RIETI Discussion Paper Series 23-E-042

Scars of the Job Market "Ice-Age"

KONDO, Ayako
RIETI

The Research Institute of Economy, Trade and Industry
https://www.rieti.go.jp/en/

RIETI Discussion Paper Series 23-E-042
June 2023

Scars of the Job Market "Ice-Age" *

Ayako Kondo
Institute of Social Science, the University of Tokyo/ Research Institute of Economy, Trade and Industry

Abstract

Existing studies found that entering the labor market during a recession has persistent negative effects – the scarring effects - on employment earnings for Japanese men. The cohorts who entered the labor market during the prolonged recession between 1993-2004 are called “the ice-age cohorts,” and the persistent gap between the ice-age cohorts and older cohorts who entered the labor market during the bubble economy are often interpreted as having this scarring effect of business cycle conditions at entry. However, the existing studies in Japan use data covering cohorts who enter the labor market in the 1990s or earlier. Motivated by the lack of empirical evidence with updated data, this paper revisits the scarring effects of a recession at labor market entry on employment and earnings using data covering graduation cohorts from 1984-2013. I find that younger cohorts who enter the labor market during the recovery do not earn more or enjoy more stable employment than the cohorts who enter the bottom of the ice-age, and that the effects of unemployment rate at entry are no longer statistically significant for cohorts who enter the labor market after the job market ice-age. I also discuss potential factors that may have weakened scarring effects.

Keywords: scarring effects, ice-age cohorts, initial labor market conditions
JEL classification: J01, J21, J31

The RIETI Discussion Paper Series aims at widely disseminating research results in the form of professional papers, with the goal of stimulating lively discussion. The views expressed in the papers are solely those of the author(s), and neither represent those of the organization(s) to which the author(s) belong(s) nor the Research Institute of Economy, Trade and Industry.

*This study is conducted as a part of the Project “Evaluation of the effects of institutional and environmental factors on family formation, parental labor market performance and children’s academic performance” undertaken at the Research Institute of Economy, Trade and Industry (RIETI). This study is also supported by JSPS KAKENHI Grant Number 20K01721. The use of microdata of the Labour Force Survey, Employment Status Survey and Basic Survey of Wage Structure was approved by the Statistics Bureau and the Ministry of Health, Labour and Welfare based on this JSPS grant.
The draft of this paper was presented at the DP seminar of the Research Institute of Economy, Trade and Industry (RIETI). I thank participants in the RIETI DP Seminar for their helpful comments.
The author is also grateful for helpful comments and suggestions from seminar participants at HKUST.

1. Introduction

The Japanese economy experienced a prolonged recession in the 1990s, borne disproportionately by young people who graduated from school and entered the labor market during this period. As a result, there exist substantial and persistent gaps in earnings and job quality between the cohorts who entered the labor market in 1993-2004, the so-called job market "ice-age," and older cohorts. The cohorts from the ice-age job market are often referred to as "the ice-age cohorts" or "the lost generation" because they suffer from unstable employment and lower income, even in their thirties and forties.

Existing studies have found that entering the labor market during a recession has persistent negative effects on the employment and earnings of Japanese men (Ohtake and Inoki 1997; Genda et al. 2010). Such "scarring effects" of a recession at entry have been observed in many other countries (von Wachter, 2020a; Cockx, 2016), but the effects are large and persistent in Japan. Hence, the persistent gap between ice-age and older cohorts in the labor market during the so-called "bubble economy" is often interpreted as the scarring effect of business cycle conditions at entry.

Existing Japanese studies utilize data from cohorts who entered the labor market in the 1990s or earlier. Despite the lack of empirical evidence with updated data, economists and policymakers assume that ice-age cohorts suffer from the scarring effect of a recession at entry, blaming the rigidity of the Japanese labor market. This study aims to reconsider this interpretation with data from the younger cohorts who entered the labor market during the recovery in the mid-2000s.

Using individual-level data from the Labour Force Survey and the Basic Survey of Wage Structure, this study analyzed Japanese men who graduated from school in 1984-2013 for up to 20 years after graduation. This study began by comparing the potential experience profiles of employment and earnings across the five cohort groups. It is striking that while cohorts that entered the labor market before the ice-age enjoyed more stable employment and higher earnings than the ice-age cohorts, the differences between the ice-age cohorts and younger cohorts are subtle.

Motivated by this contrast, this study revisits the scarring effects of a recession at entry by applying the same model as in Genda et al. (2010) with data that include younger cohorts. I found that the effects of the unemployment rate at entry are no longer statistically significant for cohorts that enter the labor market during or after the job market ice-age. Since the same data and model confirm significant and persistent effects for older cohorts, the disappearance of scarring effects implies more permanent

structural changes in the youth labor market due to the prolonged recession.

After demonstrating the estimated scarring effect, the potential factors behind the weakening of these effects are discussed. One potential factor is increased job mobility, related to the erosion of lifetime employment caused by the prolonged recession in the broader population (Hamaaki et al. 2012; Kawaguchi and Ueno 2013). Furthermore, Ono (2010) and Kambayashi and Kato (2016) indicated that young workers searching for regular jobs disproportionally suffer from increased job instability because it is difficult to dismiss incumbent prime-age regular workers.

This study also relates to the literature on the effects of the Great Recession caused by the 2008 financial crisis. While Altonji et al. (2016) found that the impact of the Great Recession on new college graduates was more negative and persistent than in past recessions, Rothstein (2021) showed evidence of a structural break before the Great Recession that decreased the employment of post-Great Recession cohorts. The ice-age cohorts in Japan bear some similarities to the Great Recession cohorts in the United States, and the findings of this study on the lack of recovery for the post-ice-age cohort suggest some structural breaks in Japan as well.[1]

The remainder of this paper is organized as follows. Section 2 provides the institutional background and describes how the ice-age job market and affected cohorts are perceived in Japan. Section 3 describes the data sources, while Section 4 presents the potential experience profiles by cohort as a descriptive analysis. Section 5 shows the cohort effects on the main outcomes. Section 6 estimates the scarring effects using young and old subsamples, and Section 7 discusses potential factors that may have weakened the scarring effects. Finally, section 8 concludes the paper.

2. "Ice-age" Job Market and the "Lost Generation" in Japan

The Japanese economy experienced a prolonged recession that began in 1992. As a result, the unemployment rate rose from 2.2% in 1992 to 5.4% in 2002, the worst year since the 1950s (Figure 1). Due to the high displacement cost of regular workers in Japan, the consequences of this recession were borne disproportionately by young people who entered the labor market during this so-called "ice-age" job market.

[1] Literature on the scarring effects is often referred to in discussions on the impact of the COVID-19 crisis on young workers in the United States and other countries (e.g., von Wachter 2020). However, the impact of COVID-19 on the entry-level labor market in Japan was limited (the last cohort in Appendix Figure A1 corresponds to 2021 graduates). Therefore, this study does not consider the cohorts who graduated in 2021 and 2022 in Japan are comparable to the ice-age cohorts.

Japan's entry-level job market is characterized by an immediate transition from school to full-time work. High schools play an important role in the matching process between students and employers in the job market, although their importance has recently declined as the number of new high school graduates who begin working immediately after graduation is decreasing. This school-based hiring system contributed to a relatively low youth unemployment rate; even during the worst recession period of the early 2000s, approximately 70% of male students who did not proceed to tertiary education found a full-time regular job. Conversely, colleges do not intervene in the job market for new college graduates, except for highly specialized STEM occupations. However, a separate market exists for new college graduates because many firms strongly prefer them when hiring entry level workers.

The disadvantage of this smooth transition from school to work is that access to good jobs for inexperienced workers is limited by the time of graduation. It has been found that a recession at the time of entry into the labor market has persistent negative effects on employment and earnings in many countries.[2] A meta-analysis by Kawaguchi and Murao (2014) shows that the effects tend to be more persistent in countries with more rigid labor markets, such as Japan. One of the earliest studies on Japan was by Ohtake and Inoki (1997), who found a negative correlation between the labor market slackness index at entry and earnings using data on male full-time workers in the 1970-90s. Genda et al. (2010) provide more rigorous evidence on the negative effects of high unemployment rates at entry and show that scarring effects are more persistent in Japan than in the United States.[3]

Such persistent effects of a recession at the time of entry have been anecdotally recognized in Japan even before these empirical studies. The cohorts who entered the ice-age job market—typically defined as cohorts who graduated from high school and

[2] The long-term negative effects of a recession at entry on labor market outcomes such as wages, earnings, and employment were found in the United States (Kahn 2010; Genda et al. 2020), Canada (Oreopoulos et al. 2012), Great Britain (Taylor 2013), Austria (Brunner and Kuhn 2014), Spain (Fernández-Kranz and Rodriguez-Planas 2018), Belgium (Cockx and Ghirelli 2015) and Norway (Raaum and Røed 2006; Liu, Salvanes, and Sørensen 2016; Haaland 2018). Also, the initial labor market conditions have long-term effects on various outcomes such as family formation and health; see the survey by von Wachter (2020).

[3] Relatedly, Kondo (2007) and Hamaaki et al. (2013) show that the failure to obtain a regular full-time job upon graduation lowers the likelihood of having a regular full-time job in subsequent years in Japan, using aggregate labor market conditions as an instrument for individual-level employment status.

college in 1993-2004—are often referred to as the "ice-age cohort" or "lost generation" because they suffer from the scarring effect of deteriorating labor market conditions at entry. The data show substantial gaps between these and the older cohorts in earnings and job quality, even among those in their 40s.

However, it is unclear whether the gaps between "the lost generation" and the older generations are purely attributable to cyclical labor market conditions at graduation or to a more permanent structural change in the Japanese labor market. Existing studies on the scarring effect of business cycle conditions at entry in Japan typically cover cohorts who graduated in the 1990s or earlier. To the best of my knowledge, this study is the first attempt to examine whether the scarring effect still exists for cohorts that entered the Japanese labor market in the 2000s or later.

3. **Data Sources**

The following two repeated cross-sectional datasets were used as the main data, both covering 1987-2019: the Labour Force Survey (LFS) and the Basic Survey of Wage Structure (BSWS); which have different strengths and weaknesses. The LFS covers the unemployed and out-of-labor force populations, however, the data on earnings are coarse and self-reported. The BSWS includes more precise information on monthly salaries and annual bonuses; however, the educational background is available only for full-time employees.

The LFS is a household survey conducted by the Statistics Bureau designed as a source of official labor force statistics, such as unemployment rates. The sample represents all residents in Japan, and the survey asks about labor force status, job characteristics, annual earnings, and demographic information such as year of birth, education, and gender. The survey design changed over the study period. Until 2001, annual earnings were recorded only through special surveys conducted in February.[4] Special survey questionnaires that were not the same as the sample for the monthly basic surveys were distributed to randomly sampled households. Since 2002, detailed questionnaires have been distributed monthly to approximately one-quarter of the basic survey sample. To avoid seasonality bias while keeping the sample size large enough, surveys from January to March 2002-2019 were used.

The BSWS is an annual establishment survey conducted in June by the Ministry of Health, Labour, and Welfare. The survey asks each establishment to choose full-time

[4] Although the special survey was also conducted in August 2001, data from August 2001 survey are not used in this paper.

employees randomly and report each employee's monthly salary, overtime pay, other compensation, bonuses paid in the previous year, hours worked, job characteristics, and demographic information. The salaries of the sampled employees are precise; however, part-time and self-employed workers were not covered.

Both data sets were augmented with regional and national unemployment rates at entry into the labor market. Since new graduates in Japan typically search for jobs in the year before graduation, the year of job search (the year before graduation) is defined as follows: birth year + 18 for high school graduates, birth year + 20 for junior college and vocational school graduates, and birth year + 22 for college graduates, with a minus one-year adjustment for those born in January-March. The unemployment rates for the ten regions have been available since 1983; thus, the oldest cohort included in the analysis sample are those who graduated in March 1984. The region of residence in the year of entry was unavailable; thus, the region of the current residence was used as a proxy.[5] This definition is similar to that of Genda et al. (2010).

As the main outcome variables, this study focuses on the following four variables: i) a dummy indicator for employment, which takes 1 if employed and 0 otherwise; ii) a dummy indicator for regular employees; iii) real annual labor income taken from the LFS; and iv) real annual earnings of full-time employees taken from the BSWS. The first two variables were available only from the LFS because the BSWS covers only full-time employees, most of whom are regular employees. The consumer price index deflates both real annual labor income measures. Since the LFS asks about annual labor income only in several intervals, annual labor income from the LFS is defined as the median value of each interval; for example, 1.25 million yen for "1-1.49 million yen" and 8.50 million yen for "7-9.99 million yen." The annual earnings of full-time employees from the BSWS are defined as the monthly salary (including overtime pay) of the survey month multiplied by 12 months plus the annual bonus paid in the previous year.

The sample was limited to men to avoid complications from delayed marriage and declining fertility. The youngest cohort included in the analysis were those who graduated in 2013. Table 1 presents the summary statistics of the main outcome variables and sample size.

[5] Other panel data, including the Japan Household Panel Survey conducted by Keio University, show that about 88% of men in their 30s live in the same region as they lived at age 15 or 18.

