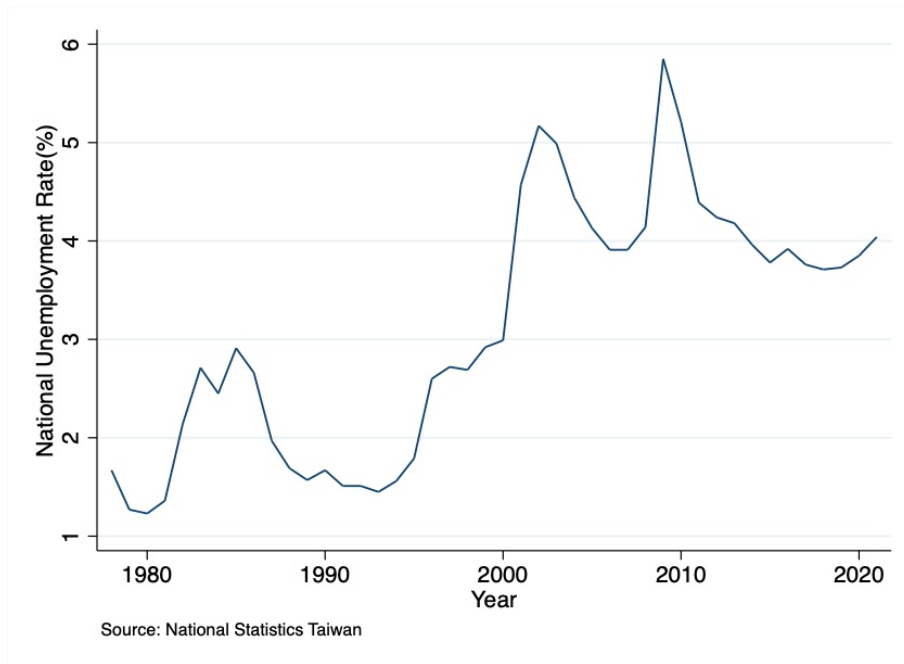
Figure 1:   Taiwan's Unemployment Rate from 1978 to 2018

examined in the study. More specifically, it is going to estimate the magnitude and persistence of the effects of adverse conditions at the labor market entry on future labor outcomes such as earnings and employment status in Taiwan, as a supplement to a rich scarring effects literature, and more broadly to hysteresis literature.

# 3    Data and Sample

## 3.1    Data Source

My estimation uses the Manpower Utilization Survey from Taiwan, executed by the Directorate-General of Budget, Accounting and Statistics, Executive Yuan. The survey has been conducted in May annually since 1978, mainly as a supplementary survey to the annual Labor Force Survey in Taiwan, containing data of monthly incomes, employment status, current employer characteristics, etc. Specifically, the yearly survey randomly sampled 20000 families who are over 15 years old on a face-to-face individual basis. Practically, I use the data collected since 1999 due to the availability of another data - the unemployment rate, where the record dates back to 1978. The Manpower Utilization Survey collected before 1999 includes most observations graduating far earlier than the 1970s, thus to sustain the sampling design, I only draw the surveys from 1999 to 2018.

The pooled cross-sectional datasets have advantages in terms of my research questions. First of all, it covers a long period after one's graduation to study the hysteresis from external labor market shocks, providing much yearly variation. Secondly, the sample size is large enough to allow me to look into heterogeneity by estimating the effects on various demographic groups with different education levels and employed characteristics. However, compared to a panel dataset, the cross-sectional dataset doesn't explicitly survey the exact year or region of graduation. I have to construct the necessary information based on the educational attainment provided. As a result, there is a measurement error for the graduation timing in the pooled cross-sectional data. In addition, a panel dataset usually records one's early stage of career such as the first employer right after graduating, which could possibly offer more information to explore the mechanism behind the scarring effects, as the literature already illustrates the importance of the initial job quality. Unfortunately, the pooled cross-sectional dataset limits some study options.

## 3.2    Key Measures

The first dependent variable for the study is monthly earnings in the unit of the new Taiwan dollar in the dataset. It reports one's income in April in the calendar year of survey conduction, excluding any unusual earnings such as child's education subsidies. I deflate the monthly wages by CPI index based on 2016 and use log real monthly wages as the dependent variable. The second key dependent variable is the current employment status, which is drawn from the questionnaire questions - "what were you doing during most of the last week". The variable doesn't strictly follow the economic definition of unemployment distinguishing those who actively

search for a job even though under unemployment and who don't. For simplicity, I construct a dummy variable equalling 0 for all individuals without being currently employed, and equaling 1 for all people who are employed at the time of survey regardless of full-time or part-time employment. The third important dependent variable is working time, which is constructed as work hours per week.

The regressor of the primary interest is the annual national unemployment rate, the proxy for the macro labor market condition. I use the national level primarily because of the lack of data about graduation regions. In addition, advantageously, the national unemployment rate can overcome the issue of non-random regional mobility from regional-yearly variation.

Another critical variable is schooling, by which I construct the graduating year profiles for each observation. The insufficiency of graduating records makes me refer to the variable educational attainment. Based on Taiwan's education system, a university degree is assigned with 16 years which is 9+3+4, senior high school and vocational schools are assigned with 12 years, junior high school is 9 years, and for master's study, which can last 1 to 4 years, I assigned an average of 18 years in total. Accordingly, the labor market entry year is defined as the year of birth + 6 + schooling. Noted, all the calculations correspond to an individual who enters elementary school at age of 6. Without the record of birth month, neither can I more precisely calculate the entering year when usually children born later than September have to either register schools early or in one delayed year. So, there is at least an error around 1 year regarding entering elementary school, although the error could be negligible. One also needs to consider an unusual delay of schooling due to other reasons such as having a gap year. Thus, to reduce the measurement error, I average the national unemployment rate before, in, and after the predicted graduation year, a three-year value, as a proxy in a sensitivity test. The sensitive test is attached in appendix 8.2.

