The Effects of Exposure to a Large-Scale Recession on Higher Education and Early Labor Market Outcomes*

Eleanor Jawon Choi† Hanyang University and IZA

Jisoo Hwang‡ Seoul National University

Hyelim Son§ University of Seoul

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Abstract

This study examines the effects of timing of exposure to the Asian financial crisis on higher education and early labor market outcomes. We estimate an extended difference-in-differences model exploiting variation in age at exposure and regional severity of the recession in South Korea. Using data from the Census and Youth Panel, we find that individuals from hard-hit regions are less likely to graduate from college, tend to shift away from humanities to STEM majors, and have lower-quality first jobs, than their peers in the same cohort. These effects are more pronounced among individuals who experienced the recession at younger ages.

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†Co-corresponding author. College of Economics and Finance, Hanyang University, 222 Wangsimni-ro, Seongdong-gu, Seoul 04763, South Korea. Email: choiej@hanyang.ac.kr. Phone: +82-2-2220-1019.

‡Co-corresponding author. College of Liberal Studies, Seoul National University, 1 Gwanak-ro, Gwanak-gu, Seoul 08826, South Korea. Email: jisoohwang@snu.ac.kr. Phone: +82-2-880-9544.

§Co-corresponding author. School of Economics, University of Seoul, 163 Seoulsiripdae-ro, Dongdaemun-gu, Seoul 02504, South Korea. Email: hlson@uos.ac.kr. Phone: +82-2-6490-2073.

1 Introduction

The effect of recessions on individual's educational attainment is theoretically ambiguous. For high school or college students, economic downturns could lead to an increase in college or graduate school attendance due to reduced labor market opportunities. On the other hand, their enrollment may decrease due to lower household income and credit constraints. For younger children, their future educational attainment can be affected through the effect of the recession on their parents or neighborhood. A severe recession may increase parental time due to unemployment, but it may also lead to reduced material investments at the household or community level. The dominant mechanism and how it could vary by individual's age at the time of the recession are thus questions that need to be answered empirically.

This paper studies the effect of timing of exposure to a large-scale recession on educational attainment and subsequent early labor market outcomes. We exploit variation in age at exposure and regional labor market shocks from the 1997–1998 Asian financial crisis (AFC) in South Korea. The AFC provides a valuable setting because it was not only the worst recession in South Korea's history since the Korean War, but it was also very sudden and sharp, with relatively stable unemployment trends before and thereafter. We investigate whether individual's age at exposure to the AFC affects college outcomes at the extensive (enrollment and graduation) and intensive (type and major) margins, employment probability, and quality of the first job. We also explore possible mechanisms using household characteristics and regional data.

We use data from the Census and twenty waves of the Youth Panel to analyze a nationally representative sample of young men and women in South Korea born during 1968–1996 (age 1–29 at the time of AFC). We estimate an extended difference-in-differences model exploiting variation in age at exposure to the AFC within regions (or, equivalently, within-cohort regional variation in recession severity). Recession severity is measured by the sharp increase in the unemployment rate between 1997 and 1999 in the region where the individual was born or lived at age 14. The key identifying assumption is that cohort trends in education and early labor market outcomes are parallel across regions with more vs. less severe economic shocks in the absence of the recession

triggered by the AFC.

We find negative effects of the AFC on higher educational attainment. Individuals from regions more severely affected by the recession are less likely to attend and graduate from four-year colleges than their peers in the same cohort. The impact on four-year college education are larger for cohorts who experienced the crisis at a younger age. We also find intensive margin effects regarding college majors. Conditional on college enrollment, exposure to the AFC resulted in a significant decrease in humanities and a slight increase in STEM major selection.

For early labor market outcomes, while we find no effect on employment probability, the quality of the first job deteriorates for those who grew up in regions more severely affected by the crisis. Specifically, we find a decrease in earnings in their first job and a lower probability of being employed in a large firm or holding a white-collar position. The adverse effects of the recession on initial earnings and the likelihood of having a white-collar first job are more pronounced among individuals who were younger (under age 13) at the time of the recession.

We test the validity of our identification strategy by challenging the parallel cohort trend assumption in various ways. The identification assumption would be violated if there is endogenous selection across regions within each cohort or if region-specific time-varying unobserved factors are confounded with the severity of the AFC. Specifically, we explore the possibility of endogenous selection into the region of birth (or region at age 14), confounding pre-trends, confounding contemporaneous local labor market shocks, and non-random attrition. Each scenario is examined through a series of internal validity checks, such as conducting a placebo test on older cohorts beyond college graduation age during the AFC, investigating selection on observables, using alternative specifications to account for region-specific cohort trends, conducting a shift-share instrumental variable analysis, and implementing alternative sample restrictions. The results of these exercises suggest that our recession effect estimates are unlikely to be driven by selection or confounding factors.

We also conduct additional analyses to better understand the channels through which the AFC impacted children's long-term outcomes. We consider three possible mechanisms: household

credit constraints, family distress, and a decline in community-level resources. Heterogeneity analysis by parents' education level and analysis of parental monetary investment such as private out-of-school education spending provides no clear evidence of the household credit constraints channel. However, we find some suggestive evidence of a larger increase in the divorce rate due to financial reasons and a slower growth in government spending per capita on K–12 education in regions that were affected more severely by the AFC. We thus conjecture changes in family stability and the quality of neighborhoods or schools to be more relevant than household credit constraints in explaining the recession effect. Larger impacts on younger children, on the other hand, may be due to their lack of contemporaneous labor market substitution effects, the existence of "critical" periods in human capital development, or their longer exposure to persistent non-monetary effects following the AFC.