4. Descriptive Analysis: Potential Experience Profiles by Cohorts

Before conducting a more complicated analysis, this section presents the potential experience profiles of the four outcomes (employment, regular employment, annual income from LFS, and annual earnings from the BSWS) by cohort group. The sample was divided into five groups based on the predicted year of graduation: 1) 1987-92: bubble economy cohorts; 2) 1993-98: older half of ice-age cohorts; 3) 1999-04: younger half of ice-age cohorts; 4) 2005-09: post-ice-age cohorts; and 5) 2010-13: global great recession cohorts. The dotted vertical lines in Figure 1 correspond to the years before graduation for the first cohort in each group.[6]

As seen in Figure 1, the bubble economy cohorts entered the labor market when the unemployment rate was very low, owing to the boom known as the "bubble economy." While the typical definition of the job market ice-age is graduation years 1993-2004, this study divided the ice-age cohort into older cohorts whose job search was completed before the financial crisis in the fall of 1997 and younger ones. Figure 1 illustrates that while the older group faced an unprecedented, rapid, and lasting increase in unemployment, the unemployment rate was much higher in the younger cohort. The fourth group, the post-ice-age cohorts, entered the labor market during the period typically considered a recovery from the ice-age. Figure 1 shows that the unemployment rate decreased during this period, although the level of the unemployment rate was higher than in the first half of the ice-age. Finally, the last group comprises cohorts affected by the global recession triggered by the bankruptcy of Lehman Brothers in the fall of 2008 and the Great East Japan Earthquake in March 2011.

The four panels in Figure 2 present the potential experience profiles of the four outcome variables by the five cohort groups and three levels of educational background. Panel *a* shows employment-to-population ratios. The bubble economy cohorts (1987-92) of all three educational backgrounds had the highest employment rate during the first five years after graduation. Among high school graduates, younger cohorts had lower employment rates. Conversely, for college graduates, the younger half of the ice-age cohorts (1999-04) had the lowest employment rates soon after graduation.

[6] For the convenience of regional data availability and consistency with existing studies such as Genda, Kondo, and Ohta (2010), I used the unemployment rate as the proxy for labor market/business cycle conditions. For information, the average real GDP growth rate in the year prior to graduation for each cohort group: 4.7% for the bubble economy cohorts, 1.3% for the older half of ice-age cohorts, 0.5% for the younger half of the ice-age cohorts, 1.1% for the post ice-age cohorts, and 0.0% for the global great recession cohorts.

Junior college and vocational school graduates followed a similar pattern to college graduates, while they are noisier. Finally, the male employment rates of different cohorts converged to approximately 90% for high school graduates and more than 95% for the more educated groups 10-15 years after graduation.

Panel *b* of Figure 2 shows regular employee-to-population ratios. The graphs follow a pattern similar to the employment rate while the levels are lower and the differences across cohorts are larger than those of employment rate. For high school graduates, the difference between the younger half of the ice-age cohorts and the older two groups persisted even after 15 years, in contrast to the convergence observed for the more educated groups.

Panels *c* and *d* present the annual labor income profiles from different data sources. Both show that income is highest for the bubble economy cohorts (1987-92), followed by the older half of the ice-age cohorts (93-98). While the three younger groups earn less than the two older groups, the difference between the younger half of ice-age cohorts (99-04) and the post-ice-age cohorts (05-09) is subtle, except for high school-educated full-time employees taken from the BSWS (the upper row of panel *d*). Finally, unlike the employment rate, the earnings gaps across cohorts do not converge within 15 years.

Overall, these graphs imply 1) substantially more stable employment and higher earnings for cohorts that entered the labor market before the ice-age than during the ice-age; 2) the gaps between the older and younger halves of the ice-age cohorts are comparable to the gap between the bubble economy cohorts and the older half of the ice-age cohorts; and 3) there is no clear sign of recovery for the post-ice-age cohorts compared to the ice-age cohorts.

5. Cohort Effects for Cohorts 1984-2013

As an alternative way to present cohort-level changes in labor market outcomes, this study estimated the cohort effects of the four outcomes for each single-year cohort, following Rothstein (2021).

Specifically, using three subsamples defined by educational background, the following equation was estimated:

$$Y_{sctri} = \theta_{sc} + \delta_{s,t-c-1} + \lambda_s \frac{\phi(p_{ct}^s)}{1-\Phi(p_{ct}^s)} + \eta_{sr} + \varepsilon_{sctri} \quad (1)$$

where Y_{sctri} represents the outcome variable of individual *i* with educational

background s who graduated in year c and was surveyed in year t in region r. θ_{sc} represents the cohort effect for men who graduated from school s in year c, where θ_{s1984} was set to 0 for normalization. $\delta_{s,t-c-1}$ represents the effects of the potential experience. $\frac{\phi(p_{ct}^s)}{1-\Phi(p_{ct}^s)}$ is inverse Mills ratio to correct changes in educational composition,[7] following Rothstein (2021), and p_{ct}^s is % of those with educational background s in cohort c in survey year t. η_{sr} is region-fixed effects, and ε_{sctri} is the remaining error component of each individual.

Each sample included individuals whose potential experience is 1 to 20 years; Thus, θ_{sc} is interpreted as the difference in the average outcome between cohort c and cohort 1984 for those with educational backgrounds after controlling for compositional differences in potential experience and region up to 20 years since graduation (or up to 2019 for cohorts younger than 1999). Figures 3a-d are the plots of the estimated cohort effects over the graduation year for the four outcomes.

Figure 3a presents the cohort effects on employment and shows that the employment rate of young men, especially those with a high school education, has been declining since the mid-1980s, well before the beginning of the ice-age, and this trend continued until around 2010. The sudden increase in the last three cohorts may be attributed to the tight market for young blue-collar workers in the late 2010s. However, the relationship between business cycle conditions at entry and cohort effects on employment remains unclear.

Regarding regular employment, the impact of the job market's ice-age was more visible. Figure 3b shows that the regular employee-to-population ratio remained flat for the bubble economy cohorts and then started to fall from the ice-age cohorts. However, it hit bottom in the younger half of the ice-age cohorts and did not recover significantly in the post-ice-age cohorts. These observations are consistent with those shown in Figure 2b. Additionally, the decrease in the regular employee-to-population ratio was much larger for high school-educated men than for college-educated men.

Figure 3c shows the cohort effects on log annual labor income obtained from the LFS. The effect on log income was interpreted as a percentage change in income. Unlike Figure 2c, the sample does not include those reporting any income because the log of zero cannot be defined. Nonetheless, the basic pattern seen in Figure 3c is consistent with that in Figure 2c: the bubble economy cohorts earn the most, followed by the older half of the ice-age cohorts, and income stagnates for younger cohorts, including the post-ice-age cohorts. Additionally, unlike employment and regular

[7] Estimated cohort effects do not change much when this term is not included.

employment, the impact on log income was similar across groups with different educational backgrounds.

Figure 3d shows the cohort effects on the log of annual earnings of full-time employees obtained from the BSWS. Similar to income from LFS, the bubble economy cohort earns the most, followed by the older half of the ice-age cohort, and the younger half of the ice-age cohort earns the least. However, the earnings of full-time employees recovered in the post-ice-age cohorts, especially for high school graduates. The difference between Figures 3c and 3d implies that within-cohort inequality may have increased among younger cohorts.

Note that the estimated cohort effects may reflect contemporaneous time effects, such as the shortage of physical labor in the late 2010s. Thus, this study controlled for survey year effects (See Appendix) by normalizing the 1984 and 1992 cohorts to zero, following the same idea as Rothstein (2021). The basic observations do not change much with controls for survey year effects, except that earnings for full-time employees in younger cohorts become substantially higher when contemporaneous time effects are controlled for, implying downward pressure on earnings for all cohorts in the 2000s and the early 2010s.

To summarize, until the end of the ice-age (graduation year 2004), younger cohorts faced less stable employment and lower income regardless of their educational backgrounds. This timing coincides with the deterioration of business cycle conditions upon entry into the labor market. However, employment and earnings did not recover much for the post-ice-age cohorts (the graduation year 2005-2009), who faced a tighter labor market at entry than the younger half of the ice-age cohorts. This pattern implies that the prolonged recession of the 1990s and the early 2000s may have irreversibly worsened young men's employment opportunities.

6. Weakening Scarring Effects After the Ice-age

Despite the recovery in terms of the population-wide unemployment rate and the gross domestic product (GDP) growth rate,[8] Figures 2 and 3 indicate that the employment rate, regular employee ratio, and income unconditional on employment of the post-ice-age cohorts are almost as low as the younger half of the ice-age cohorts who faced the worst labor market conditions at entry among all cohorts in this study. This observation raises the question of whether the scarring effects of labor market

[8] See footnote 4 for the average real GDP growth rate in the year prior to graduation for each cohort groups.

conditions at entry have weakened; that is, whether better labor market conditions at entry no longer have positive long-term effects on employment and earnings.

Motivated by this question, this study estimated the same empirical model as Genda et al. (2010) with older and younger subsamples and compared the size and persistence of the scarring effects. Specifically, the following equation was used:

$$Y_{sctri} = \beta_{sp}u_{cr} + \gamma_{sp}u_{tr} + \delta_{sp} + \phi_{st} + \eta_{sr} + \theta_{sr}t + \mu_{sc} + \varepsilon_{sctri} \quad (2)$$

where the subscript p represents potential experience (t-c-1) grouped into 1-3, 4-6, 7-9, and 10-12 years, u_{cr}, u_{tr} are unemployment rates in the region of residence in the year before graduation (c) or the survey year (t), respectively. The other notations are the same as those in equation (1). Standard errors are clustered by region to account for potential serially correlated common shocks.

Equation (2) was estimated using a subsample of older cohorts who graduated from 1984-2004 and that of younger cohorts who graduated from 1993-2013. Both subsamples include ice-age cohorts (1993-2004) because splitting the sample into the middle (1984-1998 and 1999-2013) causes overfitting of the linear trend for the older subsample.

The estimated β_{sp} represents the effect of the unemployment rate at entry into the labor market on the outcome when potential experience is p, which can vary with educational background (s). Table 2a compares the estimated β_{sp} for the four outcome variables between the older and younger subsamples with a high school education; and Table 2b shows the same estimates for college graduates. As the table shows, the estimated scarring effects on employment, regular employment, and annual income (both unconditional on employment and conditional on full-time employment) are significantly negative for the older subsample with high school education. Moreover, the effects remain significantly negative until the 10-12th year after graduation (except for that on regular employment, which becomes insignificant in the 10-12th year).

Regarding college graduates, Table 2b shows that the unemployment rate at entry has significantly negative effects on regular employment for the first six years, annual income has an unconditional effect on employment for twelve years, and the annual earnings of full-time employees for nine years. These observations are consistent with existing studies on scarring effects in Japan, such as Genda et al. (2010).[9]

Conversely, the effects of the unemployment rate at entry on employment and

[9] Incidentally, the older subsample overlaps substantially with the sample used by Genda et al. (2010). The estimated coefficients in columns (1) and (5) in Tables 2a and 2b tend to be slightly more negative initially and less persistent, yet comparable to the corresponding estimates from Tables 3 and 6 in Genda et al. (2010).

earnings are mostly insignificant for the younger subsample. It is puzzling that the estimated effects in the 10-12th year after graduation were positive. This may be caused by overfitting of the region-specific linear trend, as the positive signs disappear when $\theta_{sr}t$ is dropped from equation (2).[10] Strikingly, the scarring effects disappeared when we limited the sample to cohorts that entered the labor market during or after the job market ice-age.[11]

7. Discussion: Potential Factors that Weakened the Scarring Effects

As seen from Tables 2a and 2b, the scarring effects of a recession at entry weaken after the job market ice-age. This subsection discusses the potential factors that weaken the scarring effects.

First, if the entry-level labor market for new graduates is no longer affected by business cycle conditions, the population-wide unemployment rate may not affect the employment or earnings of young workers. However, this hypothesis is ruled out because several indices of the entry-level market for new graduates correlate with the national unemployment rate (see Appendix Figure A1).

The second potential factor is a change in cohort size. Since Japan's youth population has been decreasing for decades, the shrinking labor supply may affect the youth labor market. Motivated by this idea, Appendix Figure A2 shows a striking contrast in the change in cohort size according to educational background. The number of high school graduates who did not proceed to tertiary education decreased rapidly during the ice-age, and the rate of decrease slowed after 2005. The decline in supply should have improved the labor market prospects of new entrants; thus, the relative slowdown in supply shrinkage might have impeded the recovery of employment and

[10] The primary observation that scarring effects are significant only for the older subsample holds when the region-specific linear trends are excluded. I choose the specification, including the region-specific linear trends, as the primary specification of this study for the sake of comparability with Genda et al. (2010).

[11] Note that, however, this study's result is not easily comparable to the existing studies in other countries using richer data. The estimated effects for the United States reported Genda et al. (2010) are smaller and more insignificant than those by Schwandt and von Wachter (2019). The major differences between the two studies are sample size and the precision of the state of entry. Given that this study used the same model as Genda et al. (2010), the results should be considered as imprecise as Genda et al. (2010), and one cannot rule out the possibility that richer data would find statistically significant scarring effects in Japan for younger cohorts, although such data would find even clearer evidence for scarring effects for older cohorts as well.

earnings of high school graduates after 2005. By contrast, the supply of college graduates did not change significantly because college enrollment increased steadily. Thus, the change in cohort size cannot explain the lack of recovery in post-ice-age cohorts with a college education.