## 3.3   Sample Selection

I do not use all samples from the datasets, mainly due to data limitations and concerns for my research aim. First, observations with educational backgrounds in primary schools, Ph.D.'s, and junior colleges are removed from the core sample because of the difficulty in calculating schooling years that define a cohort in my study. In Taiwan, junior colleges have duration varying from 2 to 3 and 5 years. Without any details, it is hard to construct a reasonable cohort for these graduates. Otherwise, the measurement error would make the sample noisy, particularly considering that the junior college graduates account for a very large proportion

of the sample size in the original survey. Similarly, self-educated samples are also restricted. Secondly, I leave out individuals claiming to have a job but under the studying, who may be part-time students, interns, and about to graduate since the calculation of predicted entry time makes it imprecise to speculate on people with 0 experience and less than 1-year experience. Meanwhile, the dataset has individuals with a predicted experience of 40 years, but with the increasing experience, the sample size reduces dramatically. So the study only selects graduates with potential experience ranging from 1 year to 25 years to ensure an appropriate sample size and relatively equal distribution.

Therefore, my ultimate sample has 325,013 observations, ranging from 16 to 49 years old, who were predicted to enter the labor market between 1978 and 2017 when they were 15 to 24 years old. This long period covers the Asian financial crisis, early 2000s recessions, and the Great Recession when Taiwan experienced a huge rise in the unemployment rate.

## 3.4    Sample Description

Figure 2 is a summary of the main variables in the total sample. The average age in my sample is 32 years old. Observations are predicted to enter the later market for the first time from 1978 to 2017, among whom 80% are currently employed at the survey year. The average years of education are 13 years, and approximately 85% of observations obtain a high school or a higher educational level certificate. Figure 2 shows log monthly incomes, work hours, full-time, and work duration at the current employer for the currently employed in the survey year. The mean monthly income adjusted is 37,815 new Taiwan dollars for the employed in the full sample. On average, work hours are 44 hours per week, and 95% are working full-time.

For those who are employed, females work 43 hours, and males work 44 hours respectively. The employment is 71% for females while the rate is 88% for men in the sample. The variance for female employment is also larger than male, implying a large uncertainty. There is a difference in adjusted incomes, employment, and work hours between samples with different educational attainment. The higher the educational level one obtains, the higher monthly income adjusted and probability of employment are. Junior and senior high school, and vocational graduates on average have lower monthly incomes than college graduates at present. The wage gap is large in the sample probably because junior college graduates are excluded, whose mean income could be larger than high school graduates but smaller than colleges.

The distribution of total samples by categories of educational attainments and po-

|                            | No.of observations | Mean    | SD    | Median  | Min     | Max     |
| -------------------------- | ------------------ | ------- | ----- | ------- | ------- | ------- |
| Age                        | 325013             | 32.35   | 6.67  | 32.00   | 16.00   | 49.00   |
| Male                       | 325013             | 0.52    | 0.50  | 1.00    | 0.00    | 1.00    |
| Years of education         | 325013             | 13.16   | 2.67  | 12.00   | 9.00    | 18.00   |
| College graduate           | 325013             | 0.37    | 0.48  | 0.00    | 0.00    | 1.00    |
| Completed high school      | 325013             | 0.85    | 0.35  | 1.00    | 0.00    | 1.00    |
| Experience                 | 325013             | 13.19   | 7.00  | 13.00   | 1.00    | 25.00   |
| Entry year                 | 325013             | 1995.12 | 9.02  | 1995.00 | 1978.00 | 2017.00 |
| Unemployment rate at entry | 325013             | 2.78    | 1.24  | 2.66    | 1.23    | 5.85    |
| Current employment         | 325013             | 0.80    | 0.40  | 1.00    | 0.00    | 1.00    |
| Log of monthly income      | 258683             | 10.44   | 0.43  | 10.40   | 6.96    | 13.99   |
| Work duration              | 258818             | 63.02   | 57.69 | 42.00   | 1.00    | 363.00  |
| Work hours                 | 258818             | 44.29   | 8.16  | 44.00   | 0.00    | 168.00  |
| Fulltime                   | 258818             | 0.95    | 0.21  | 1.00    | 0.00    | 1.00    |

Figure 2: Descriptive Statistics for Selected Variables

tential experience are relatively equal in the final sample. People with a college degree and master's degree obtain more than 12-years of education; people with a junior, senior high school, and vocational high school certificate are educated equaling or under 12 years. Observations are distributed equally based on potential experience with around 60,000 samples in five categorical experience years.

# 4    Methodology

## 4.1    Estimation Strategy

In the study, I estimate the long-term effect of macro labor market shocks at the time of graduation mainly on two present outcomes - monthly incomes and labor supply extensively and marginally. Most studies apply regional-yearly variations in the unemployment rate as the proxy for macro labor market shocks in the case of the existence of large regional differences in the unemployment rate. In this study, I use the cohort-level national unemployment rate as the main regressor of interest. The baseline estimation specification is the following, adjusted from Schwandt and Von Wachter (2019):

$$Y_{i,t,g} = \alpha + \beta_e * UR_g + \gamma_e + \theta_t + \tau_i + \zeta_i + \epsilon_{i,t,g}$$

Where $Y_{i,t,g}$ is the present outcomes at the calendar year $t$ of individual $i$ who graduate at the year of $g$. $UR_g$ denotes the national unemployment rate at the entry year $g$. Since I don't have exact data about how long people have been at work, I define e as the potential experience with $e = t - g$. Although I have 24-years profiles, I choose a parsimonious range of experience, instead of every single year to ensure a large sample size in each categorical experience. $\gamma_e$ is an experiences fixed effect, which should capture a usual earning growth due to experience rising in a long-time career. $\theta_t$ is a survey year (i.e. calendar year) fixed effect. This fixed effect is included in case the present outcomes in the calendar year are affected by unobserved factors in the years. $\tau_i$ denotes schooling fixed effect, which is denoted in terms of educational levels - junior high school, senior high school, vocational schools, university, and Master's. $\zeta_i$ refers to one's gender.

The entry year fixed effect is excluded from my study, distinguished from typical literature using regional-yearly cohort variations, because of the use of yearly national unemployment rate in the estimation. Noted that no subsequent yearly unemployment rates are controlled in the estimation. Thus, the key parameter of interest, $\beta$ is supposed to capture an overall difference effect between the cohort graduating at a bad time and its lucky counterpart, for all the subsequent changes of labor market conditions following a common development after a recession (Von Wacther, 2020). To further see how persistent the scaring effect is, I let $\beta$ vary with potential experience levels, which are $e = 1 - 5, 6 - 10, 11 - 15, 16 - 20, 21 - 25$. So the categorical potential experience interacts with $UR_g$. From the interaction coefficients, my analysis will focus on the simple slope of outcomes on the initial unemployment rate for each following categorical year after one's graduation. The standard error is clustered at cohort levels.