There are two separate strands of related literature which study the effect of recessions on education and labor market outcomes, respectively. Research on the cyclicality of higher education finds mixed results, with some studies documenting countercyclical (Betts and McFarland, 1995; Rice, 1999; Card and Lemieux, 2001; Sievertsen, 2016; Charles et al., 2018) while others procyclical (Sakellaris and Spilimbergo, 2000; Bedard and Herman, 2008; Rao, 2016) patterns in the demand for higher education. These studies address contemporaneous effects of economic conditions on educational attainment. Research on the effect of recessions on labor market outcomes, on the other hand, study penalties experienced by young workers who graduate from college or high school at the time of the shock (Genda et al., 2010; Kahn, 2010; Hershbein, 2012; Oreopoulos et al., 2012; Altonji et al., 2016; Rothstein, 2023).[1] While not limited to immediate outcomes, these studies focus on labor market entrants.

A recession can have different impacts by individual's age at exposure, however, and with both short- and long-run consequences. We thus attempt to fill these gaps in the literature. First, we examine age-differential effects using more than twenty birth cohorts who experienced the AFC during childhood, adolescence, or young adulthood. Second, unlike many prior studies which

[1] In the context of the South Korean labor market, Choi et al. (2020) studies the long-term effects of college graduation during the Asian financial crisis.

focus on the effect of recessions on *either* education or labor market outcomes, we examine them together in a unified setting. We are thus able to present a more holistic picture of how a large-scale recession impacts individuals from schooling to their first job.

In these aspects, our paper contributes to the emerging literature on the long-run effects of a recession by age at exposure. There are only a few prior studies in this area, among which Stuart (2022) is the most closely related. He exploits variations across counties and age at the time of the 1980–1982 recession in the U.S., and finds negative effects on four-year college degree attainment and earnings in adulthood, larger for those who were younger (ages 0–13 than ages 14–19) at the time of the recession.[2] We go beyond this work, however, by further exploring potential behavioral responses to and the mechanisms underlying the observed effects. Examining changes in college major choice and private education spending, for instance, provide insight on how individuals and households may respond to mitigate adverse impacts from economic downturns. Using parental characteristics and regional data, we also provide suggestive evidence that credit constraints is not the main channel driving the negative recession effects on education and labor market outcomes.

Lastly, our paper complements research documenting the relationship between early-childhood environment and adult outcomes in general. Beyond the context of recessions, there is a large literature on the short and long-run effects of exposure to various shocks in early ages on future earnings or health (Almond et al., 2018). Research on the life-cycle approach to skill formation finds that children's development depends not only on total investment but also on its timing (Cunha et al., 2006; Heckman and Mosso, 2014). We provide evidence related to this line of work by showing age-differential effects of a large-scale recession on children's future higher education and early labor market outcomes.

The remainder of the paper is organized as follows. Section 2 provides background on the impact of the Asian financial crisis in South Korea. Section 3 describes the Census and Youth

[2]Rao (2016) also finds that macroeconomic shocks experienced before age 15 have a negative impact on educational attainment in the U.S. However, his study does not explicitly delve into how the effects of these shocks vary by age at exposure. Duque and Schmitz (forthcoming) show that exposure to the Great Depression in utero or before age 3 is associated with a significant deterioration in economic and health outcomes after midlife in the U.S. While they do not find any noticeable effect of exposure during childhood or adolescence, they have not investigated the consequences of exposure after age 16.

Panel data and explains our identification strategy. Section 4 presents the estimation results on education and early labor market outcomes and examines the internal validity of these results. In Section 5, we discuss potential mechanisms. Section 6 concludes.

2 Background on the Asian Financial Crisis in South Korea

Throughout the early 1990s, foreign creditors held an optimistic outlook on East Asia's growth potential, leading to an influx of foreign capital into the region. However, capital inflows and market confidence abruptly reversed with the collapse of the Thai baht in July 1997. This event led to widespread financial turmoil throughout Asia, which became known as the Asian financial crisis (AFC). The AFC became the worst recession in South Korea's history since the Korean War, and remains so to date as its labor market conditions were largely unaffected even during the Great Recession (Lee, 2020).

The AFC-driven recession in South Korea provides an empirically advantageous setting for identifying the long-term effects of an economic downturn, because it was not only a large but an unexpected shock to the economy, with varying degrees of impact across the country. Until the onset of the crisis, a rapid financial meltdown was unanticipated in South Korea given its solid fundamentals (Radelet and Sachs, 1998): there was a sustained annual GDP growth rate of 6–10%, unemployment rates were below 3%, inflation rates were stable around 5%, and public debt remained below 11% of GDP (Baliño and Ubide, 1999). However, the currency crisis had a devastating impact on South Korea due to its heavy dependence on short-term loans.[3] In November 1997, the government resorted to requesting financial assistance from the International Monetary Fund. By the end of December 1997, seven of the top 30 conglomerates (*chaebols*) either sought court protection or went into bankruptcy (Baliño and Ubide, 1999). The failure of these large firms, coupled with foreign investors' pessimism, resulted in a deterioration of financial institutions (Rhee and Lee, 2012), leading to a credit crunch that significantly impacted small and medium-

[3]Between 1993 and the end of September 1997, short-term external debt rose from 40 billion USD to 98 billion USD, accounting for 54% of the total external liabilities (Chopra et al., 2001).

sized enterprises (SMEs).[4] Massive layoffs and restructuring at both large firms and SMEs left many workers displaced, with the number of unemployed workers surpassing 1.4 million by 1999 (Cho and Keum, 2004).

Figure A1 documents the magnitude of macroeconomic shocks in terms of national unemployment rates and real GDP growth rates. Between 1997 and 1999, the unemployment rate soared from the pre-crisis level of 2.6% in Q4 1997, to a peak of 8.5% in Q1 1999. The real GDP growth rate fell dramatically from 4.2% in Q4 1997 to −3.4% in Q1 1998 and further to −7.3% in Q2 1998. The GDP growth rate quickly recovered to over 10% in 1999, and the unemployment rate began to decline in 1999 and stabilized at an average of 3.5% from 2001.