The third possibility is that the persistence of the initial shock decreased because younger cohorts changed jobs more often. The quitting rate of ice-age cohorts is indeed higher than that of bubble economy cohorts. Appendix Figure A3a shows the estimated cohort effect on the proportion of those who left a job within one year, following the same method as in Figure 2. The 1-year quirting rate of the ice-age cohorts was 1-2% points higher than that of the older cohorts. This is substantial given that the average quitting rate is 11.6% for high school graduates and 6.3% for college graduates. Additionally, many employers began allowing young jobseekers who had already graduated 1-3 years ago to apply for job openings targeting new prospective graduates (*dai-ni shinsotsu*) in the mid-2000s. This may have reduced the persistence of the initial shock.[12]

The third point relates to the erosion of lifetime employment caused by a prolonged recession. Hamaaki et al. (2012) built a theoretical model to show that a prolonged economic slowdown and population aging destabilize the lifetime employment scheme and empirically show flattening of the age-wage profile and the decreasing share of lifetime employees, defined as those whose tenure is equal to their potential experience. Kawaguchi and Ueno (2013) also observe a decline in job tenure among younger cohorts. Furthermore, Ono (2010) and Kambayashi and Kato (2016) show that during the prolonged recession in the late 1990s and the early 2000s, the job stability of prime-age workers with at least five years of tenure remained unchanged, while the fraction of such protected workers decreased, and young workers disproportionally suffered from job instability. "Young workers" in these studies correspond to the ice-age cohorts.

Fourth, this study examined the sectoral shift and found that it is unlikely to be an important mechanism. Appendix Figures 3b and 3c plot the cohort effects in proportions of the manufacturing sector among employed and regular employees in

[12] This increase in mobility itself can be a result of the job market ice-age, since the jobs started during a recession tend to be poorly matched. Ohta (1998) and Genda and Kurosawa (2001) find evidence that graduating during a recession raises the subsequent quitting rate of the cohort in Japan, using data that cover cohorts older than the ice-age cohorts.

large firms in the population, respectively. These figures are motivated by the belief that the traditional Japanese employment system, characterized by lifetime employment and a steep tenure-earnings profile, is more prevalent in the manufacturing sector and large firms. However, both are pro-cyclical to entry-year labor market conditions and exhibit recovery in post-ice-age cohorts. Thus, these factors cannot explain why the employment rate and earnings of the post-ice-age cohorts were almost as low as those of the younger half of the ice-age cohorts.

Finally, controlling for survey year time trends did not qualitatively change the results. Because both cohort and survey year effects cannot be identified simultaneously without additional parametric assumptions, this study modified Rothstein's (2021) method to fit the available data. These details are provided in the online appendix. The primary finding is that while controlling for time effects adds downward trends for less educated men's employment and upward trends for the earnings of full-time employees, none of the four outcomes shows recovery for the post-ice-age cohorts, except for the earnings of full-time employees with high school education, which already show some recovery without time effects.

Among the factors examined, increased job mobility might have reduced the persistence of the initial shock. Additionally, a change in supply cannot be ruled out as a potential factor, especially for high school graduates. However, both are possibilities, and there may be some other potential factors that this study cannot examine.

8. Conclusion

This study examines the employment and earnings of Japanese men in a graduation-year cohort. While significant gaps in employment stability and earnings were confirmed between the bubble economy cohorts who graduated during a boom and the ice-age cohorts who graduated during a recession, there is no clear sign of recovery for younger cohorts who faced lower unemployment rates at entry than for those who graduated at the bottom of the ice-age.

Motivated by this lack of recovery, this study examined how the effects of the unemployment rate at entry changed after the ice-age of the job market. This study found significant and persistent scarring effects of a recession at the entry for the older subsample, which was comparable to the findings of existing studies, such as Genda et al. (2010). However, after limiting the sample to younger cohorts, these effects were no longer observed.

Although the current study cannot provide plausible reasons why the scarring

effect becomes much weaker, more permanent structural changes that suppressed the earnings of young workers might have been triggered due to the prolonged recession. Note that equation (2) controls for both regional fixed effects and nationwide cohort effects. Thus, the model identifies cyclical components and more permanent changes are absorbed by the fixed effects. The model also assumes symmetry between the cohorts that entered before and after the recession. Further investigation of these permanent changes remains a topic for future research.

Finally, an important takeaway is that while the Japanese labor market has often been characterized by very strong and persistent scarring effects of labor market conditions at entry, it might no longer be the case. The bright side is that at the individual level, recovering from bad luck at entry into the labor market is becoming more feasible. Conversely, the cohorts that entered when the labor market was tight may no longer be able to maintain an advantage in the long run as the Japanese labor market has become more fluid since the 1990s.

References

Brunner, Beatrice, and Andreas Kuhn. 2014. "The Impact of Labor Market Entry Conditions on Initial Job Assignment and Wages." Journal of Population Economics 27 (3): 705–38.

Cockx, Bart, and Corinna Ghirelli. 2015. "Scars of Recessions in a Rigid Labor Market." CESifo Working Paper 5240.

Fernández-Kranz, Daniel, and Núria Rodriguez-Planas. 2018. "The Perfect Storm: Graduating in a Recession in a Segmented Labor Market." Industrial Labor Relations Review 71 (2): 492–524.

Genda, Yuji, Ayako Kondo, and Souichi Ohta. 2010. "Long-Term Effects of a Recession at Labor Market Entry in Japan and the United States." Journal of Human Resources 45 (1): 157-196.

Genda, Yuji, and Masako Kurosawa. 2001. "Transition from School to Work in Japan." Journal of the Japanese and International Economies 15: 465–88.

Haaland, Venke Furre. 2018. "Ability Matters: Effects of Youth Labor-Market

Opportunities on Long-Term Labor-Market Outcome." The Scandinavian Journal of Economics 120 (3): 794–825.

Hamaaki, Junya, Hori, Masahiro, Maeda, Saeko and Murata, Keiko. 2012. "Changes in the Japanese Employment System in the Two Lost Decades." Industrial & Labor Relations Review 65 (4): 810-846.

Hamaaki, Junya, Hori, Masahiro, Maeda, Saeko and Murata, Keiko. 2013. "How does the first job matter for an individual's career life in Japan?" Journal of the Japanese and International Economies, Elsevier 29 (c): 154-169.

Kahn, Lisa B. 2010 "The Long-Term Labor Market Consequences of Graduating from College in a Bad Economy." Labour Economics 17 (2): 303–16.

Kambayashi, R. and T. Kato. 2016. "Long-Term Employment and Job Security over the Past 25 Years: A Comparative Study of Japan and the United States." ILR Review 70 (2): 359-394.

Kawaguchi, D. and Y. Ueno. 2013. "Declining long-term employment in Japan." Journal of the Japanese and International Economies 28(0): 19-36.

Kawaguchi, D. and T. Murao. 2014. "Labor-Market Institutions and Long-Term Effects of Youth Unemployment." Journal of Money, Credit and Banking 46 (S2): 95-116.

Kondo, Ayako. 2007. "Does the First Job Really Matter? State Dependency in Employment Status in Japan." Journal of the Japanese and International Economies 21: 379–402.

Liu, Kai, Kjell G. Salvanes, and Erik Ø. Sørensen. 2016. "Good Skills in Bad Times: Cyclical Skill Mismatch and the Long-Term Effects of Graduating in a Recession." European Economic Review 84: 3–17.

Ohta, Souichi. 1999. "Keikijunkan to tenshokukodo (Turnover behavior and business cycle)." In Nihonkkeizai no Kozochousei to Rodoshijo, ed. J. Nakamura and M. Nakamura, 13–42. Tokyo: Nihon-hyoronsha.

Ohtake, Fumio, and Takenori Inoki. 1997. "Rodo-shijo ni Okeru Sedai Koka (Cohort effects in the labor market)." In Gendai macro keizai bunseki—tenkanki no nihon keizai, ed. K. Asako, N. Yoshino and S. Fukuda, 297–320. Tokyo: University of Tokyo Press.
Ono, H. 2010. "Lifetime employment in Japan: Concepts and measurements." Journal of the Japanese and International Economies 24 (1): 1-27.

Oreopoulos, Philip, Till von Wachter, and Andrew Heisz. 2012. "The Short- and Long-Term Career Effects of Graduating in a Recession." American Economic Journal: Applied Economics 4 (1): 1–29.

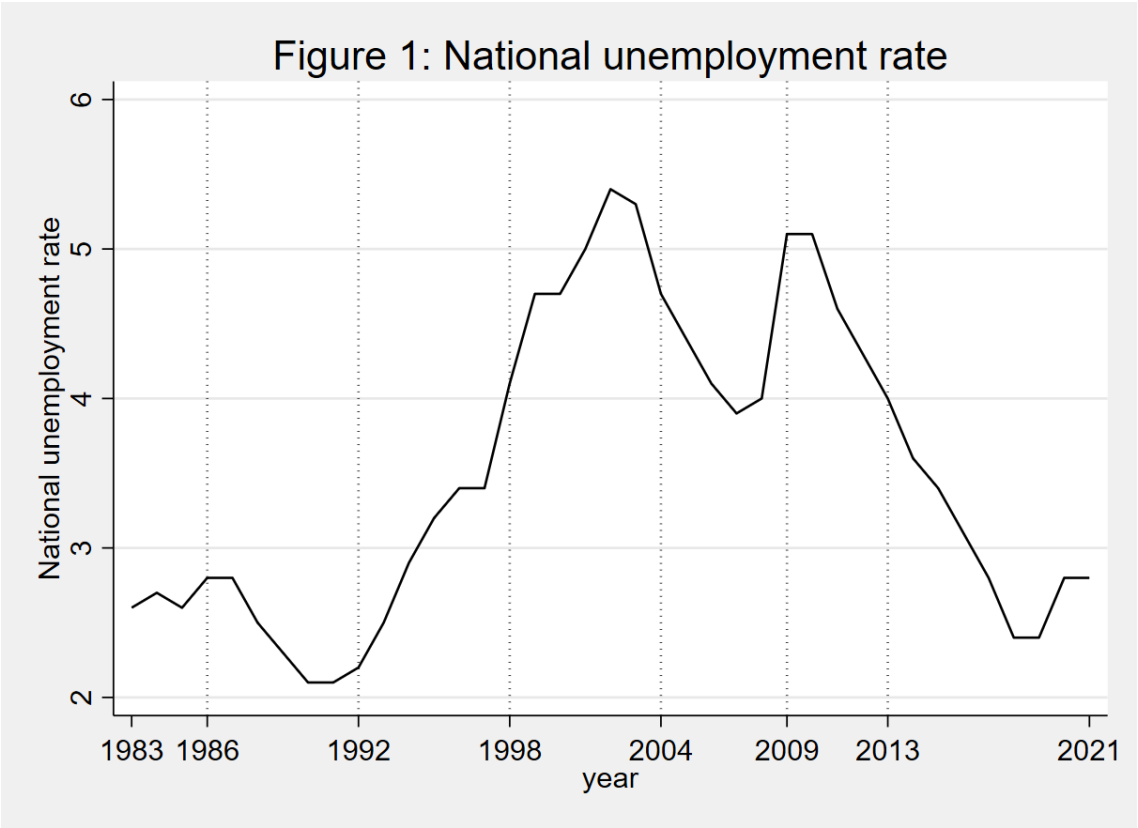
Raaum, Oddbjørn, and Knut Røed. 2006. "Do Business Cycle Conditions at the Time of Labor Market Entry Affect Future Employment Prospects?" The Review of Economics and Statistics 88 (2): 193–210.

Rothstein, J. 2021. "The Lost Generation? Labor Market Outcomes for Post Great Recession Entrants." Forthcoming, Journal of Human Resources.

Schwandt, H. and T. von Wachter. 2019. "Unlucky Cohorts: Estimating the Long-Term Effects of Entering the Labor Market in a Recession in Large Cross-Sectional Data Sets." Journal of Labor Economics 37 (S1): S161-S198.

von Wachter, Till. 2020a. "The Persistent Effects of Initial Labor Market Conditions for Young Adults and Their Sources." Journal of Economic Perspectives 34 (4): 168-94.

von Wachter, T. 2020b, Lost Generations: Long-Term Effects of the COVID-19 Crisis on Job Losers and Labor Market Entrants, and Options for Policy*. Fiscal Studies 41: 549-590. https://doi.org/10.1111/1475-5890.12247



Source: Annual Reports of the Labour Force Survey, Statistics Bureau of Japan

Table 1. Summary Statistics

a. Labour Force Survey

	High School	Two-year college or vocational school	Four-year college
Sample used in Figures 2 and 3 (potential experience <=20 years)			
Employed	86.8%	93.3%	94.6%
Regular employee	69.3%	78.1%	83.5%
Annual income (10k JPY)	238.07	289.61	387.18
Log annual income	5.46	5.62	5.90
Sample size	109,181	27,740	71,551
Sample used in Table 2 (potential experience <=12 years)			
Employed	86.8%	93.3%	94.6%
Regular employee	69.3%	78.1%	83.5%
Annual income (10k JPY)	238.07	289.61	387.18
Log real annual income	5.46	5.62	5.90
Sample size	75,303	18,935	48,093

b. Basic Survey of Wage Structure

	High School	Two year-college or vocational school	Four-year college
Sample used in Figures 2 and 3			
Log real annual earnings	5.91	5.98	6.21
Sample size	3,365,471	919,360	3,141,889
Sample used in Figures 2 and 3			
Log real annual earnings	5.82	5.89	6.10
Sample size	2,213,550	620,905	2,172,560