## 4.2   Endogenous Timing

The macro labor market shocks is considered exogenous, however, there would be a problem if people choose their educational levels responding to the business cycles. Literature has long been concerned with business cycles and schooling choice, particularly the composition of labor maker entry can be endogenous within business cycles (Solon et al, 1994). In the scarring effect literature, usually one can instrument local unemployment rate at the entry with the early regional unemployment rate before graduation, for instance, the unemployment rate at age 22 in a residence region at the age 14 (Khan, 2010), although it is argued that this instrument is likely to have a direct effect on subsequent wages (Brunner and Kuhn, 2014).

My study, on the other hand, uses the national unemployment rate at the predicted graduation years based on educational attainment. So there is no potential threat that people chooses the timing of graduation, instead the issue becomes whether people would choose their level of education, which is the base of my calculation for the timing of entering the labor market, regarding macro-economic status. For example, one scenario could be that a high school graduate decided to give up a college degree, entering the labor market early due to unpromising macro economics. An opposite scenario is that young people turned to higher education rather than go to the labor market because of weak economics involving fewer jobs at the time. However, even though people indeed postpone their education or on the contrary pursue more education due to a bad economy, one doesn't know whether or not this group of people are sorted thus biasing the estimation. So as a further test, added in appendix 8.1, I will check the selection bias - whether entrants to colleges during the recessions were sorted.

## 4.3   Limitations

One limitation of the study is that the estimation assumes the effect of recessions is linear. However, deeper and longer recessions may have stronger effects on labor market outcomes (Von Wachter, 2020). Another limitation of the estimation strategy is the missing of current labor market conditions. In some literature, the current regional unemployment rate is controlled to capture present macro effects on wages. Since my study uses the cohort-level national unemployment rate, due to collinearity, the effect of the current unemployment rate is omitted, which could be absorbed by the calendar year fixed effect. Moreover, regional variation is completely ignored in the study. Although Taiwan is not a geographically large area, there has been a regional discrepancy in terms of unemployment rate in 23 counties (Chuang and Lai, 2008). The third limitation is the lack of details for seasonal workers. The data

provides information on seasonal employment, which helps me exclude a possible influence on current employment status since the data shows that the unemployed due to seasonal reasons only account for a negligible percentage in the sample. However, this does not necessarily exclude an impact on the change of their wage profiles.

# 5    Result and Discussion

## 5.1    Effects on Earnings and Employment

Table 5.1 Column 1 shows the effect of the unemployment rate at the labor market entry on log monthly incomes with potential experience varying. For the first 5 years., a one-point rise in the unemployment rate leads to a reduction of monthly earnings by 1.71%. The effect is larger in the second five years with a loss of 2% in earnings, compared to what lucky cohorts experience in the same periods on average. Then it steadily decreases with years going on: the reduction is by 1.93% in 15 years and by 1.39% in 20 years. Until 20 years after graduation, the scarring effect fades to zero as the magnitude becomes positive and statistically insignificant at a 5% level.

Considering results mentioned in previous literature, the initial effect in my sample is within a range of a 10% loss of earnings due to a typical recession (Von Wachter, 2020). Note that my estimation is based on categorical five years, a longer period than a typical measurement of the initial three years. This could make the initial effect somewhat smaller since often the scaring effect reduce by experience years. However, in the long run, my estimation is more persistent - the scarring effect lasts for twenty years. In contrast, most studies in the past find the effect would usually fade out within 10 years or 15 years. The long-lasting scarring effect in the subsequent years is not necessarily abnormal in my sample, given a different region and the proxy of the national unemployment rate. Particularly, past literature using regional-yearly variation usually includes the current unemployment rate at the regions to capture part of consequent and contemporaneous effects.

Table 5.1 Column 2 illustrates the effect of starting labor market conditions on the probability to be employed. The estimation tells that the effect on labor supply is only temporary. In the initial 5 years, there is a 3.4% reduction of the probability to be unemployed due to a one-point rise in the initial unemployment rate, and the standard error is small. In the subsequent years, the effect remains negligible and statistically insignificant at a 5% level, which is fairly close to most US studies where no effect on persistent employment is found.

Table 5.1: Effect of national unemployment rate at labor market entry on outcomes for full sample

|  | (1) Log Income | (2) Employed | (3) Hour | (4) Duration | (5) Full Time |
|---|---|---|---|---|---|
| 1 - 5 years | -0.0171 | -0.0342 | 0.0937 | -3.0012 | -0.0038 |
|  | (0.0043)** | (0.0107)** | (0.0827) | (0.7775)** | (0.0010)** |
| 6 -10 years | -0.0204 | -0.0003 | 0.1687 | -2.2029 | 0.0009 |
|  | (0.0034)** | (0.0030) | (0.0517)** | (0.5409)** | (0.0009) |
| 11-15 years | -0.0193 | 0.0046 | 0.0778 | -1.4937 | 0.0009 |
|  | (0.0035)** | (0.0031) | (0.0391) | (0.5342)** | (0.0010) |
| 16-20 years | -0.0139 | -0.0030 | 0.0066 | -3.2617 | 0.0025 |
|  | (0.0042)** | (0.0053) | (0.0544) | (0.7665)** | (0.0014) |
| 21-25 years | 0.0069 | 0.0044 | 0.1607 | -2.3601 | 0.0036 |
|  | (0.0055) | (0.0081) | (0.1344) | (0.8273)** | (0.0047) |
| $R^2$ | 0.34 | 0.07 | 0.04 | 0.29 | 0.02 |
| $N$ | 258,683 | 325,013 | 258,818 | 258,818 | 258,818 |

Note: Other controls included in the regression are potential experience, gender, education, and calendar year dummies. Data is from Taiwan's Manpower Utilization Survey from 1999 to 2018. Standard errors are in parentheses. * $p < 0.05$; ** $p < 0.01$

For this result, one explanation could be in the discussion. As much literature, particularly on the EU, points out, a rigid labor market can buffer the cut of early wages at the cost of decreasing employment stability (Umkehrer, 2019; Escalonilla et al., 2021). In my sample, the effect on earnings and the effect on employment could probably account for each other as well. In the initial periods, the loss is absorbed by the likelihood to be employed, so the loss in earning is relatively small for those who are successfully employed. In the subsequent years, unlucky graduates only experience the scarring effects in earnings instead of unemployment so the magnitude of wage loss becomes larger in the second period. There are many potential arguments to explain this. As shown in Table 5.1 column 1 and column 2, the scarring effect on incomes increases from 1.17% in the first five years to 2.04% in the 6 - 10 years while effects on the unemployment fade to zero.