[Figure 1 here]

The severity of these impacts, however, was unequal across regions.[5] Figure 1 exhibits the variation in recession severity measured by the difference in the annual unemployment rate between 1997 and 1999 in each region (ΔUR_r^{97-99}), ranging from 2.5–5.0 percentage points.[6] The jump in the unemployment rate was particularly large in the Northwest and Southeast. The differing impacts of the crisis were partly due to disparities in industrial structure. For instance, areas that specialized in traditional manufacturing such as food and textiles (e.g., Busan and Daegu in the Southeast) were severely affected, as the crisis reinforced existing trends of declining labor-intensive industries (Hassink, 1999; OECD, 2001). The Ulsan industrial complex (on the Southeastern coast) suffered as production in the car industry dropped by 43.8% in 1998 compared to the previous year. On the other hand, unemployment rates increased dramatically in the Seoul metropolitan area (in the Northwest), which had high concentrations of independent SMEs. *Chae-*

[4]Bankruptcy filings of SMEs nearly doubled from 11,600 to 22,800 between 1996 and 1998 (Gregory et al., 2002).

[5]Regions refer to major administrative divisions, which include nine provinces (Gyeonggi, Gangwon, North Chungcheong, South Chungcheong, North Jeolla, South Jeolla, North Gyeongsang, South Gyeongsang, and Jeju) and seven major cities (Seoul, Busan, Daegu, Incheon, Gwangju, Daejeon, and Ulsan). Geographically, South Korea is about the same size as the state of Indiana, and each administrative division is comparable to a commuting zone in the U.S.

[6]Regional unemployment rates are calculated from the labor force statistics using the size of the working age population, employment-to-population ratio, and the number of people in the labor force by region. The regional labor market data is compiled from the Economically Active Population Survey (EAPS) by Statistics Korea, which is comparable to the Current Population Survey in the U.S.

bols cut orders from subcontractors as a form of retrenchment and banks also prioritized larger enterprises during the crisis because their own risk of bankruptcy was more closely linked to large firms than SMEs (Hassink, 1999; OECD, 2001).

3 Data and Method

3.1 Data and Analysis Sample

We construct two analysis samples using data from the Population and Housing Census (Census) and the Youth Panel (YP). First, we use the 2% sample of the 2020 Census to examine educational attainment of 1968–1996 birth cohorts who were 1–29 years old at the onset of the AFC in 1997. The Census is conducted by Statistics Korea every five years to collect information on population, households, and housing characteristics. Our analysis sample includes 369,816 individuals born in South Korea, and their region of birth is used to link to the regional recession severity measure (Figure 1).

Second, we use annual longitudinal surveys from the YP to study college education and early labor market outcomes of individuals exposed to the AFC at ages 1–25. The YP data are maintained and released by the Korea Employment Information Service, which operates under the Ministry of Employment and Labor. The structure of the YP is comparable to the National Longitudinal Surveys in the U.S. Currently, two panel studies have been completed: six waves of YP2001 and fourteen waves of YP2007, which correspond to survey years 2001–2006 and 2007–2020, respectively. Because different birth cohorts are interviewed in the YP2001 and YP2007, we combine the two datasets and construct a sample of 13,878 individuals born between 1972 and 1996. The 1972–1977 birth cohorts are from YP2001, and the 1978–1996 birth cohorts are from YP2007.[7]

From the YP's longitudinal information, we construct cumulative variables on individuals' post-secondary education and labor market outcomes as of the last wave of the survey. The YP respondents were 27–42 years old at the last wave, i.e., wave 6 of YP2001 and wave 14 of YP2007.

[7]The 1994–1996 birth cohorts were added to YP2007 in 2015 (wave 9) and followed up through 2020.

Because the YP contains information on region of residence at age 14 (and not region of birth), we restrict our sample to individuals who lived in South Korea at age 14 and merge it with the regional recession severity measure using region of residence at age 14.

There are a few notable features of the two samples constructed from the Census and YP data. First, birth region is available in the Census but not in the YP. Thus, we use region of residence at age 14 as a proxy for region of birth when analyzing the YP sample. Second, those born before 1972 are surveyed in the Census but not in the YP, which makes the 1972 birth cohort the oldest group in the YP sample. Third, college major choices are observed only in the YP. Lastly, labor market outcomes are comparable across cohorts in the YP sample, but not in the Census sample, because the Census shows a snapshot only every five years and therefore labor market outcomes of individuals are measured at different levels of experience.

[Table 1 here]

Table 1 shows summary statistics of the key variables used in our analysis. On average, the regional unemployment rate increased by about 3.6 percentage points during the AFC. Over 98% of both samples have graduated from high school, over 70% have ever attended college, and over 62% have a college degree. Because secondary education is almost universal in South Korea, higher education is recognized as a critical determinant of economic success. After completing their education, 85% of the YP sample find employment during the analysis period, among which 63% hold a white collar occupation as their first job.

3.2 Empirical Strategy

We estimate a generalized difference-in-differences (DID) model similar to Stuart (2022), exploiting variation in age at exposure to the AFC within regions (or, equivalently, within-cohort regional variation in recession severity). The regression model is specified as follows:

$$y_i = \sum_{c<29} \beta_c AFC_r \times 1[\text{Age in } 1997 = c] + \mathbf{X}_i'\boldsymbol{\gamma} + \delta_c + \lambda_r + \varepsilon_i, \tag{1}$$

where y_i is the educational or labor market outcome of person i who was c years old in 1997 and born in region r. AFC_r represents recession severity in region r induced by the Asian financial crisis and is measured by the sharp increase in the regional unemployment rate between 1997 and 1999, ΔUR_r^{97-99}. A vector of person i's predetermined characteristics $\mathbf{X}_i$ controls for person i's demographic characteristics and family background, such as sex and parents' educational attainment. Cohort fixed effects δ_c capture nationwide changes in initial human capital endowments, educational environment, labor market conditions, and related government policies, across cohorts. Time-invariant differences in these factors across regions are absorbed by region fixed effects λ_r. ε_i is an error term representing the remaining unobserved determinants of the outcome.

The parameters of interest are the coefficients β_c's on the interaction terms between the main treatment variables, AFC_r and cohort dummies. We use 29-year-olds in 1997 (i.e., 1968 birth cohort) as the reference group in the DID analysis. Hence, β_c measures the effect of a one percentage point increase in the regional unemployment rate during the AFC on individuals who were age c in 1997 relative to those who were age 29 in 1997.