Figure 2. Potential experience profiles by cohort group

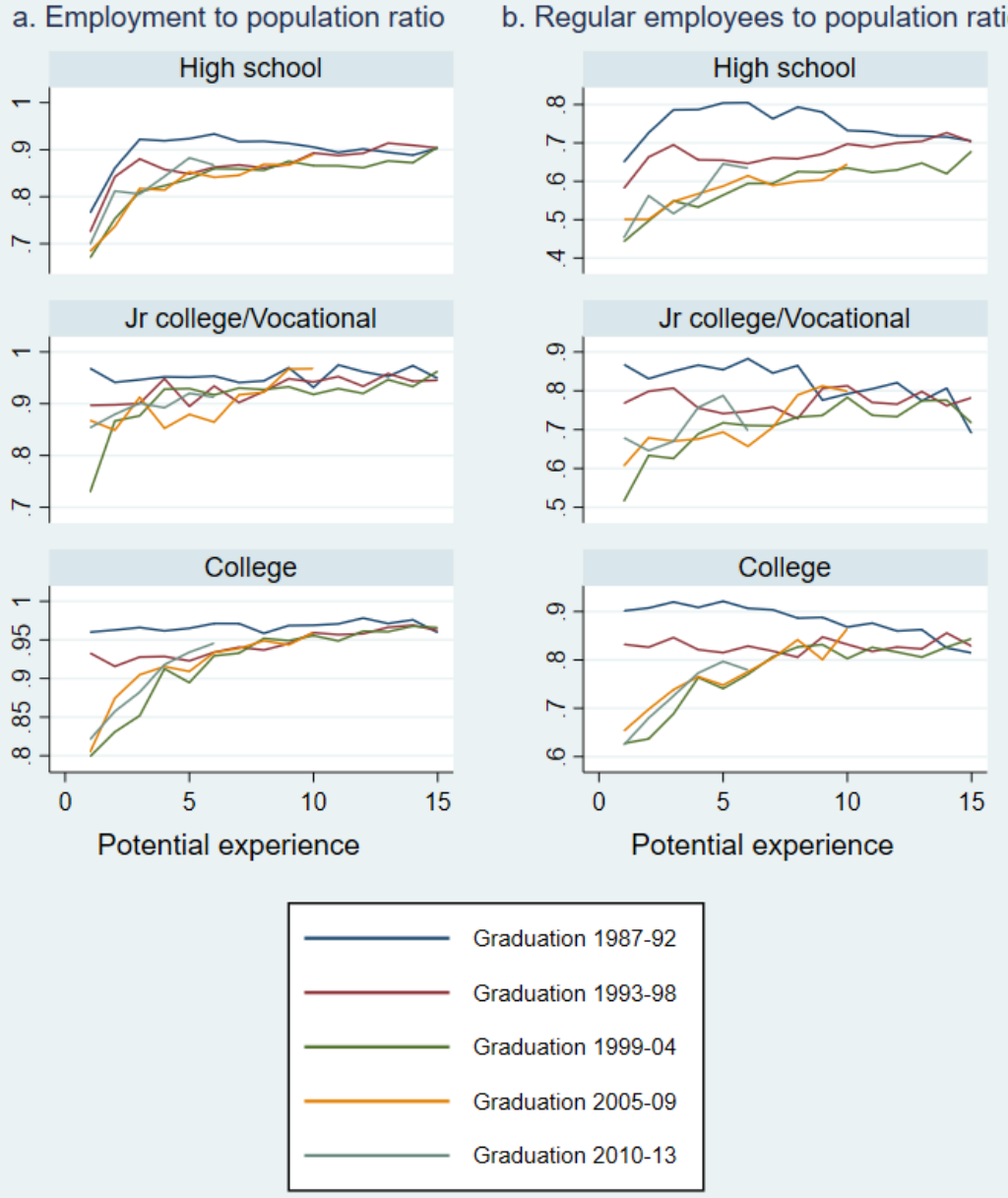
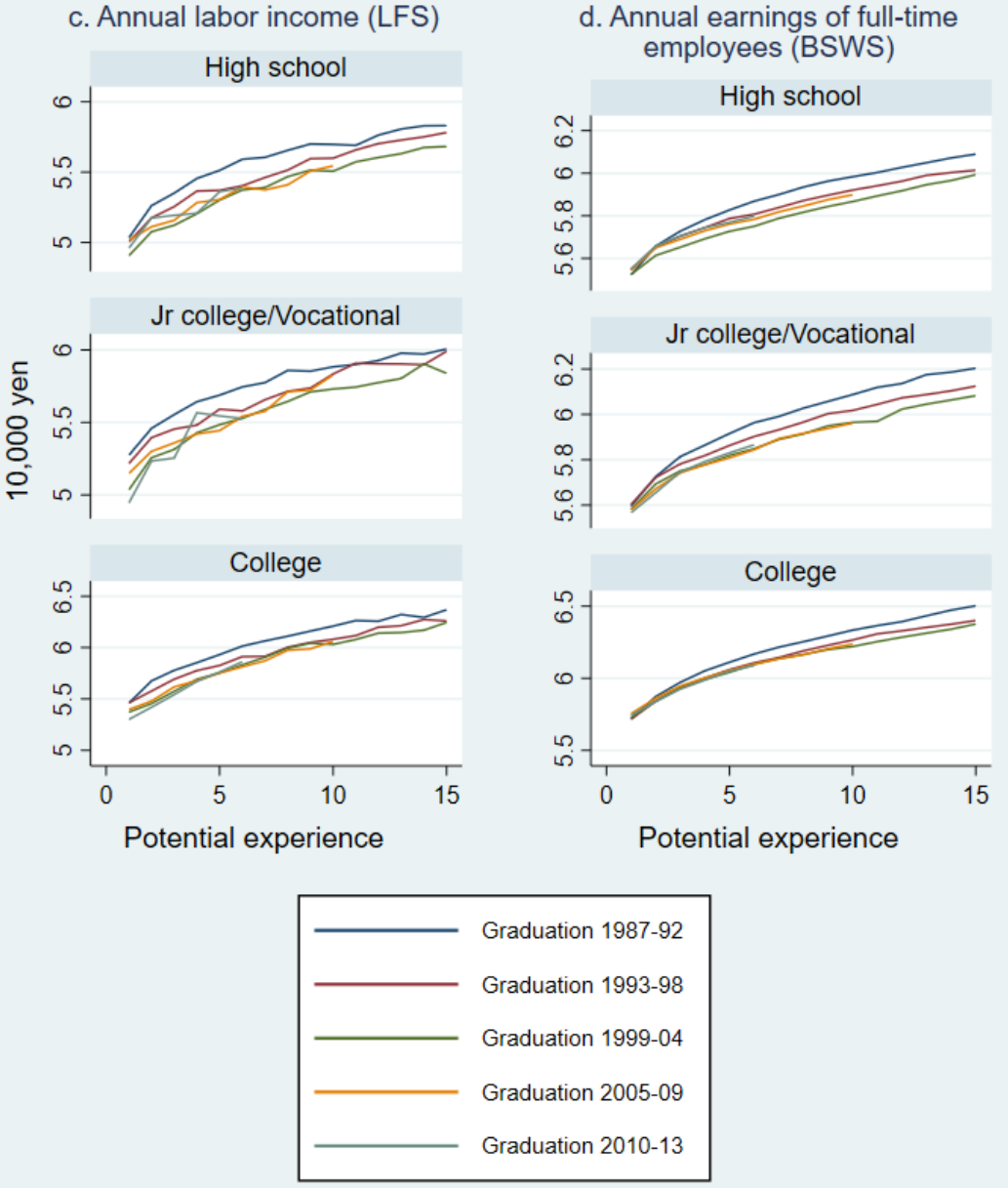


Figure 2. Potential experience profiles by cohort group



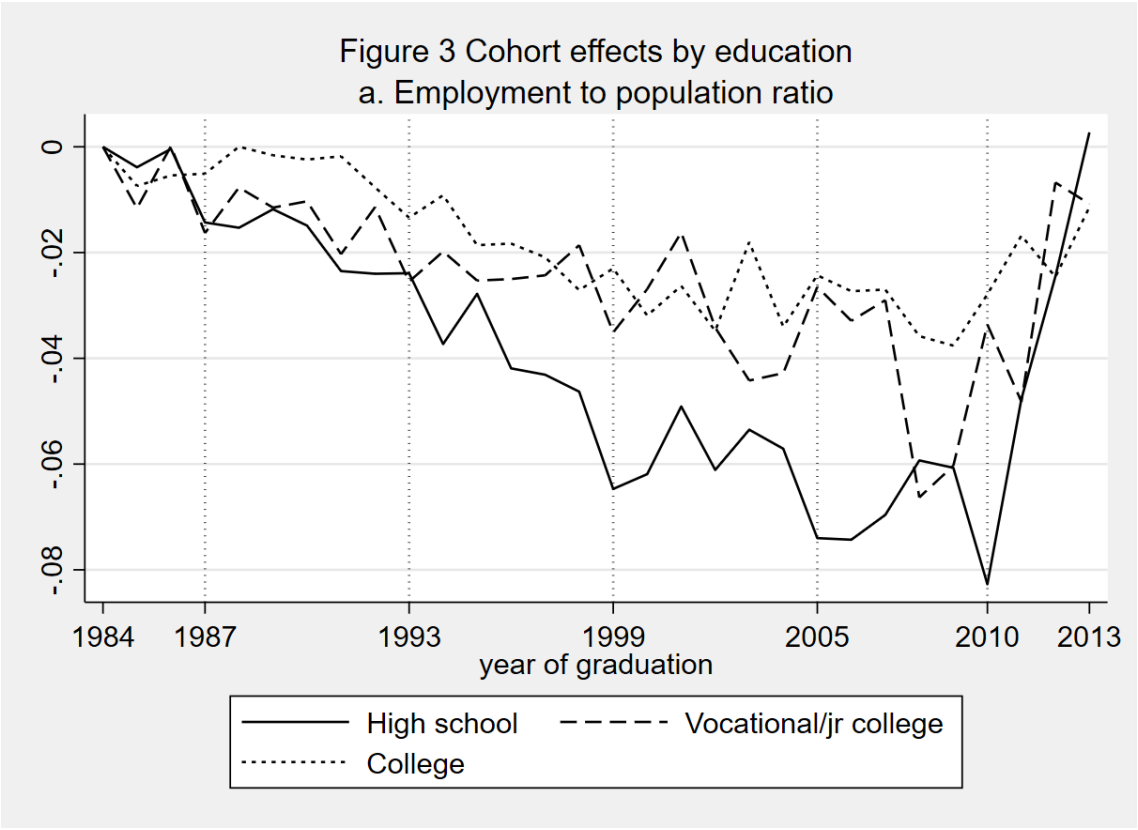


Figure 3 Cohort effects by education
a. Employment to population ratio
0
-.02
-.04
-.06
-.08
1984
1987
1993
1999
2005
2010
2013
year of graduation
High school
Vocational/jr college
College

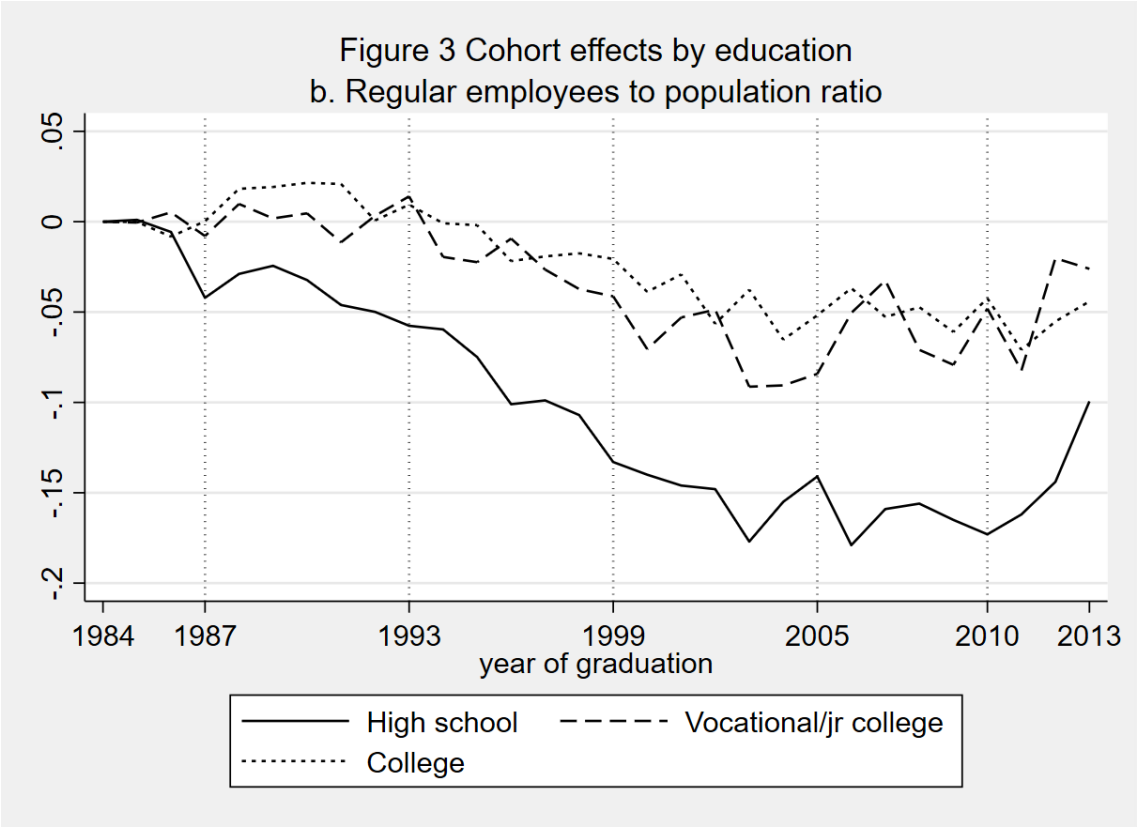


Figure 3 Cohort effects by education
b. Regular employees to population ratio
.05
0
-.05
-.1
-.15
-.2
1984
1987
1993
1999
2005
2010
2013
year of graduation
High school
Vocational/jr college
College