Past studies managing to explain the reasons of wage loss turn to look at work hours and labor contracts. For instance, although some workers are employed, they work shorter time per week or they are under part-time contracts, which makes them earn less than those who have an opportunity to work full time. In other words, if they graduated at a good time, they could have found a full-time job under a better

contract, stayed at a better employer, thus gaining specialized experience. Hence, in the next, I examine the effect of an initial macro labor market shock on the intensive margin, work duration for current employers, and labor contracts.

## 5.2  Effects on Work Status

I defined full-time contracted employees as those who work over 35 hours per week, in the contrast, part-time labor work less than 35 hours. Alternative definition categorizing by 40 hours is used as a sensitive check. Table 5.1 Column 3 shows that there are no particularly negative effects on work hours. Though I estimate a positive effect in 6 - 10 years significantly at a 1% level, the magnitude is 0.17 hours, which is less than an hour, small enough to be negligible. The same applies to a positive result in the 11 - 15 years as the standard error is too larger while the effect size is too small. Also, the monthly wage in the 6 - 10 period drops by 2% with no obvious impacts from the increased work hours. Hence, it implies that the loss in earnings comes from a drop in incomes per hour instead of reduced work hours.

From Table 5.1 Column 5, an effect on full-time contract can be found in the initial graduating years. For unlucky cohorts the probability to have a full-time contract decreases by 0.38%, compared to lucky cohorts graduating at a prosperous time. The effect is minor though statistically significant at a 5% level. However, after I apply an alternative definition for the full-time contract with over 40 work hours per week, the effect becomes smaller and insignificant.

Next, I estimate the effect of initially unfavorable entry on work duration, how long one has worked for the current employer. In other words, I examine whether starting condition has an effect on the present stability – how many months an individual stays in a position in one company. As it turns out in Table 5.1 Column 4, the negative effect is long-lasting and profound. Unlucky cohorts graduating at a depressing time tend to stay 2 to 3 fewer months at one company than their lucky counterparts over their whole careers. The correlation shows that individuals firstly entering a depressed labor market will change their jobs more frequently in the future, implying higher labor mobility. It is likely that this flexibility in a career contributes to a higher probability to find a better-qualified employer, increasing one's earnings and probability to recover from the scarring effects (Oreopoulos et al., 2012).

In addition, with the availability of the data, which gives me information about current employer characteristics, I examine whether the huge wage loss in the present found previously is mediated by one's current employer quality. To conduct the examination, I control a variable for employer characteristics, which is the current

employer size in the sample. The inclusion of the variable is expected to capture time-invariant employer characteristics that could be potentially linked with the firm size. For example, large-scale firms could have high firm quality, which provides sufficient compensations, or probably be less vulnerable to macro shocks, etc. Table 5.2 gives the result of the estimation with control of the size variable. It turns out that overall the variable doesn't pick up much loss effect on wage, although the loss effect becomes smaller, as the result remains significant and similar to the original one in magnitude.

*Table 5.2: Effect of national unemployment rate at labor market entry on outcomes for full sample*

|  | (1) Log Income | (2) Employed | (3) Hour | (4) Duration | (5) Full Time |
|---|---|---|---|---|---|
| 1 - 5 years | -0.0124 | 0.0001 | 0.0364 | -2.7256 | -0.0023 |
|  | (0.0041)** | (0.0009) | (0.0704) | (0.7015)** | (0.0011)* |
| 6 -10 years | -0.0178 | -0.0008 | 0.1325 | -2.0711 | 0.0017 |
|  | (0.0031)** | (0.0005) | (0.0467)** | (0.5047)** | (0.0009) |
| 11-15 years | -0.0193 | -0.0007 | 0.0709 | -1.5201 | 0.0008 |
|  | (0.0032)** | (0.0007) | (0.0352) | (0.5009)** | (0.0010) |
| 16-20 years | -0.0154 | -0.0019 | 0.0106 | -3.3278 | 0.0015 |
|  | (0.0049)** | (0.0009)* | (0.0501) | (0.7705)** | (0.0014) |
| 21-25 years | 0.0074 | 0.0035 | 0.1492 | -2.2613 | 0.0036 |
|  | (0.0058) | (0.0017)* | (0.1289) | (0.8415)* | (0.0048) |
| $R^2$ | 0.36 | 0.82 | 0.05 | 0.30 | 0.03 |
| $N$ | 258,683 | 325,013 | 258,818 | 258,818 | 258,818 |

*Note: Other controls included in the regression are firm size dummies, potential experience, gender, education, and calendar year dummies. Data is from Taiwan's Manpower Utilization Survey from 1999 to 2018. Standard errors are in parentheses * $p < 0.05$; ** $p < 0.01$*

## 5.3  Effects on Outcomes by Gender

In the following two sections, I discuss the effect for subgroups based on gender and education. Table 5.3.1 and Table 5.3.2 illustrate the effects on all core outcomes by gender. An alternative proxy for initial labor market conditions is adopted in the appendix where I use male unemployment rate and female unemployment rate respectively.