Although β_{29} cannot be identified in regression model (1) by construction, β_{29} is unlikely to be different from zero for college education outcomes given that age 29 is beyond the college graduation age for most individuals. In Section 4.1, we show that β_c's for the educational attainment of those aged 25–28 in 1997 are precisely zero, statistically indistinguishable from β_{29}. This result suggests that individuals aged 25 and older are effectively "untreated" cohorts when analyzing higher educational outcomes, and thus a valid reference group. For labor market outcomes, on the other hand, β_{29} may be different from zero and is likely to be negative, given that young workers experience earnings losses during a recession (e.g., Rinz, 2022; Rothstein, 2023; Salvanes et al., forthcoming). If $\beta_{29} < 0$, any negative estimates of β_c would understate the true recession effect on cohort c.

In the analysis using the YP sample, we estimate a slightly modified version of equation (1) due to limitations of the YP data. First, we construct the regional unemployment spike, ΔUR_r^{97-99}, using region at age 14 as a proxy for birth region, as aforementioned. Second, we use those who

were 25 years old in 1997 (i.e., 1972 birth cohort) as the reference group because they are the oldest cohort in the YP. In Section 4.1, we provide evidence that these modifications are unlikely to bias our results.

When we report the estimated AFC effects, $\hat{\beta}_c$'s, in subsequent tables and figures, we combine adjacent cohorts to increase precision and ease exposition: for instance, $\hat{\beta}_{1-3}$, $\hat{\beta}_{4-6}$, $\hat{\beta}_{7-9}$, $\hat{\beta}_{10-12}$, $\hat{\beta}_{13-15}$, $\hat{\beta}_{16-18}$, $\hat{\beta}_{19-21}$, $\hat{\beta}_{22-24}$, and $\hat{\beta}_{25-28}$. In the regression analysis, observations are weighted using individual sample weights provided in the Census or YP data. Standard errors are clustered at the cohort-by-region level, which corresponds to the level of variation in the main treatment variables, $AFC_r \times 1[\text{Age in } 1997 = c]$.[8]

The key identifying assumption of our DID design is that cohort trends in education and early labor market outcomes are parallel across regions with more vs. less severe AFC shocks had it not been for the recession triggered by the AFC. Potential threats to the parallel cohort trend assumption are endogenous selection across regions within each cohort or region-specific time-varying unobserved factors, confounded with the severity of the recession. For example, if individuals (from the same cohort) are negatively selected in regions with large AFC shocks, the recession effect would be biased downward, overstating any negative impact. We investigate the internal validity of our empirical strategy and establish a causal interpretation of the results in Section 4.3. In particular, we examine the possibility of endogenous selection into the region of birth (or region at age 14), confounding pre-trends, confounding contemporaneous local labor market shocks, and non-random attrition.

[8]Recent research on statistical inference shows that the level of standard error clustering should be determined based on the (quasi-)experimental design. If treatment assignment is made across certain groups, clustering at this group level can, in general, be justified (Abadie et al., 2023).

4 Results

4.1 Education Outcomes

We first investigate the effect of the recession on total years of education. Figure 2 plots the estimated effect of the AFC by age in 1997, i.e., $\hat{\beta}_c$'s, using the Census. Compared to the reference group (those who were 29 years old in 1997), the effects are negative and statistically significant, particularly for those who were younger at the time of the recession. A one percentage point increase in the regional unemployment rate for individuals who were ages 1–3 in 1997 lowers their educational attainment by 0.26 years relative to those who were age 29. The effects become smaller in magnitude across cohorts until it becomes statistically indistinguishable from zero by age group 19–21 in 1997. The severity of the recession does not have a significant impact on years of education for individuals who were already in their twenties in 1997, as most of them would have already made their educational decisions by then.

[Figure 2 here]

Given that nine years of elementary and middle school are compulsory and high school enrollment rate is 99% in South Korea, we expect that the result in Figure 2 is coming from higher education. In Figure 3, we therefore look at the effects for college attendance (panel A) and graduation (panel B). The AFC significantly dampened future college attendance and graduation rates for those who were below ages 19–21 in 1997, by about 2 to 6 percentage points for a one percentage point increase in the regional unemployment rate. We find larger negative effects on those exposed to AFC at younger ages, and this cohort pattern is mainly driven by a reduction in four-year college education. Recession effect estimates for two-year college outcomes show no distinct pattern in cohort heterogeneity.

[Figure 3 here]

Before exploring further outcomes in the YP data, we replicate the analysis on educational attainment using the YP sample to ensure comparability with the Census. Figure 4 shows the re-

sult on college attendance (panel A) and graduation (panel B) using both Census and YP samples. As noted above, the reference group in the YP sample consists of individuals who were 25 years old, instead of 29, in 1997. We thus plot the Census results separately, using two different reference groups: age 29 and age 25 in 1997. Since the recession effects are precisely zero for those aged 25–28 relative to 29-year-olds in 1997, the two sets of estimates are very similar regardless of the choice of reference group. This exercise also serves as a falsification test for our DID design, showing that there are no cohort trends confounded with recession severity for those beyond college graduation age in 1997.

The YP sample also shows that individuals more severely affected by the recession during their youth are less likely to attend or graduate college. The overall patterns are similar with the Census results, although recession effect estimates in the YP sample are slightly larger in magnitude (by about 2 to 2.5 percentage points) and less precise because of the smaller sample size. The similarity of the results between the two samples also confirms that using region at age 14 as a proxy for region of birth in the YP sample is unlikely to bias our estimates. We also check comparability in results for two-year and four-year college outcomes separately and find similar patterns across samples (see Figure A2).