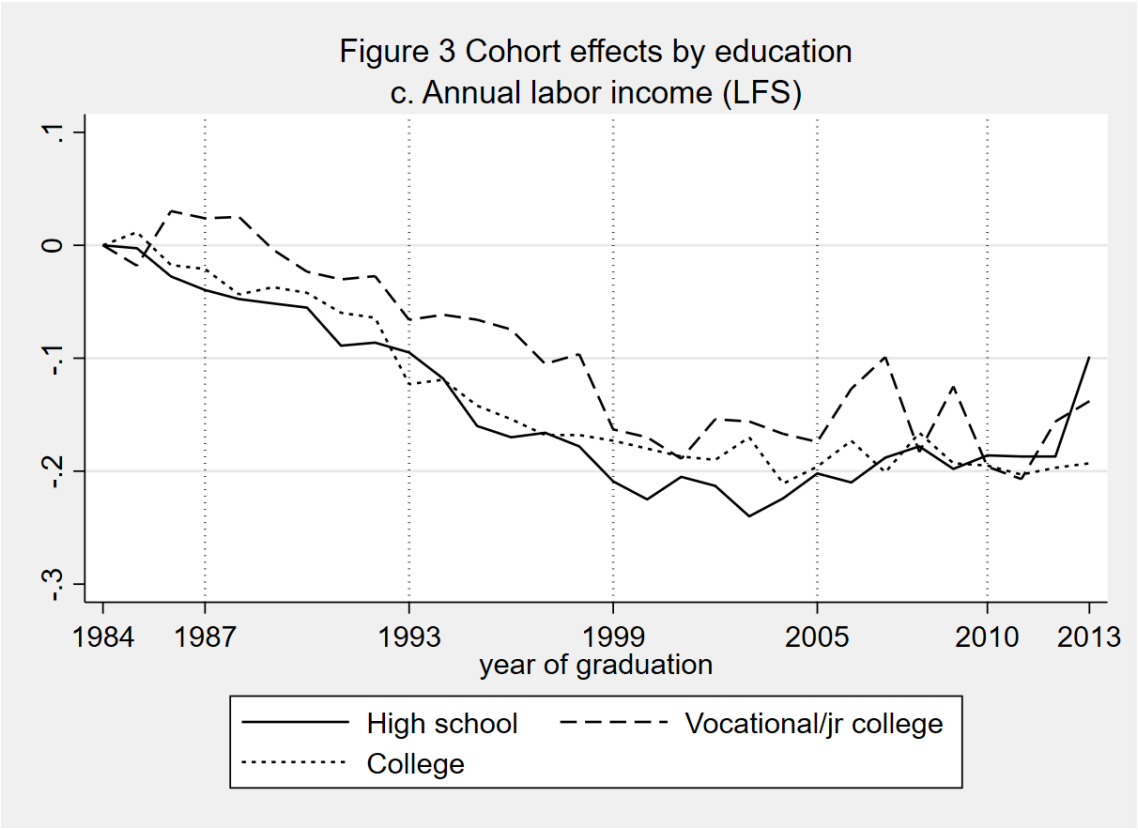


Figure 3 Cohort effects by education
c. Annual labor income (LFS)
.1
0
-.1
-.2
-.3
1984
1987
1993
1999
2005
2010
2013
year of graduation
High school
Vocational/jr college
College

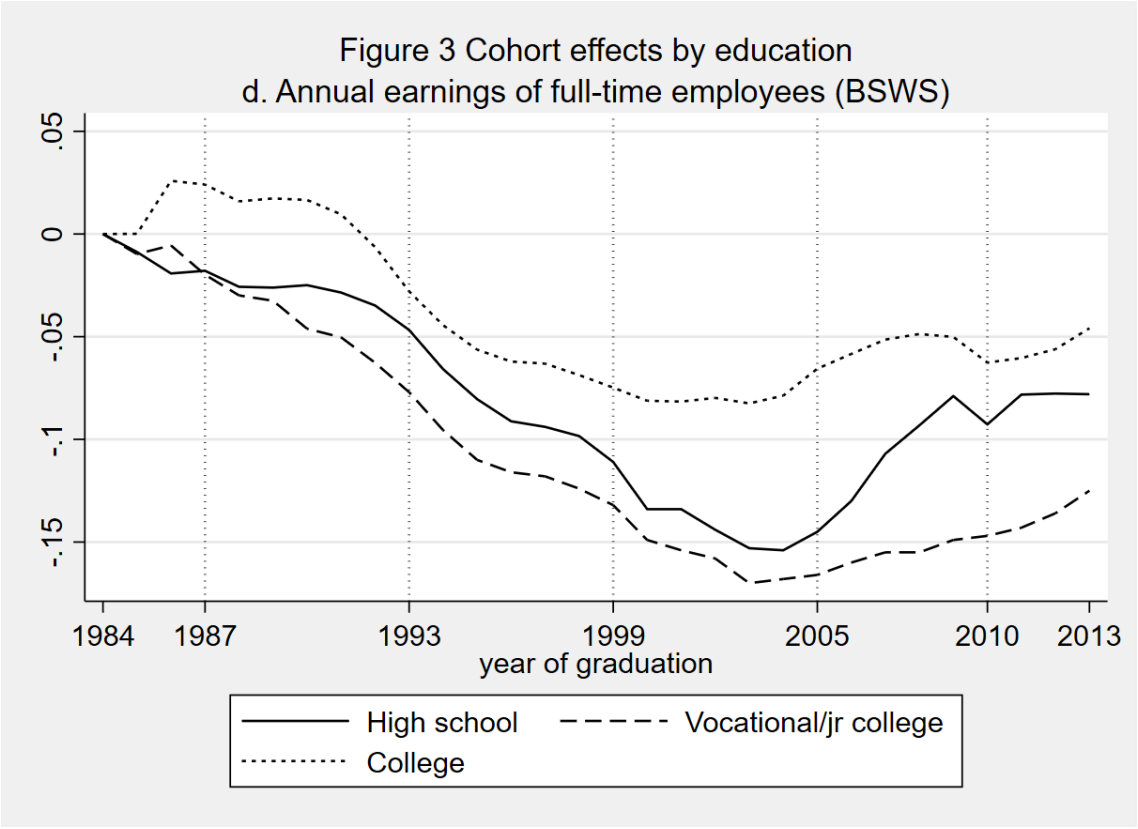


Figure 3 Cohort effects by education
d. Annual earnings of full-time employees (BSWS)
.05
0
-.05
-.1
-.15
1984
1987
1993
1999
2005
2010
2013
year of graduation
High school
Vocational/jr college
College

Table 2a. Estimated effects of the unemployment rate at entry (high school graduates)

VARIABLES	Employed		Regular employee		Log real annual income		Log real annual earnings of full-time employees	
	1984-2004	1993-2013	1984-2004	1993-2013	1984-2004	1993-2013	1984-2004	1993-2013
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unemployment rate at entry								
* experience of 1–3 years	-0.056***	-0.024**	-0.058***	-0.022*	-0.096***	-0.026	-0.039***	-0.005
	[0.015]	[0.009]	[0.018]	[0.011]	[0.023]	[0.020]	[0.004]	[0.009]
* experience of 4–6 years	-0.040***	-0.005	-0.049**	-0.008	-0.078***	-0.013	-0.030***	0.006
	[0.010]	[0.009]	[0.016]	[0.007]	[0.022]	[0.018]	[0.005]	[0.008]
* experience of 7–9 years	-0.026**	0.006	-0.022*	0.007	-0.054**	0.019	-0.021***	0.014
	[0.008]	[0.011]	[0.012]	[0.006]	[0.022]	[0.016]	[0.005]	[0.009]
* experience of 10–12 years	-0.017*	0.007	0.003	0.022***	-0.036*	0.045*	-0.015**	0.018*
	[0.008]	[0.013]	[0.009]	[0.006]	[0.019]	[0.020]	[0.005]	[0.009]
Sample size	66,616	38,213	66,653	38,225	59,513	32,710	1,919,966	1,177,874

Note: Standard errors in brackets are robust against clustering by region. Other controls include potential experience dummies and their interactions with the contemporaneous unemployment rate, graduation year dummies, region dummies, survey year dummies, and region-specific linear trends. *, **. ** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Table 2b. Estimated effects of the unemployment rate at entry (four-year college graduates)

VARIABLES	Employed		Regular employee		Log real annual income		Log real annual earnings of full-time employees	
	1984-2004	1993-2013	1984-2004	1993-2013	1984-2004	1993-2013	1984-2004	1993-2013
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unemployment rate at entry								
* experience of 1–3 years	-0.021**	-0.015*	-0.047***	-0.040**	-0.076***	-0.018	-0.033***	0.009
	[0.008]	[0.007]	[0.010]	[0.014]	[0.013]	[0.020]	[0.006]	[0.008]
* experience of 4–6 years	-0.006	-0.001	-0.022*	-0.014	-0.049***	0.011	-0.023***	0.019*
	[0.006]	[0.007]	[0.011]	[0.017]	[0.010]	[0.018]	[0.006]	[0.010]
* experience of 7–9 years	-0.003	0.002	-0.011	-0.003	-0.026**	0.033*	-0.014*	0.026*
	[0.006]	[0.005]	[0.008]	[0.014]	[0.011]	[0.017]	[0.006]	[0.012]
* experience of 10–12 years	-0.002	0.002	-0.013	-0.004	-0.025*	0.042***	-0.006	0.026*
	[0.006]	[0.007]	[0.007]	[0.013]	[0.012]	[0.013]	[0.007]	[0.013]
Sample size	39,306	29,025	39,324	29,028	37,580	27,176	1,732,900	1,404,620

Note: Standard errors in brackets are robust to clustering by region. Other controls include potential experience dummies and their interactions with the contemporaneous unemployment rate, graduation year dummies, region dummies, survey year dummies, and region-specific linear trends. *, **. ** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Appendix

Scars of the Job Market "Ice-Age"

Ayako Kondo

A1. Sources of Appendix Figures A1-A3

Figure A1
Percentage of new graduates immediately employed after graduation (all educational levels): School Basic Survey (MEXT)
Job vacancy-applicant ratio for new high school graduates: Press releases based on Hello Work administrative records MHLW
https://www.mhlw.go.jp/content/11800000/000986725.pdf
Job vacancy-applicant ratio for new college graduates: Survey by the Recruit Works Institute

Figure A2: Authors' tabulation from the Employment Status Survey, 2017.
Graduation year was defined as birth year + years of education + 6 years.

Figure A3: Labour Force Survey.

a. Left a job within 1 year: Dummy variable based on the question "when did you leave your previous job?" Defined as 0 if no previous job has been reported.
b. Manufacturing: Based on industry classification of current jobs
c. A large firm was defined as a firm with more than 500 employees.

A2. Cohort effects with controls for survey year effects

As explained by Rothstein (2021), it is impossible to identify cohort effects, survey year effects, and potential experience effects non-parametrically because the survey year, graduation year, and potential experience are perfectly collinear. Thus, following Rothstein (2021), this study normalized two cohort dummies to zero and interpret the estimated cohort effect as a deviation from the line that passes through the two normalization points.

Specifically, by adding survey year effects to equation (1), the following equation is

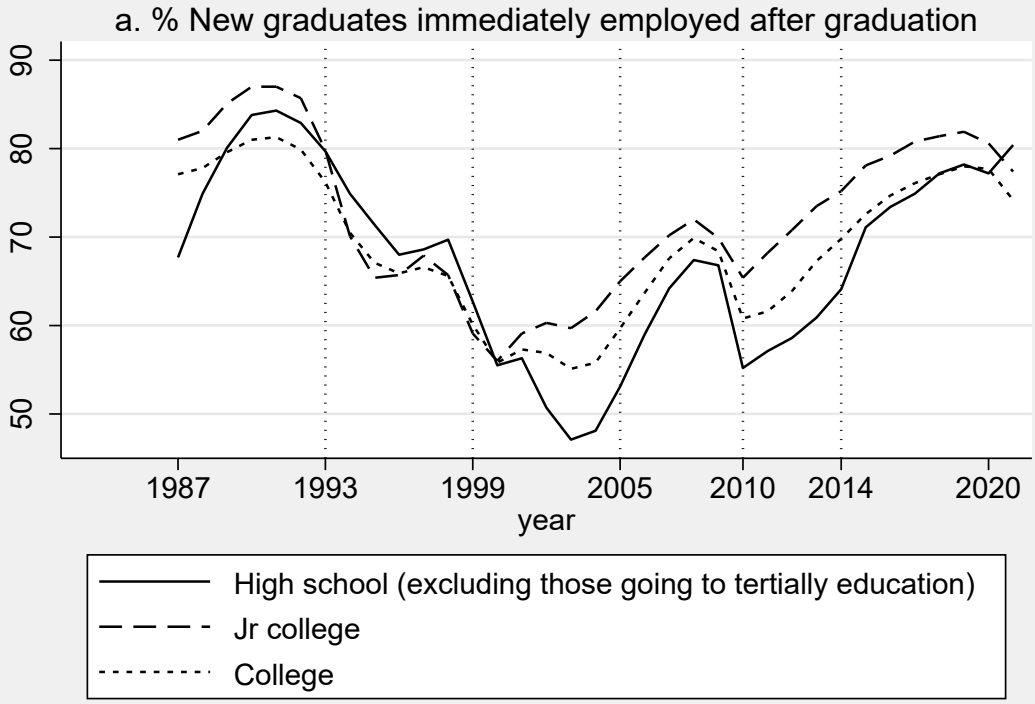
estimated:

$$Y_{sctri} = \theta_{sc} + \delta_{s,t-c-1} + \lambda_s \frac{\phi(p_{ct}^s)}{1-\Phi(p_{ct}^s)} + \eta_{sr} + \tau_{st} + \varepsilon_{sctri} \qquad (1)'$$

Where, in addition to θ_{s1984}, θ_{s1992} is also set to 0 for normalization, and τ_{st} represents survey year effect of year *t* for education group *s*. θ_{sc} is interpreted as the deviation of cohort *s* from the linear line connecting cohorts 1984 and 1992.