*Table 5.3.1: Effect of national unemployment rate at labor market entry on outcomes for males*

|  | (1) Log Income | (2) Employed | (3) Hour | (4) Duration | (5) Full Time |
|---|---|---|---|---|---|
| 1 - 5 years | -0.0154 | -0.0460 | 0.1253 | -2.0172 | -0.0048 |
|  | (0.0061)* | (0.0128)** | (0.1023) | (0.6202)** | (0.0017)** |
| 6 -10 years | -0.0182 | -0.0047 | 0.1971 | -1.3914 | 0.0004 |
|  | (0.0033)** | (0.0030) | (0.0562)** | (0.5395)* | (0.0010) |
| 11-15 years | -0.0184 | 0.0001 | 0.1528 | -0.9402 | 0.0028 |
|  | (0.0036)** | (0.0037) | (0.0617)* | (0.5049) | (0.0014) |
| 16-20 years | -0.0193 | -0.0063 | -0.0331 | -3.8836 | 0.0035 |
|  | (0.0059)** | (0.0049) | (0.0757) | (0.9589)** | (0.0019) |
| 21-25 years | 0.0108 | 0.0167 | 0.1201 | -2.3294 | 0.0046 |
|  | (0.0052)* | (0.0094) | (0.1166) | (1.0731)* | (0.0033) |
| $R^2$ | 0.30 | 0.08 | 0.03 | 0.30 | 0.02 |
| $N$ | 148,721 | 169,862 | 148,824 | 148,824 | 148,824 |

*Note: Other controls included in the regression are potential experience, education, and calendar year dummies. Data is from Taiwan's Manpower Utilization Survey from 1999 to 2018. Standard errors are in parentheses * $p < 0.05$; ** $p < 0.01$*

*Table 5.3.2: Effect of national unemployment rate at labor market entry on outcomes for females*

|  | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
|  | Log Income | Employed | Hour | Duration | Full Time |
| 1 - 5 years | -0.0288 | -0.0236 | 0.0411 | -4.2919 | -0.0023 |
|  | (0.0060)** | (0.0070)** | (0.0770) | (1.0830)** | (0.0009)* |
| 6 -10 years | -0.0282 | 0.0011 | 0.0873 | -3.5599 | 0.0013 |
|  | (0.0045)** | (0.0032) | (0.0548) | (0.7058)** | (0.0010) |
| 11-15 years | -0.0222 | 0.0062 | -0.0505 | -2.3896 | -0.0021 |
|  | (0.0053)** | (0.0032) | (0.0534) | (0.7478)** | (0.0009)* |
| 16-20 years | -0.0059 | 0.0001 | 0.0627 | -2.3432 | 0.0008 |
|  | (0.0037) | (0.0064) | (0.0767) | (0.7864)** | (0.0019) |
| 21-25 years | 0.0030 | -0.0072 | 0.1794 | -2.0983 | 0.0010 |
|  | (0.0099) | (0.0089) | (0.1929) | (1.2116) | (0.0084) |
| $R^2$ | 0.32 | 0.07 | 0.05 | 0.29 | 0.01 |
| $N$ | 109,962 | 155,151 | 109,994 | 109,994 | 109,994 |

*Note: Other controls included in the regression are potential experience, education, and calendar year dummies. Data is from Taiwan's Manpower Utilization Survey from 1999 to 2018. Standard errors are in parentheses * $p < 0.05$; ** $p < 0.01$*

First of all, male labor experiences 1.5% reductions in wages due to a one-point rise in the unemployment rate in the first five years after graduating. The effect size remains at around 1.8%, lasting for 20 years. However, female workers endure a larger decrease in earnings by 2.8%. Although the loss remains larger than males in the next 10 years, it is less persistent as it fades to zero after graduating 15 years. Secondly, the marginal effects of the initial bad conditions on the likelihood to be employed are not persistent for both males and females. Note that men experience a reduction of 4.6%, twice larger than 2.4% for women.

Likewise, men are more likely than women to be influenced regarding whether or not they can obtain a full-time job. The initial probability to be full-time employed reduce twice great as women, as shown in Tabel 5.3.1 column 5. In terms of work hours, no effects are found in the two subgroups, although a slight increase in work time is detected for male workers. Lastly, in general, work duration for one employer reduce larger for women than men. Note that male workers experience a particular shorter duration in middle age than other periods. Even though both gender experience instability after graduating during a recession, the effect tends to be more profound for women in the labor market. If high job mobility could account for the

recovery of wage loss due to the unfavorable labor market entry, as mentioned in section 5.2, women indeed endure less persistent wage loss.

## 5.4   Effects on Outcomes by Education

Following the baseline strategy, I estimate the effect on two other subgroups, low-educated graduates receiving less than 12 years of education and high-educated graduates. Table 5.4.1 and Table 5.4.2 show the result on all key outcomes - earnings, employment, work hour, work duration, and full-time jobs. It turns out that for high-educated graduates, college and master graduates in my sample, the scarring effects primarily through loss in earnings. In the starting 10 years, the effect is around 1% and not statistically significant at 5% level but it becomes larger and significant in the later career. Distinguished from past studies, my study discovered the most profound loss during 16 - 20 years in one's middle age for college students. In the same period, their work duration for the current employer reduces by almost half of a year. However, more-educated graduates' probability to be employed is not likely to be affected by a bad initial labor market entry. For lower educated groups, no negative effects significantly at 5% level on monthly incomes are detected. The main loss of unfavorable labor market entry lies in the probability of unemployment with a reduction by 5.2%. However, the effect is temporary. In contrast to some labor markets with institutional rigidity, for example, to Japan, a labor market with a "lifetime" employment system, the estimated marginal effect on employment is over 3% - 4% initially which lasts 12 years for less educated people (Genda et al, 2010).

*Table 5.4.1: Effect of national unemployment rate at labor market entry on outcomes for high-educated groups (years of education > 12)*

|  | (1) Log Income | (2) Employed | (3) Hour | (4) Duration | (5) Full Time |
|---|---|---|---|---|---|
| 1 - 5 years | -0.0096 | -0.0111 | 0.1420 | -0.8049 | -0.0021 |
|  | (0.0052) | (0.0100) | (0.0869) | (0.5903) | (0.0008)** |
| 6 -10 years | -0.0169 | 0.0017 | 0.1196 | -1.1711 | 0.0008 |
|  | (0.0037)** | (0.0037) | (0.0580)* | (0.5167)* | (0.0006) |
| 11-15 years | -0.0290 | 0.0026 | 0.0224 | -1.5372 | 0.0002 |
|  | (0.0054)** | (0.0043) | (0.0444) | (0.7087)* | (0.0014) |
| 16-20 years | -0.0419 | -0.0030 | 0.0116 | -5.0501 | 0.0002 |
|  | (0.0084)** | (0.0061) | (0.0733) | (1.0225)** | (0.0015) |
| 21-25 years | 0.0064 | 0.0081 | 0.1069 | -2.6456 | 0.0005 |
|  | (0.0190) | (0.0098) | (0.1753) | (2.5426) | (0.0029) |
| $R^2$ | 0.35 | 0.02 | 0.03 | 0.40 | 0.00 |
| $N$ | 102,934 | 119,716 | 102,976 | 102,976 | 102,976 |