[Figure 4 here]

Overall, both samples find significant negative effects of the recession on higher educational attainment, which are more pronounced for those exposed to the AFC under age 13. In the Census sample, a one standard deviation increase in the regional unemployment rate results in a 3.8 percentage point (6.1% of the dependent variable mean) decrease in the college graduation rate for individuals under age 13 in 1997 relative to 29-year-olds in 1997. The corresponding estimate from the YP sample is a 5.4 percentage point (8.4%) decrease. The magnitude of our estimates is in line with Stuart (2022), where a change in economic conditions of about one standard deviation leads to a 4.4 percentage point (10.7%) decline in college degree attainment among individuals exposed to the 1980–1982 recession at ages 0–10 in the U.S.[9]

[9]Stuart (2022) measures recession severity as the decrease in log real earnings per capita between 1979 and 1982

Next, we investigate whether experiencing a large-scale recession also affects college major choice, conditional on college enrollment. College major selection is one of the most consequential decisions college students make, as it leads to significant earnings gaps even among those with the same level of education (Altonji et al., 2012).

Table 2 shows the regression results on indicator variables for each field of study—humanities, social sciences, STEM (science, technology, engineering, mathematics), and medicine. Here we combine age groups into two broader categories (ages 1–12 and 13–24), because we do not detect meaningful differences by age at exposure using our main specification (Figure A3). We find a decrease in humanities and social sciences majors (column 1) and a weak increase in STEMM majors (column 4; STEM plus medicine) among those more severely affected by the AFC.[10] The decrease in humanities and social sciences majors is mainly driven by the decrease in humanities major, in particular (column 2), whereas the slight increase in STEMM is due to conventional STEM majors and not medicine (columns 5 and 6).

[Table 2 here]

Because labor demand-driven shifts in college major quota cannot explain our result, the finding suggests that students more heavily affected by the recession gravitated towards relatively "practical" majors.[11] Observing or experiencing high unemployment during childhood may have heightened their awareness of, and preference for, fields with better employment prospects and job security. The result is consistent with Blom et al. (2021), which find that college students choose more lucrative majors during economic downturns. Our result is distinct in that we find such patterns even among individuals who were much younger than college-going age at the time of the recession. The fact that students in South Korea must choose their major upon entering college (not during their undergraduate years) pushes the relevant age forward, but we find similar magnitudes

in county of birth.

[10]Medical school is offered at the undergraduate level in South Korea, so we consider medicine to be a STEMM major on par with traditional STEM majors.

[11]The admissions quotas of four-year colleges in South Korea are highly regulated by the Ministry of Education (Han, 2022), and more importantly, nationwide changes in college admissions would be absorbed by cohort fixed effects in our model.

even among those who were below age 13 in 1997 (Figure A3). This suggests that recessions can have more lasting impacts on students' field of study and consequently, their career paths, than what is known in the existing literature.

4.2 Early Labor Market Outcomes

In this section, we study the impact of the recession on early labor market outcomes, such as employment and quality of first job. We focus on the first job after graduation, excluding part-time jobs during high school or college. All analyses are conducted using data from the YP.

[Figure 5 here]

Figure 5 presents the extensive margin effect on the probability of employment after entering the labor market. Exposure to a larger AFC shock does not affect whether an individual finds employment. However, Figure A4 provides suggestive evidence that individuals who were more severely affected by the AFC tend to start their first job earlier. In panel A, censored regression analysis shows that age at first job is reduced by about 0.5 years (median is age 23).[12] A slightly higher likelihood of finding a job by age 26 in panel B also indicates accelerated labor market entry.[13] This result is consistent with lower college attendance and completion due to the AFC shown in Section 4.1.

[Figure 6 here]

In Figure 6, we examine how the AFC affects the quality of the first job in terms of earnings, firm size, and occupation type, among the employed. Earnings and firm size are commonly used as indicators of job quality, and occupation type represents the skill level of the job (white collar or blue collar). Panel A shows that individuals exposed to the AFC under age 13 receive lower monthly earnings at their first job relative to those who were older in 1997, with a one percentage point increase in the regional unemployment rate leading to a 10.4% decline in earnings

[12] Age of initial employment is right censored for individuals who never had a job after graduation. It is left censored for individuals whose starting year of first employment is missing but the ending year is recorded.

[13] The results are robust to the use of alternative age cutoffs, such as employment by age 24 or 25.

on average.[14][15] The effect is statistically significant at the 10% level only for those aged 1–3 in 1997, however, and is statistically indistinguishable from zero for older cohorts (13–24 year-olds in 1997).[16]

Panel B shows the impact of the recession on the probability of being employed in a large firm. A large firm is defined as a firm with 300 or more employees, which is the criterion traditionally used by the Ministry of Employment and Labor to distinguish between SMEs and large firms.[17] We find that a one percentage point increase in the regional unemployment rate is associated with a decrease of about 6 percentage points in the likelihood of working in a firm with more than 300 employees (20% of the dependent variable mean) among those exposed to the AFC between age 4 and 24, relative to the reference group. The negative effect is even larger in magnitude (12 percentage points) for youngest cohorts, who were 1 to 3 years old in 1997. The results are qualitatively similar when we use alternative firm size cutoffs, such as more than 100, 500, or 1,000 employees (see Figure A5).

As another measure of initial job quality, we consider the likelihood of having a white collar first job in panel C.[18] The estimates show that a one percentage point higher regional unemployment shock decreases the likelihood of holding a white collar job by 9.8 percentage points (15% of the dependent variable mean) for younger cohorts (under age 13 in 1997), compared with those who were age 25 at the time of the shock. For those who were between 13 and 24 years old in

[14]Monthly earnings (before taking the logarithm) are in South Korean won (KRW) and inflation-adjusted to the 2020 value. 1 USD is worth approximately 1,300 KRW.

[15]In YP2007, "wage at the first job" refers to the starting wage at the time respondents began working. In YP2001 where starting wages were not collected retrospectively, wages may refer to wages at any point during their first job for individuals who already had a job before the survey began in 2001. In our analysis sample, which combines YP2001 and YP2007 data, 83% of individuals have wage information at the year of starting work and 88% have wage information within 3 years from starting work.

[16]The results are qualitatively similar when monthly earnings are analyzed in levels rather than logs.