For comparison, a graph of the rotated Figure 3 as a graph without time effects has been plotted. Specifically, instead of θ_{sc} obtained from equation (1), I plot $\theta_{sc} - (c - 1984)\theta_{s1992}/(1992 - 1984)$.

Fig A1 Indices for labor market for new graduates in Japan



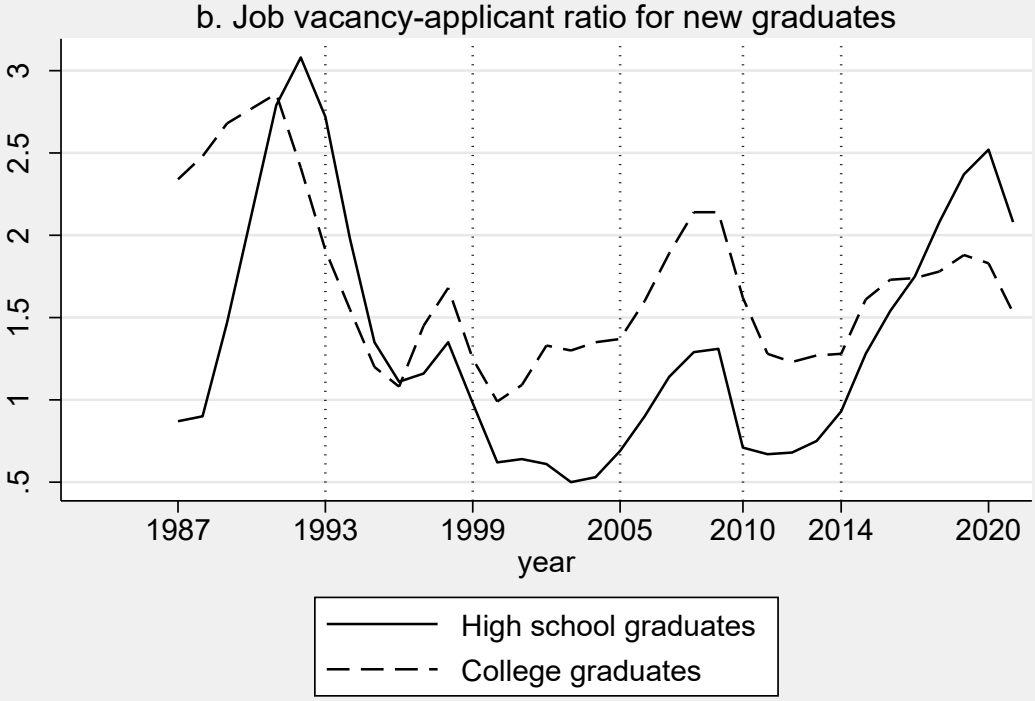
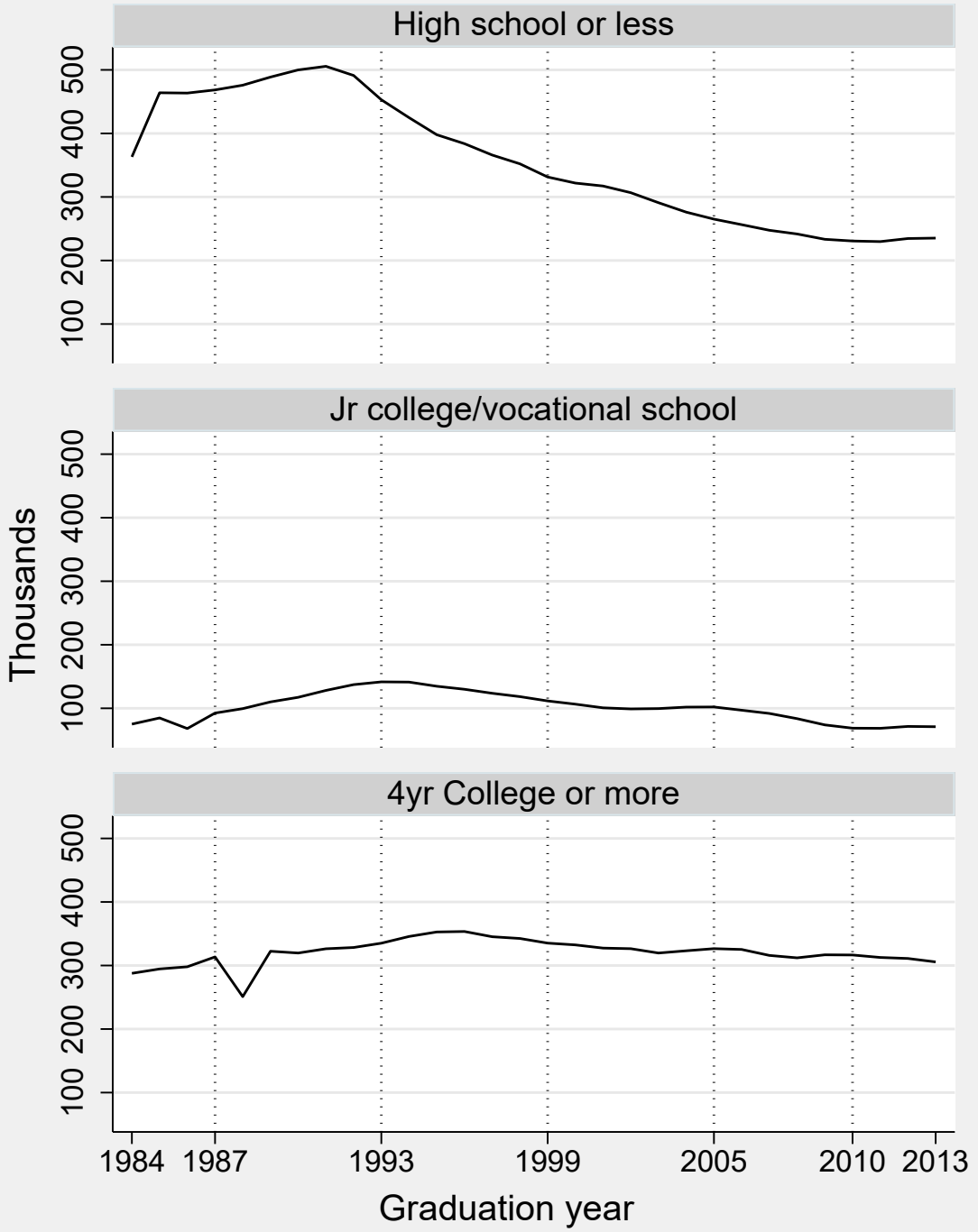
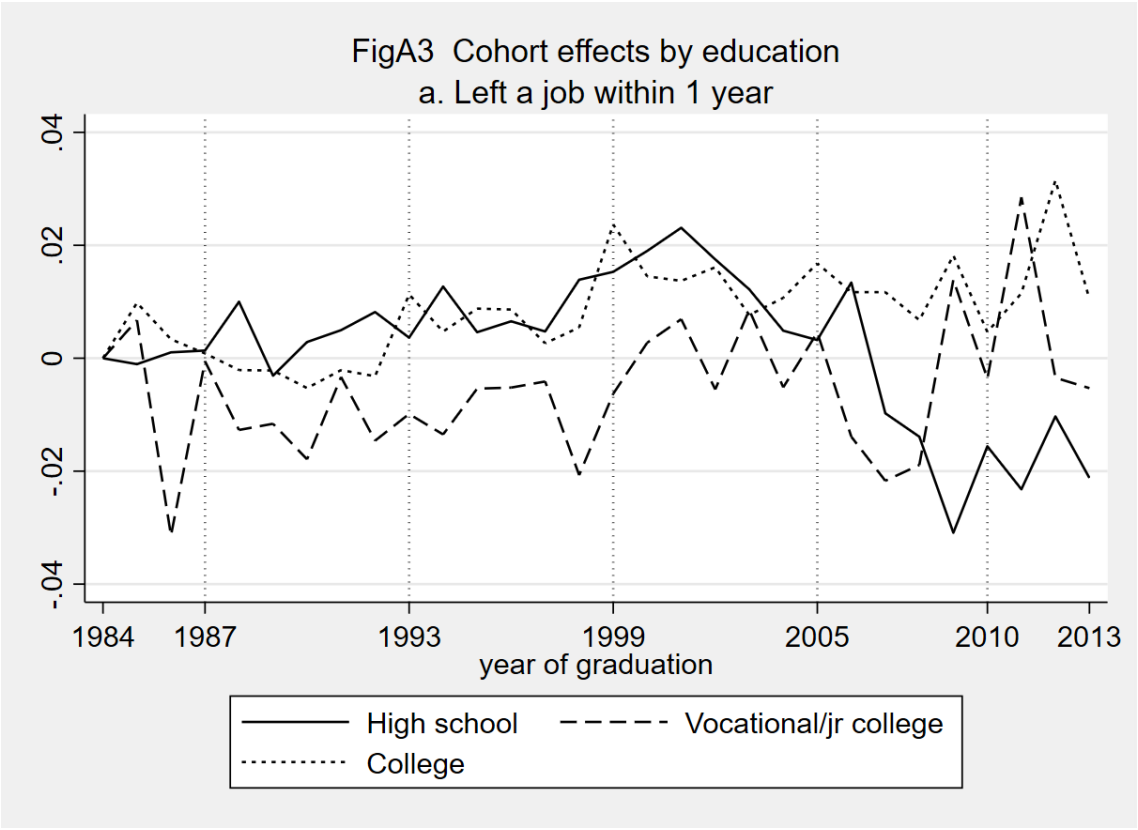
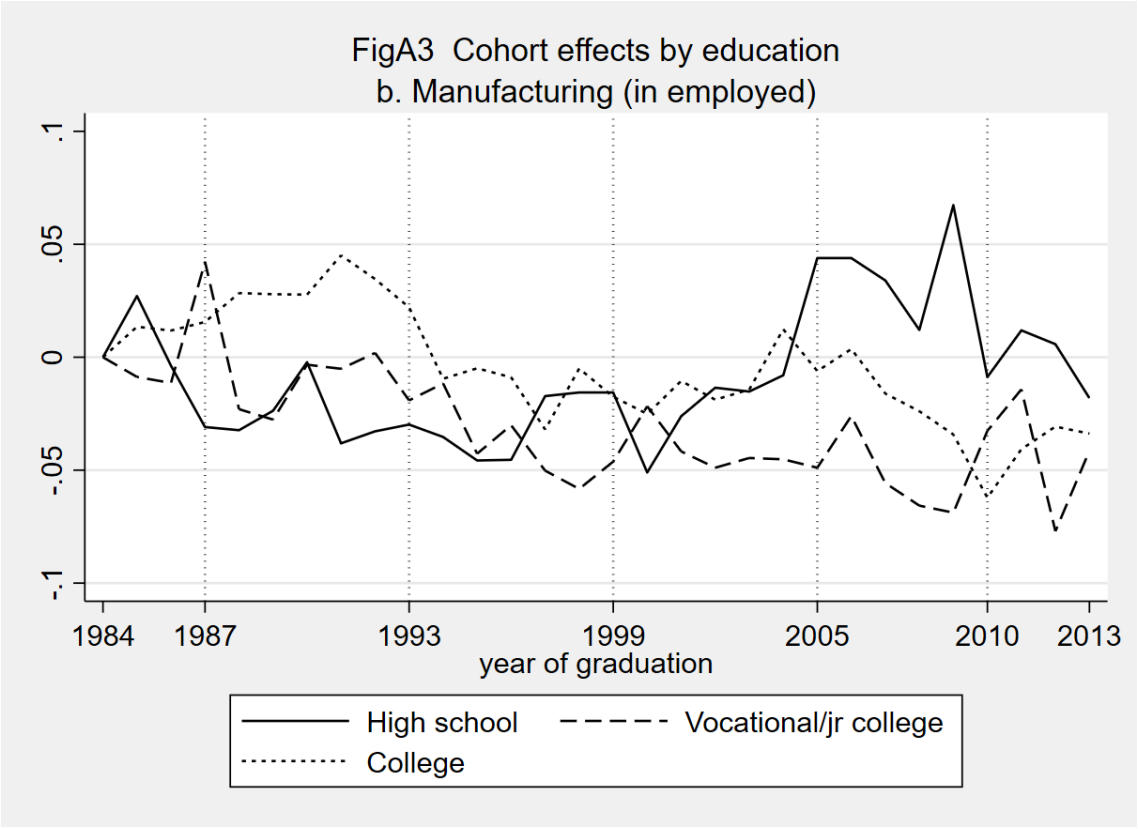


Figure A2: Male population by education and graduation year




FigA3 Cohort effects by education
a. Left a job within 1 year
.04
.02
0
-.02
-.04
1984
1987
1993
1999
2005
2010
2013
year of graduation
High school
Vocational/jr college
College


FigA3 Cohort effects by education
b. Manufacturing (in employed)
.1
.05
0
-.05
-.1
1984
1987
1993
1999
2005
2010
2013
year of graduation
High school
Vocational/jr college
College