*Note: Other controls included in the regression are potential experience, education, gender, and calendar year dummies. Data is from Taiwan's Manpower Utilization Survey from 1999 to 2018. Standard errors are in parentheses.\* $p < 0.05;$\*\*$p < 0.01$*

*Table 5.4.2: Effect of national unemployment rate at labor market entry on outcomes for low-educated group (years of education < 12)*

|  | (1) Log Income | (2) Employed | (3) Hour | (4) Duration | (5) Full Time |
|---|---|---|---|---|---|
| 1 - 5 years | 0.0052 | -0.0519 | 0.0096 | -1.1880 | -0.0048 |
|  | (0.0048) | (0.0136)** | (0.0688) | (0.4483)* | (0.0016)** |
| 6 -10 years | -0.0022 | -0.0024 | 0.1088 | -1.3196 | 0.0014 |
|  | (0.0022) | (0.0029) | (0.0541) | (0.4429)** | (0.0015) |
| 11-15 years | -0.0067 | 0.0047 | 0.1162 | -1.4013 | 0.0017 |
|  | (0.0036) | (0.0031) | (0.0505)* | (0.5072)** | (0.0020) |
| 16-20 years | -0.0071 | -0.0029 | 0.0415 | -3.2808 | 0.0034 |
|  | (0.0057) | (0.0051) | (0.0586) | (1.0285)** | (0.0023) |
| 21-25 years | 0.0101 | 0.0038 | 0.1190 | -2.2451 | 0.0038 |
|  | (0.0083) | (0.0075) | (0.1048) | (0.8035)** | (0.0053) |
| $R^2$ | 0.20 | 0.10 | 0.02 | 0.23 | 0.01 |
| $N$ | 155,749 | 205,297 | 155,842 | 155,842 | 155,842 |

*Note: Other controls included in the regression are potential experience, education, gender, and calendar year dummies. Data is from Taiwan's Manpower Utilization Survey from 1999 to 2018. Standard errors are in parentheses. $* p < 0.05$; $** p < 0.01$*

There are four aspects that need to be taken into account for the loss gap in the core outcomes between these two groups in the sample. First of all, college students may respond more intensively to the national-wide measurement of macro shocks than regional conditions if there is high regional mobility in Taiwan's labor market. They are less sensitive to regional shocks since they have high mobility to mitigate a negative effect (Genda et al. 2010). Also, college graduates are particularly attracted by greater labor market entry conditions in a region, which is disproportionate to lower educated counterparts (Wozniak, 2010). Hence, my study using national unemployment could estimate a larger income loss for college graduates. Secondly, measurement error when constructing schooling could be potentially greater for the low-educated group than the high-educated one. For junior high school graduates who are at a young age, and high school drop-outs who are not clearly identified in the dataset, the predicted time of the first labor market entry which is derived from the schooling may be misleading. If this is the case, the effect for the less educated could be attenuated. Thirdly, in terms of loss in earnings, there is almost no effect for the lower educated group. A large reduction in employment in the initial periods could partly explain no early wage cut is as pointed out in section 5.1. Minimum wage can also be an explanation as it could buffer the reduction of earnings since

lower-educated workers earn less in the first place. It could also be that skill levels matter more than education levels. This requires a further specific comparison between junior college graduates in Taiwan who receive 2 to 5 years of professional skill training and college graduates. Fourth, in the first place, approximately 19,000 observations are excluded in the study who were employed but did not report incomes, of whom 88% are low-educated. It slightly implies that the analysis misses some less earned and less educated observations although the size is probably too small to have an impact on the ultimate results.

## 5.5    Effects for Upturns and Downturns

In this section, I explore how graduates respond to the unemployment rate when they are at upturns and downturns to decompose the effect found in the above sections. Genda et al. (2010) point out an asymmetric response to a macro shock for the less-educated graduates in Japan that the rise in the unemployment rate at entry brings a larger negative effect than the positive effect of the fall in the unemployment rate. However, this asymmetry doesn't hold for higher educated groups in Japan, nor for all groups in the US. To conduct the exploration, I construct an upturn dummy variable that takes 1 if this year's unemployment rate falls compared to the previous year's, and takes 0 otherwise.

I add a three-way interaction among the national unemployment rate at entry, upturn dummy variable, and categorical experience year on the baseline estimation. Table 5.5 shows the response to the initial unemployment rate at different combination levels of upturns, downturns, and predicted experience years on income and the likelihood of employment. The decomposition illustrates that for the first five years and the last periods (16 - 20 years) when the scarring effect exists, graduates who entered the labor market at the upturns would not experience a significant negative effect as their counterparts at the downturn. There are smaller negative effects about a 0.32% reduction of incomes in starting period and 0.4% in 16 - 20 years, neither of which are significant. To see whether the difference between upturns and downturns is statistically significant or not, I conduct a pairwise test for each scarring period. The results of the difference is significantly positive but the magnitude is around 0.018 for the initial period, which is too small to confirm asymmetry.

*Table 5.5: The effect of national employment rate at entry on incomes and employment status, varying effects between upturns and downturns*

|  | Log Income | Employed |
|---|---|---|
| 1 - 5 years*0 | -0.0214 | -0.0330 |
|  | (0.0048)** | (0.0104)** |
| 1 - 5 years*1 | -0.0032 | -0.0253 |
|  | (0.0035) | (0.0338) |
| 6 -10 years*0 | -0.0180 | 0.0004 |
|  | (0.0037)** | (0.0036) |
| 6 -10 years*1 | -0.0252 | -0.0019 |
|  | (0.0049)** | (0.0028) |
| 11-15 years*0 | -0.0133 | 0.0020 |
|  | (0.0029)** | (0.0031) |
| 11-15 years*1 | -0.0264 | 0.0045 |
|  | (0.0049)** | (0.0033) |
| 16-20 years*0 | -0.0179 | -0.0015 |
|  | (0.0047)** | (0.0052) |
| 16-20 years*1 | -0.0040 | -0.0215 |
|  | (0.0057) | (0.0109) |
| 21-25 years*0 | 0.0082 | 0.0050 |
|  | (0.0081) | (0.0098) |
| 21-25 years*1 | 0.0071 | 0.0137 |
|  | (0.0077) | (0.0114) |
| $R^2$ | 0.34 | 0.07 |
| $N$ | 258,683 | 325,013 |