[17]The Ministry of SMEs and Startups used the threshold of 300 employees to distinguish between SMEs and large firms until 2015. While the legal definition of SMEs is no longer based on the number of employees, a significant difference in job quality remains across the 300-employee threshold. For instance, the 2020 Survey on Labor Conditions by Employment Type reveals that employees in firms with less than 300 employees earn 61.8% of what employees in firms with more than 300 employees earn (Ministry of Employment and Labor, 2020).

[18]White-collar occupations include: 1) Business, administrative, financial, and insurance; 2) Research and engineering and technology; 3) Education, legal, social work, and public service; 4) Health and medicine; 5) Arts, design, broadcasting, and sports. Blue-collar occupations include: 1) Beauty, lodging, food, security, and cleaning; 2) Sales, transportation, and shipping; 3) Construction and mining; 4) Installation, maintenance, and industrial worker; 5) Agriculture and fisheries.

1997, the effect is reduced to about half. We also investigate the impact of the recession on weekly hours of work, the likelihood of being a wage worker, and the likelihood of being a public sector employee, but find no significant effects.[19]

To summarize, while we do not observe an employment response to the recession, we do observe a deterioration in the quality of the first job. We also find that these effects tend to be more pronounced for those who were younger at the time of the recession, although the pattern is less distinct for firm size. Our estimates are comparable in magnitude to estimates from prior studies. We show an average 7.8% reduction in earnings for a one standard deviation increase in regional AFC severity among those exposed to the AFC during ages 1–12. Stuart (2022), for example, finds a 5.2% decline in earned income for a one standard deviation increase in recession severity among individuals age 0–10 at the time of the recession relative to the age group of 20–29. Chetty and Hendren (2018) find that growing up in a neighborhood one standard deviation better leads to about a 6.4–10.4% increase in adult income.

Heterogeneity in the recession effect on early labor market outcomes by age at exposure may be explained by the interplay of three forces: the direct labor market penalties during periods of economic downturn, the indirect effect resulting from the reduction in college education, and individuals' behavioral responses to the adverse shock. The direct labor market effect is documented in the scarring effect literature; entering the job market during a recession harms labor market outcomes for college graduates (Kahn, 2010; Oreopoulos et al., 2012; Altonji et al., 2016; Choi et al., 2020; Rothstein, 2023) and high school graduates (Genda et al., 2010; Hershbein, 2012). The indirect effect, on the other hand, operates through the effect of the recession on educational attainment. Individuals who already surpassed college entrance or graduation age by 1997 would thus be primarily subject to the direct effect than the indirect effect. Conversely, for those who experienced the recession before reaching typical college-going age, the adverse effect on labor market outcomes is more likely to be operating through indirect effects on their human capital accumulation than immediate labor market penalties. Lastly, our finding from the previous sec-

[19]Results available upon request.

tion suggests that individuals' behavioral responses, such as selecting more remunerative college majors, could play a role in alleviating some of the recession effects.[20]

4.3 Internal Validity

With both cohort and region fixed effects included in our regressions, the primary remaining concern is related to non-parallel region-specific cohort trends that may be confounded with the severity of the AFC shock. We perform several tests to assess such a possibility, which could be due to endogenous selection into the region of birth (or region at age 14), confounding pre-trends, confounding contemporaneous local labor market shocks, or non-random attrition. Overall, the results of the internal validity checks suggest that our recession effect estimates are unlikely to be driven by selection or confounding factors.

Placebo test. Figures 2, 3, and 4 show that the impact of the recession on educational attainment is indistinguishable from zero for individuals exposed to the AFC at ages 25 to 28, using the cohort of 29-year-olds as the reference group. This finding provides strong support for our research design by confirming that there are no cohort trends in higher education associated with the severity of the recession for individuals who would have mostly completed their college education before the AFC. This exercise is analogous to demonstrating the absence of a treatment effect during a pre-intervention period in a standard event-study DID analysis, with the distinction that the time dimension is measured in cohorts instead of calendar time.

Endogenous selection across regions. In Figures A6, A7, and A8, we examine whether across-cohort differences in baseline ability and earnings potential differ by region of birth (or region at age 14) and whether such differences are confounded with recession severity across regions. First, we show that the estimated β_c's from the main regression model in equation (1) are not sensitive to

[20] We have also examined whether there is a migration response away from larger-AFC shock regions by using a mover indicator as the dependent variable in our DID analysis with the YP data. Individuals are considered movers if they have lived in a region other than their region at age 14. The estimated effects of the recession on migration rates are very noisy and null effects cannot be ruled out, although positive in sign for all cohorts. The results are available upon request.

the inclusion of individual background controls, $\mathbf{X}_i$. The stable recession effect estimates suggest that bias from non-random selection would be small, if any. This exercise is similar in spirit to Altonji et al. (2005) and Oster (2019), in the sense that we assume selection on unobservables to be proportional to selection on observables.

Second, we relax the parallel cohort trend assumption in our DID analysis by adding broader region-specific linear cohort trends, $\theta_{b(r)} \times c$, to equation (1). Broader region-specific linear cohort trends allow changes in characteristics across cohorts to differ by broader region groups.[21][22] For both education and labor market outcomes, this alternative specification yields very similar estimates of the recession effect as in the baseline regression. We also obtain similar results when we use a quadratic, instead of linear, function of age in 1997 to construct broader region-specific cohort trends.

Confounding pre-trends. Another possible scenario for non-parallel cohort trends is that regions with higher economic growth and faster expansion of college education may have experienced a slowdown, and these regions also happen to be the ones hit hard by the AFC. In such a situation, we may obtain spuriously negative estimates of recession effects. To capture differential pre-trends in higher education and economic conditions across regions, we add to the regression interactions between cohort fixed effects and changes in regional characteristics from 1990–1995 ($\Delta W_r^{90-95} \times \delta_c$), such as log real GDP, log population, and the share of college graduates.[23] We observe similar results across all education and labor market outcomes, except for an attenuation in the negative estimates for log earnings at first job (see Figures A6, A7, and A8).