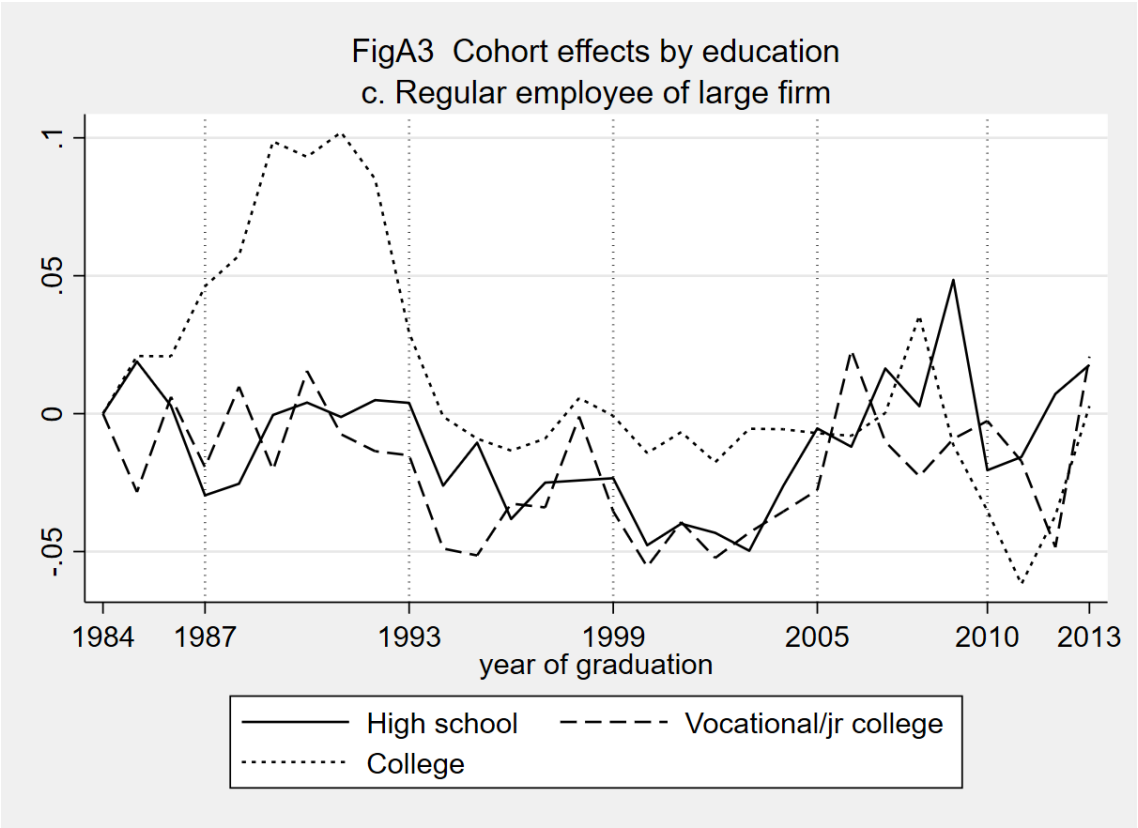


Table A1 Summary statistics (additional variables used in Figures A3a-c)

	High School	Two-year college or vocational school	Four-year college
Left a job within 1 year	11.6%	9.2%	6.3%
Manufacturing	29.9%	19.3%	21.5%
Regular employment in large firms	16.2%	18.6%	35.0%
Sample size	109,181	27,740	71,551

Fig A4 Normalized cohort effects (1984=1992=0)

a. Employment to population ratio

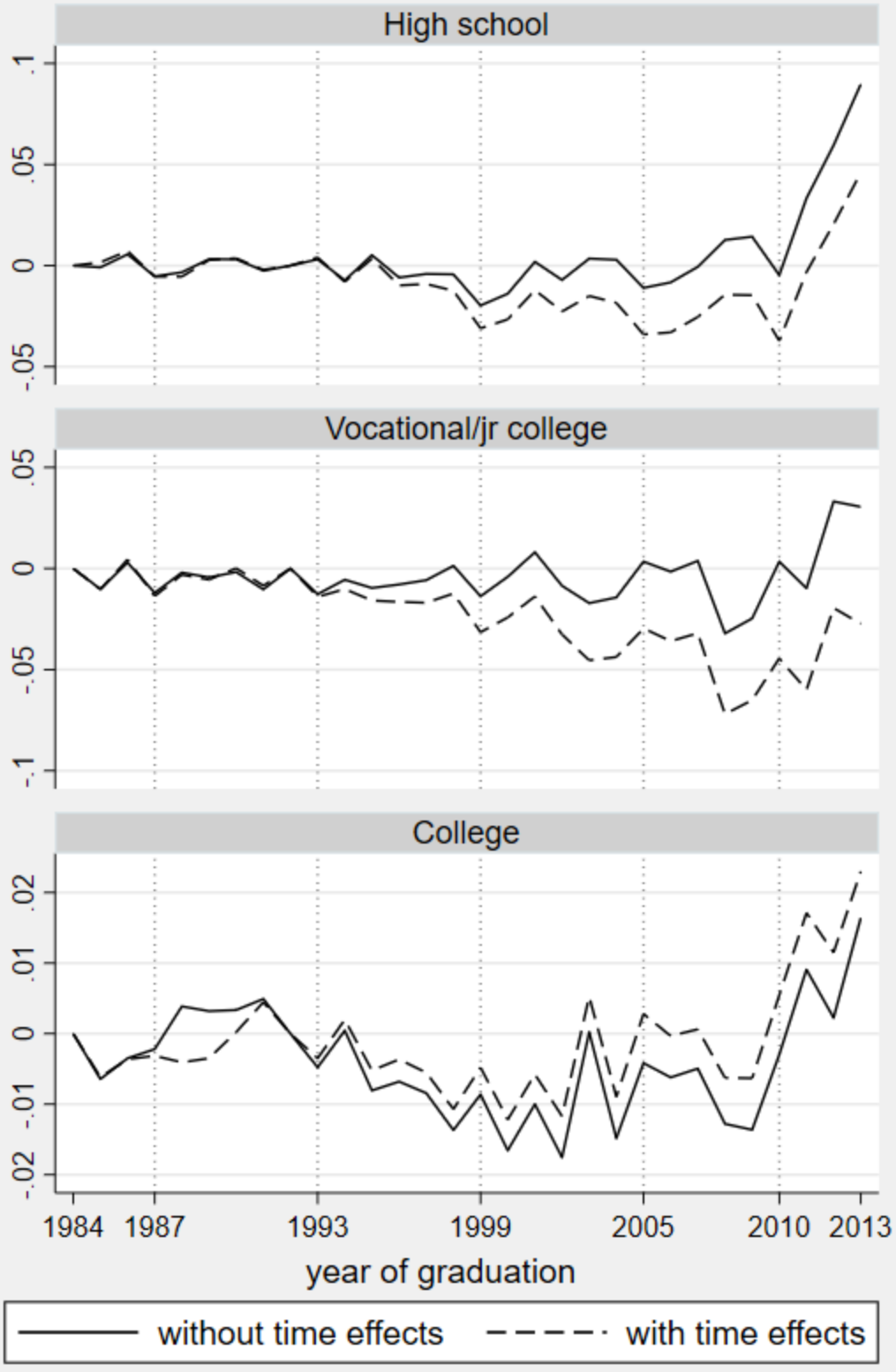


Fig A4 Normalized cohort effects (1984=1992=0)
b. Regular employees to population ratio

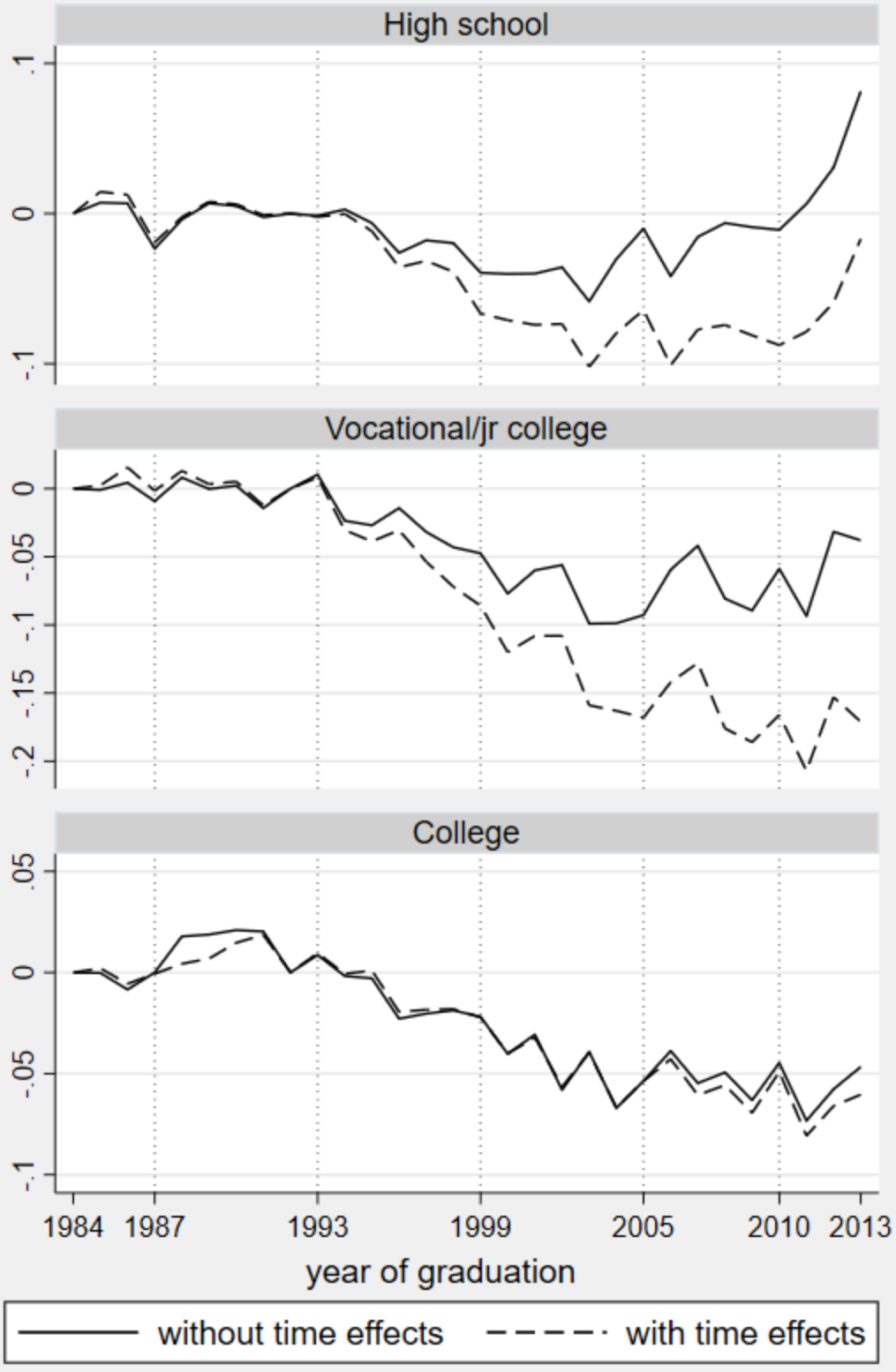


Fig A4 Normalized cohort effects (1984=1992=0)
c. Annual labor income (LFS)

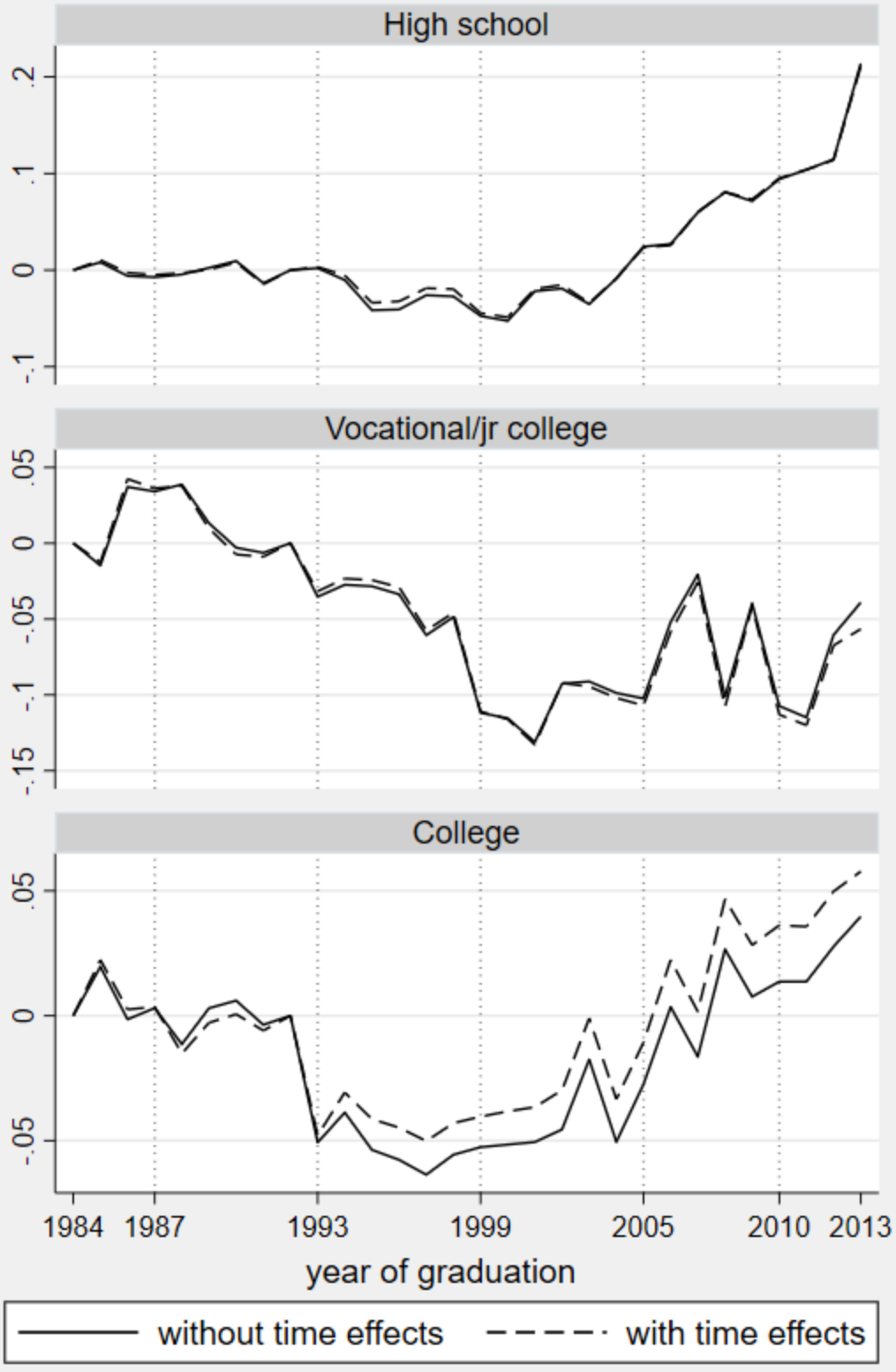


Fig A4 Normalized cohort effects (1984=1992=0)
d. Annual earnings of full-time employees (BSWS)