*Note: Other controls included in the regression are upturn dummy, potential experience, education, gender, and calendar year dummies. Data is from Taiwan's Manpower Utilization Survey from 1999 to 2018.*
*\* $p < 0.05$; \*\*$p < 0.01$*

# 6 Conclusion

Entering the labor market during a recession is unfortunate for young adult workers coming of age. The experience of these unlucky cohorts has long been concerned by economists and policymakers. Learning how graduates in the labor markets respond to the short-term macro shocks not only lead to a better understanding of the adjustment process itself but also more importantly to give implication to possible protection for unlucky entrants and particularly less advantageous groups for policymakers. To study the question, I exploit the Manpower Utilization Survey, a cross-sectional data from Taiwan, spanning over two decades. This data allows me to explore differential effects for diverse demography specific to Taiwan, thus contributing to the scarring effect and hysteresis literature in labor economics.

Fairly close with past studies, I find a negative and persistent effect of unfavorable initial labor market conditions on earnings in Taiwan though it lasts twenty years, longer than the usual ten to fifteen years. On the other hand, distinguished from studies in the US where the unemployment effect is not detected in the flexible labor market (Kahn, 2010) and studies in Japan, a rigid labor market, where a large unemployment effect lasts ten years (Genda et al, 2010), my study shows a modest impact on future employment status for unlucky entrants. There is a temporary reduction in the probability to be employed in the beginning five years. My study also detects the differential scarring effects which are distinguished in two ways. Firstly, women suffer larger but less persistent incomes cuts than men. Secondly, the loss in earnings as a result of bad labor market entry is only experienced by high-educated individuals, while for lower-educated workers no wage loss is found. The latter group instead endures a rise in unemployment to a great extent in the first five years. The disparity in the scarring effect between these two groups may concern with Taiwan's labor market characteristics where for lower-educated people earnings loss could probably be buffered by minimum wage or other labor policies.

Although this study explores the effect of short-term labor market shocks, there are many possible ways for further analysis to get a comprehensive understanding of the topic. For example, the net effect regarding living standards and assets in the sample is unknown. Particularly for less-educated individuals in my sample there is no explicit clues on the changes in their weekly earnings so how they as less advantaged people in the society truly experience afterward recessions remain to be studied in detail. For example, they could experience cyclical downgrading in their career. Devereux (2002) points out that when the unemployment rate is high, firms tend to hire candidates with higher education levels, particularly for low-paying occupations. As a result, the lower-skilled and educated group experience a loss in occupation quality apart from unemployment during the recession.

The cost of recession at the time of labor market entry undoubtedly raises concerns as mentioned above. This paper is by no means to directly contribute to policy-making in Taiwan but more aspects of the issue will be mentioned as a conclusion. First, even though lower and higher educated groups suffer the loss to a different extent, there is a huge gap and disparity in their average incomes in the first place. Secondly, observations with financial deficiency and with missing records not reporting their incomes are not in the study. Most of them could be the real needed in the aftermath of a labor market shock. Hence, although beyond the scope of this paper, those people who are outside the system and missed in the data also need to be concerned.

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# 8    Appendix

## 8.1    Balance Check

This section follows section 4.2 to examine the endogenous issue. The main concern for the endogenous timing is that a selected group of people could be pessimistic about future thus giving up higher education or on the contrary pursue a higher education spending more time at schools given the temporary bad economic situations. If these people are sorted base on unobservable characteristics, then the estimated result would be biased. As explained in section 4.2, since I already use predicted schooling based on educational attainment as the regressor, the primary issue is whether people entering colleges at a bad time is sorted on some unobservable variables. To test it, I slightly adjust the method adopted in Genda et al. (2010) by regressing future incomes on the national unemployment rate when one was 18 years old, which is around the time of high school graduating, for samples who are recorded as the owners of college diploma at the survey year. Ideally, there should not be a directly strong correlation between a short-term exogenous shock at one's 18 years old and individuals' future incomes unless these people are sorted on some abilities. Table 8.1.1 column 1 shows the results. Other variables controlled are potential experience, calendar year dummies, and education. There is a particular association in middle age but not in other periods. Overall, the evidence for selection is not so strong over the whole life cycle. Next, following Schwandt and Von Wachter (2019), I conduct a balance check to see the gender composition of my full sample to rule out a possibility of selection into timing by gender as presented in Table 8.1.1 column 2.

Table 8.1.1: Initial effects on gender and log Incomes

|  | Regression (1) Log Income | Regression (2) Male |
|---|---|---|
| 1 - 5 years | 0.0089 | 0.0081 |
|  | (0.0053) | (0.0082) |
| 6 -10 years | -0.0128 | -0.0038 |
|  | (0.0038)** | (0.0030) |
| 11-15 years | -0.0347 | -0.0054 |
|  | (0.0058)** | (0.0022)* |
| 16-20 years | -0.0124 | 0.0033 |
|  | (0.0192) | (0.0041) |
| 21-25 years | 0.0144 | -0.0088 |
|  | (0.0152) | (0.0078) |
| $R^2$ | 0.33 | 0.01 |
| $N$ | 100,560 | 325,013 |

## 8.2 Sensitivity Test

*Table 8.2.1: Effect of national unemployment rate at labor market entry on outcomes for full sample*

|  | (1) Log Income | (2) Employed | (3) Hour | (4) Duration | (5) Full Time |
|---|---|---|---|---|---|
| 1 - 5 years | -0.0233 | -0.0463 | 0.1407 | -3.9292 | -0.0045 |
|  | (0.0046)** | (0.0110)** | (0.0891) | (0.7716)** | (0.0012)** |
| 6 -10 years | -0.0248 | -0.0016 | 0.1899 | -2.7342 | 0.0008 |
|  | (0.0036)** | (0.0033) | (0.0543)** | (0.5788)** | (0.0010) |
| 11-15 years | -0.0228 | 0.0042 | 0.0917 | -1.9899 | 0.0012 |
|  | (0.0037)** | (0.0034) | (0.0411)* | (0.5840)** | (0.0011) |
| 16-20 years | -0.0181 | -0.0017 | 0.0132 | -4.0311 | 0.0026 |
|  | (0.0048)** | (0.0058) | (0.0551) | (0.8059)** | (0.0015) |
| 21-25 years | 0.0085 | 0.0026 | 0.2215 | -2.5815 | 0.0043 |
|  | (0.0061) | (0.0088) | (0.1436) | (1.0651)* | (0.0050) |
| $R^2$ | 0.34 | 0.07 | 0.04 | 0.30 | 0.02 |
| $N$ | 255,367 | 320,748 | 255,497 | 255,497 | 255,497 |