Confounding contemporaneous local labor market shocks. The variation in the unemployment hike, ΔUR_r^{97-99}, can be generated by any local labor market shock, such as regional changes in the

[21] We use six region groups, each of which includes a few adjacent regions: 1) Gyeonggi, Seoul, and Incheon; 2) Gangwon; 3) North Chungcheong, South Chungcheong, and Daejeon; 4) North Jeolla, South Jeolla, and Gwangju; 5) North Gyeongsang, South Gyeongsang, Busan, Daegu, and Ulsan; and 6) Jeju.

[22] To avoid an over-controlling problem, we use broader region-specific cohort trends instead of region-specific cohort trends. Other related studies, such as Stuart (2022) and Duque and Schmitz (forthcoming), also control for cohort-specific trends at a broader geographic level than the primary treatment variable.

[23] Regional GDP and population are from the Korean Statistical Information Service (KOSIS). The proportion of college graduates by region are calculated using the 1990 and 1995 Census data.

size of the labor force, employment, and unemployment, or the composition of residents. If there were other local labor market shocks that were not triggered by the AFC but happened to coincide with the AFC, our DID estimates would not be able to isolate the effects of an AFC-induced decline in labor demand. This concern can be partly addressed by our earlier analysis, in which we control for broader region-specific cohort trends.

As another robustness check, we estimate equation (1) by two-stage least squares (2SLS) using a shift-share instrumental variable (SSIV).[24] Our shift-share instrument for ΔUR_r^{97-99} is constructed by interacting a region's pre-crisis industry employment shares and national-level employment changes during the AFC recession across industries:

$$Z_r = \sum_k S_{rk}^{93} \Delta \ln E_k^{97-99}. \tag{2}$$

In equation (2), S_{rk}^{93} is the share of region r's employment in industry k in 1993, measuring differential exposure of each region to common AFC shocks across industries. $\Delta \ln E_k^{97-99}$ is the log employment growth in industry k from 1997 to 1999, representing the national-level AFC shock across industries.[25] The shift-share instrument predicts the AFC-induced recession severity, $AFC_r = \Delta UR_r^{97-99}$, using predetermined industry structure and national-level shocks.

Tables A1 and A2 compare the baseline and SSIV estimation results using the Census and YP data, respectively. The 2SLS estimates tend to be noisier than the corresponding OLS estimates in both samples. In the Census sample, the 2SLS estimates are substantially smaller than their OLS counterparts although we find qualitatively similar cohort patterns—diminishing recession effects

[24] Many influential studies exploiting local labor market shocks have used an SSIV strategy (e.g., Bartik, 1991; Blanchard and Katz, 1992; Card, 2009; Autor et al., 2013). See Goldsmith-Pinkham et al. (2020) and Borusyak et al. (2022) for recent advances in causal inference in SSIV research designs.

[25] To construct the SSIV, we use employment counts in six industry sectors by region, which are available in KOSIS. The industry categories in the 1990s follow the sixth edition of the Korean Standard Industrial Classification (KSIC) published in 1991. According to the KSIC, the six industry sectors include 1) Agriculture, forestry, and fishing, 2) Manufacturing and mining, 3) Construction, 4) Wholesale and retail trade; Accommodation and food service, 5) Real estate; Business facilities management and business support services; Rental and leasing activities; Public administration and defence; Social security service; Education; Health and social work; Other personal services; Activities of households as employers; Activities of extraterritorial organizations and bodies; and 6) Electricity, gas, steam and air conditioning supply; Transportation and storage; Finance and insurance. Regional employment data are not available for finer industry categories within these major industries.

with age at exposure—for educational attainment. The 2SLS estimation produces comparable point estimates to the OLS in the YP sample for all education and labor market outcomes except for employment at the extensive margin, where we find larger 2SLS estimates than the precise zero OLS estimates.

Non-random attrition. In Figures A9 and A10, we investigate whether non-random attrition in the YP sample biases our results. Post-secondary education and labor market outcomes are not observed for those who exited the YP survey before completing their education or entering the labor market. If the attrition rate is systematically related with the magnitude of the AFC shock across regions within each cohort, the recession effect estimates would be biased in our DID analysis. The direction of the bias would depend on the sign of the correlation and the selection pattern of those dropping out from the YP. Given that most people in South Korea complete high school by age 19 and college by age 26, we restrict the analysis sample to those who were at least 19 or 26 years old in the most recent year of survey participation.[26] The estimated recession effects are effectively unchanged for college education (Figure A9) and early labor market outcomes (Figure A10).

5 Discussion of Possible Mechanisms

5.1 Negative Recession Effect

Section 4 shows that children who were exposed to a larger AFC shock have lower educational attainment and lower-quality first jobs. In this section, we conduct additional analyses to suggest potential mechanisms for our findings.

The first possible explanation for the deterioration of education and early labor market outcomes is credit constraints faced by households in regions more severely affected by the crisis. To investigate this hypothesis, we perform a heterogeneity analysis by parental education level as a

[26] Among 13,878 individuals in the YP sample, 2.5% and 19.2% left the survey before age 19 and 26, respectively. Note that the two youngest cohorts, born in 1995–1996, not yet reached age 26 in the last wave of YP2007 and are therefore not included in this restricted sample.

proxy for parental resources since our data lacks retrospective questions about household income. Table 3 reports the result for college education and labor market outcomes using the YP sample. We find limited evidence of differential recession effects by parental education level: F-statistics and associated p-values indicate that children with less-educated parents (both mother and father without college degrees) are not significantly more affected by the AFC than those with college-educated parents.