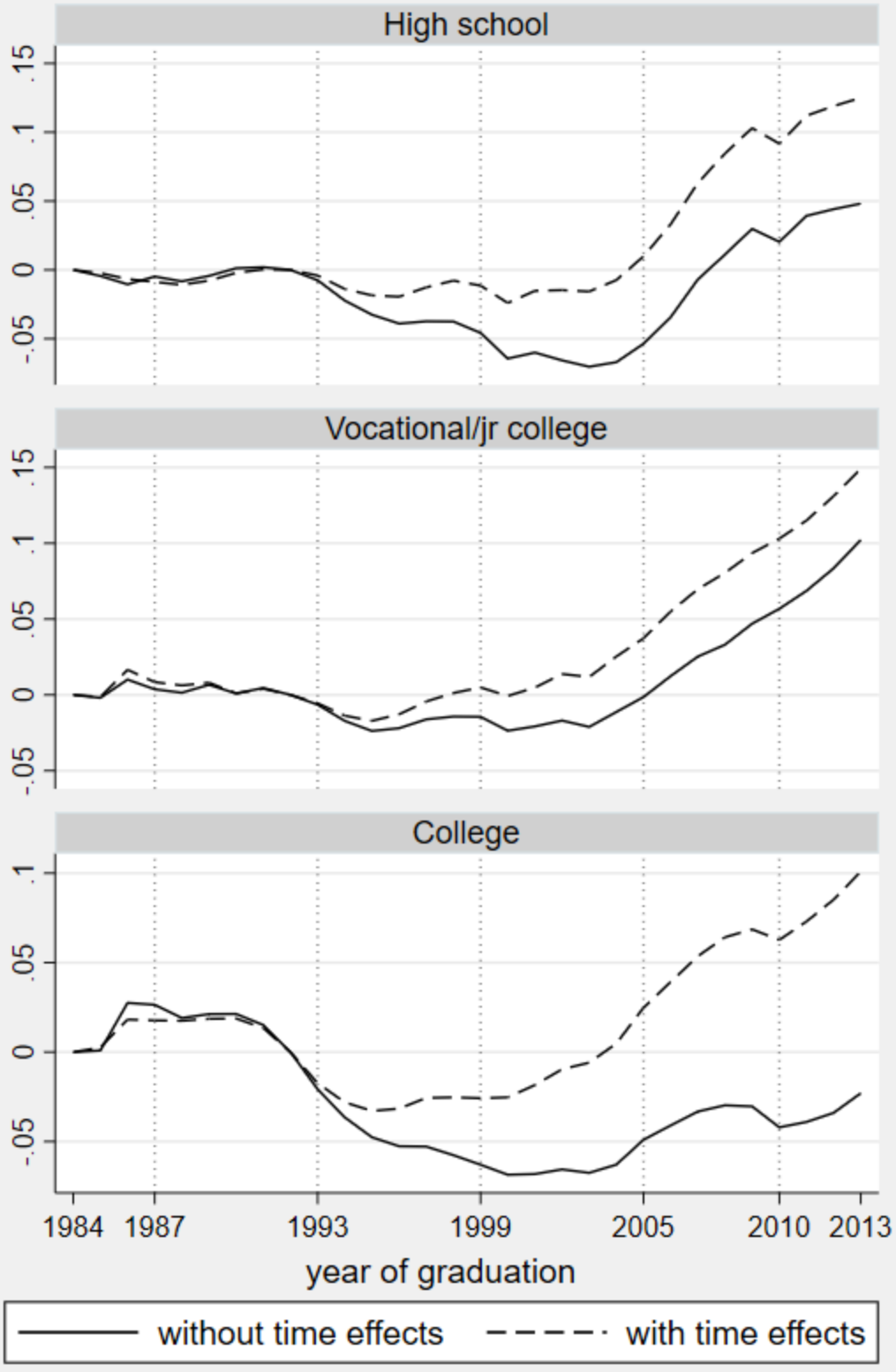


Fig A4 Normalized cohort effects (1984=1992=0)

e. Left a job within 1 year

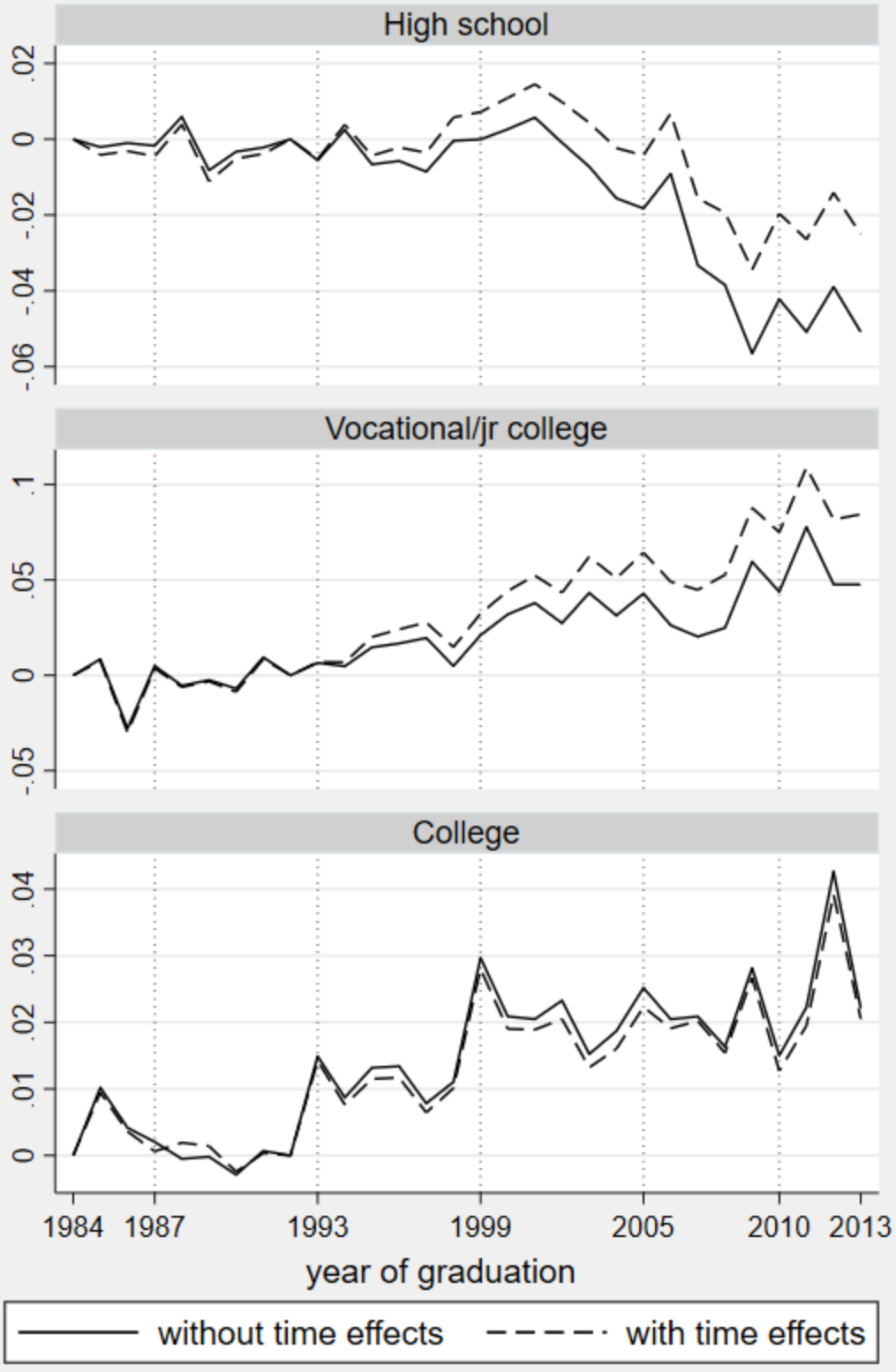


Fig A4 Normalized cohort effects (1984=1992=0)
f. Manufacturing (in employed)

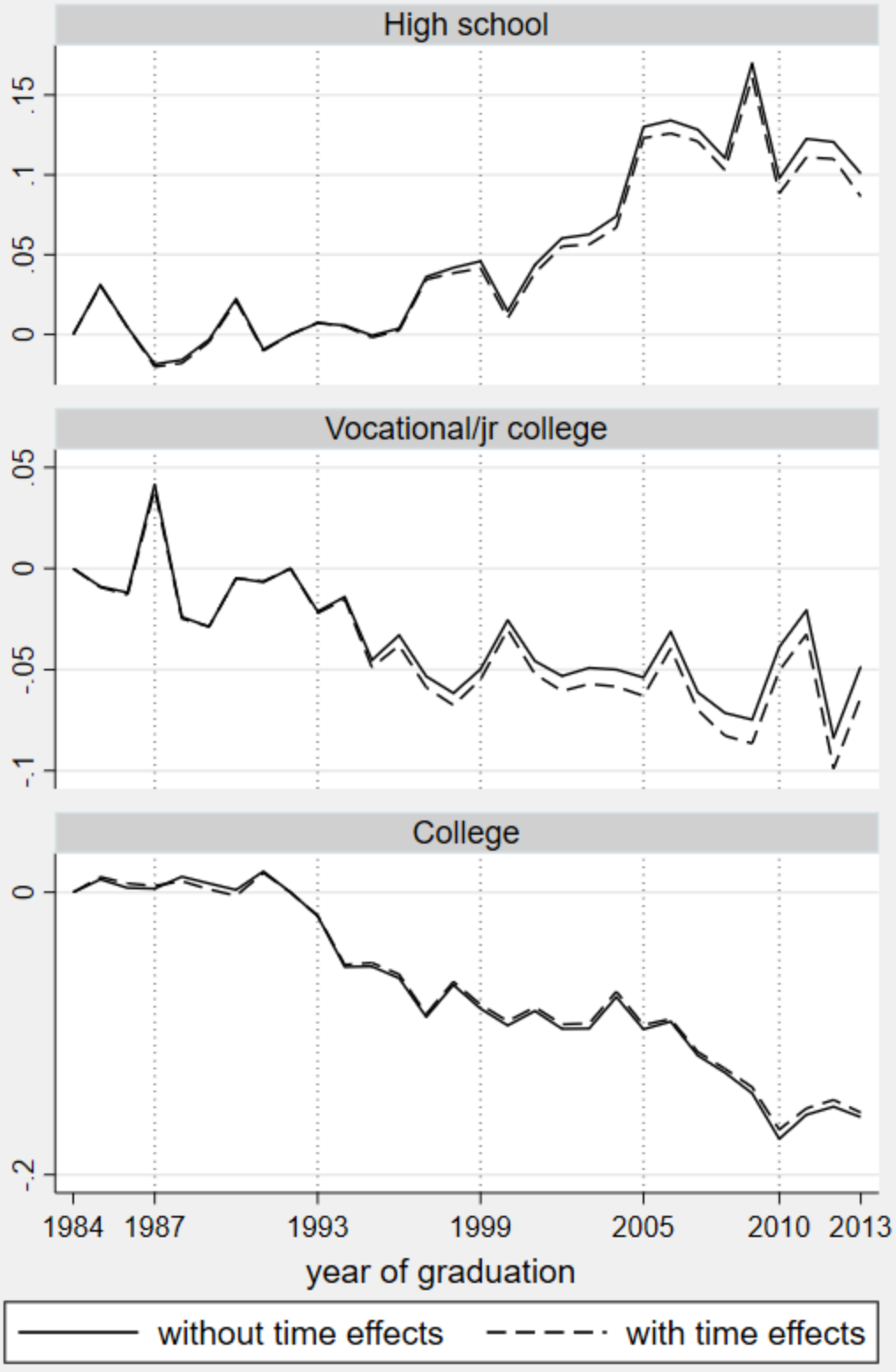


Fig A4 Normalized cohort effects (1984=1992=0)

g. Regular employee of large firm