*Note: An average national unemployment rate over the three yeas around the labor market entry is applied. Other controls included are potential experience, gender, education, calendar year dummies. Standard errors are in parentheses.\* $p < 0.05$; \*\* $p < 0.01$*

*Table 8.2.2: Effect of national unemployment rate at labor market entry on outcomes for males*

|  | (1) Log Income | (2) Employed | (3) Hour | (4) Duration | (5) Full Time |
|---|---|---|---|---|---|
| 1 - 5 years | -0.0136 | -0.0334 | 0.0764 | -1.6492 | -0.0039 |
|  | (0.0052)* | (0.0123)** | (0.0934) | (0.5742)** | (0.0015)* |
| 6 -10 years | -0.0154 | -0.0028 | 0.1570 | -1.2115 | 0.0005 |
|  | (0.0029)** | (0.0025) | (0.0502)** | (0.4708)* | (0.0009) |
| 11-15 years | -0.0154 | 0.0011 | 0.1201 | -0.8229 | 0.0025 |
|  | (0.0031)** | (0.0030) | (0.0531)* | (0.4047)* | (0.0013) |
| 16-20 years | -0.0177 | -0.0046 | -0.0415 | -3.5204 | 0.0029 |
|  | (0.0046)** | (0.0045) | (0.0636) | (0.7272)** | (0.0016) |
| 21-25 years | 0.0089 | 0.0172 | 0.0922 | -2.3204 | 0.0039 |
|  | (0.0051) | (0.0088) | (0.1123) | (1.0889)* | (0.0033) |
| $R^2$ | 0.30 | 0.08 | 0.03 | 0.30 | 0.02 |
| $N$ | 148,721 | 169,862 | 148,824 | 148,824 | 148,824 |

*Note: Male unemployment rate at the labor market entry is applied. Other controls included are potential experience, education, calendar year dummies. Standard errors are in parentheses.*$p < 0.05;$***$p < 0.01$*

*Table 8.2.3: Effect of national unemployment rate at labor market entry on outcomes for females*

|  | (1) Log Income | (2) Employed | (3) Hour | (4) Duration | (5) Full Time |
|---|---|---|---|---|---|
| 1 - 5 years | -0.0410 | -0.0391 | 0.1139 | -6.2735 | -0.0030 |
|  | (0.0069)** | (0.0073)** | (0.0827) | (1.1612)** | (0.0014)* |
| 6 -10 years | -0.0409 | -0.0022 | 0.1221 | -5.1402 | 0.0010 |
|  | (0.0055)** | (0.0039) | (0.0637) | (0.8288)** | (0.0013) |
| 11-15 years | -0.0335 | 0.0048 | -0.0627 | -3.5847 | -0.0028 |
|  | (0.0065)** | (0.0042) | (0.0668) | (0.9930)** | (0.0013)* |
| 16-20 years | -0.0067 | -0.0050 | 0.0410 | -2.3717 | 0.0007 |
|  | (0.0054) | (0.0070) | (0.1074) | (1.1446)* | (0.0026) |
| 21-25 years | 0.0019 | -0.0110 | 0.2876 | -2.5906 | 0.0025 |
|  | (0.0105) | (0.0094) | (0.1994) | (1.3259) | (0.0092) |
| $R^2$ | 0.32 | 0.07 | 0.05 | 0.29 | 0.01 |
| $N$ | 109,962 | 155,151 | 109,994 | 109,994 | 109,994 |

*Note: Female unemployment rate at the labor market entry is applied. Other controls included are potential experience, education, calendar year dummies. Standard errors are in parentheses.* $p < 0.05$; ** $p < 0.01$*
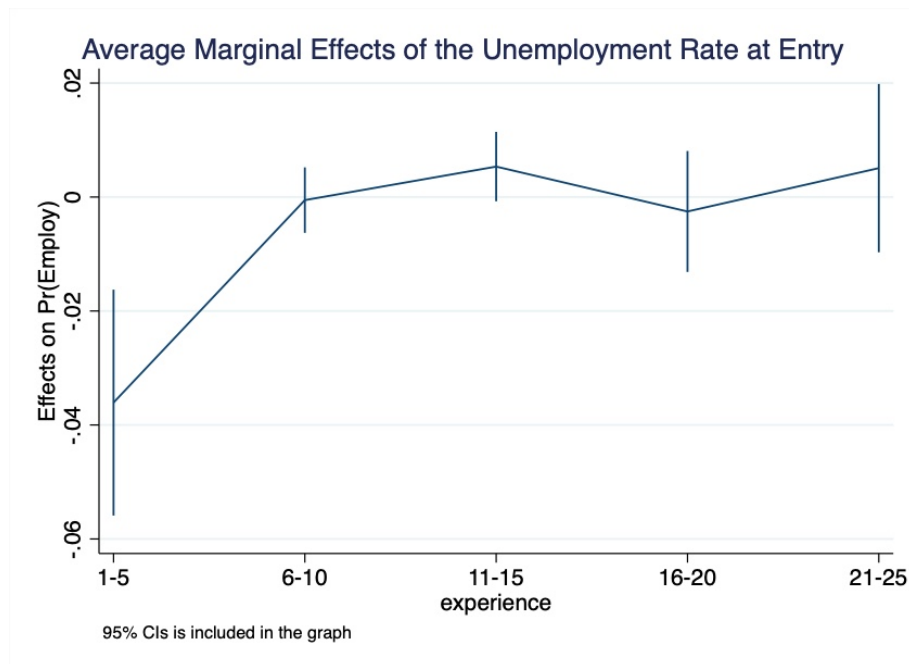
## 8.3   Probit Model



Figure 3:   Estimation on unemployment effect by probit model