[Table 3 here]

To consider the effect on parental monetary investment more directly, we also look at private out-of-school education spending. South Korean households are known for their heavy investment in children's private out-of-school education (e.g., cram school, private tutoring) in order to increase their chance of entering elite colleges.[27] We use information from YP2007, which has (retrospective) questions about respondents' overall experience of private out-of-school education during middle and high school. Because we cannot obtain the same information from YP2001, the reference group for this exercise is age 19 (instead of 25) in 1997, which is an old enough age to have completed high school. Figure 7 panels A and B show the results regarding whether the individual received any private education during secondary school and the total expenditure amount, respectively.[28] We find that parents in regions with larger unemployment shocks did not cut back on their children's private education. In fact, the effects on private education spending are *positive*, which may suggest a behavioral response from parents to mitigate potentially adverse AFC effects on their children's human capital accumulation.

[Figure 7 here]

As additional evidence, Figure 7 panels C and D show results for the likelihood of attending in-state college and having part-time work during high school, respectively. We find no evidence

[27] 75% of students in elementary, middle, and high school received private out-of-school education in 2021 (Ministry of Education, 2021).

[28] Note that the amount is not inflation-adjusted because the survey asks about the overall experience during middle and high school, rather than on a yearly basis.

of a higher likelihood of enrolling in in-state college, which would be more affordable than out-of-state college, among those who were more severely affected by the AFC. We also investigate part-time work experience during high school as a proxy for household economic hardship and find no significant effects.[29] Overall, we do not find strong support for household credit constraints as the primary mechanism of our findings.

Second, even if there are no significant differences in parental monetary investment by recession severity, children's human capital development may be affected by non-monetary factors such as family distress. Stressors such as family members' (fear of) unemployment, health deterioration, or marital instability may be greater in regions more heavily impacted by the crisis. To explore this possibility, we investigate whether children from more affected regions were more likely to have experienced adverse life events such as the death of a family member or parental divorce. Because the YP2001 survey does not have the question on (retrospective) life events, we study 1978–1993 birth cohorts from our YP2007 sample who were asked this question in wave 2.[30] The dependent variable is a dummy variable that equals 1 if the individual experienced such an event between his/her age in 1997 and age 15. We restrict the time frame in this way so as not to include events that occurred prior to the AFC and because the youngest cohort, who were born in 1993, was age 15 at the time of wave 2.[31]

[Table 4 here]

Table 4 reports the results on life events following equation (1). We find no recession effect on parental death (column 1), but we do find that individuals from larger-shock regions are more likely to have experienced the death of a family member other than parents (column 2). The magnitude of this effect is not trivial, considering that such events are rare: only 2.6% of the sample experienced the death of a family member, but a one percentage point increase in the regional unemployment

[29] We focus on the high school period because part-time work during college may be driven by a desire to gain work or life experience rather than for financial reasons.

[30] Retrospective life events were asked only in wave 2 of YP2007, so this information is not available for the 1994–1996 birth cohorts added to YP2007 in wave 9.

[31] For the 1978–1981 birth cohorts, who experienced the AFC between ages 16–19, the recession effect on life events between 1997 and age 15 is expected to be zero by design. Indeed, we obtain precise zero estimates for those aged 16–18 in 1997 in regressions using 19-year-olds as the reference group (see Table 4).

rate raises the likelihood of experiencing this event by 3.4 percentage points for the youngest cohort (age group 4–6 in 1997). While our data does not allow us to identify the specific cause of death, our result is consistent with prior studies which show that recessions or job displacement can increase mortality and morbidity. (Sullivan and von Wachter, 2009; Coile et al., 2014; Schwandt and von Wachter, 2023).

We also find evidence of a slight increase in the likelihood of experiencing parental divorce, although it is statistically significant only for those who were ages 13–15 in 1997 (column 3). When we additionally consider the cause of divorce using data from the Civil Registration and Vital Statistics, we find a positive correlation between the 1997–1999 change in the regional unemployment rate and the 1997–2003 change in the rate of divorce due to financial reasons (Figure 8 panel A).[32]

[Figure 8 here]

Third, the effect of the recession could operate at the broader community level. Previous studies such as Chetty et al. (2016) show adverse effects of living in high-poverty neighborhoods on children's long-term outcomes. If the quality of neighborhoods or schools declined in regions more severely hit by the AFC, the outcomes of children from those regions could be worse even if their parents were not directly affected by the recession. As a proxy for school quality, we calculate regional education spending per capita using information from the Statistical Yearbook of Education published by the Korean Educational Statistics Service.[33] Figure 8 panel B indicates a weak negative correlation between the size of the AFC shock and the growth in regional education spending per capita between 1997 and 2003.[34]

[32]Because divorce takes a few years to be settled, there would be a lag in the realization of outcomes. There is a national trend of accelerating divorce rate in the early 2000s after the AFC until reaching a peak in 2003 (Statistics Korea, 2009, Jones, 2015).

[33]We divide annual regional education expenditure by the number of students in the region. The regional education expenditure includes expenditure spent on kindergarten, primary and secondary school education spending. Accordingly, when calculating the number of students in the region, we sum the total number of students at these grade levels. Expenditure is in 1,000 of 2020 KRW.

[34]To capture any delayed effects of the recession on education spending and quality, we use the change in education spending between 1997 and 2003 as in the divorce analysis.

Although suggestive, we thus conjecture that non-monetary and broader neighborhood factors were primary channels in driving adverse recession effects rather than household credit constraints. Our result is consistent with studies such as Cameron and Taber (2004) who find that borrowing access is relatively unimportant in schooling decisions and Bulman et al. (2021) who find that college attendance among U.S. children responds only to very large increases in household income.[35] The result is also consistent with Carneiro et al. (2022) which point to family stress, rather than income loss, as the underlying mechanism for the impact of parental job loss on children's education outcomes using Norwegian data.

5.2 Age-differential Recession Effect

Why the recession effects are more pronounced for younger (under age 13) cohorts is yet another question. Although it is outside the scope of this paper to empirically disentangle the exact mechanisms underlying this finding, we discuss three potential reasons based on evidence from the literature.

First, it should be noted that individuals who are not old enough to work would not be subject to labor market substitution effects during the recession. Several studies indicate that the demand for college education is counter-cyclical because of opportunity cost considerations, i.e., when jobs are scarce, attending college becomes a less costly option (e.g., Betts and McFarland, 1995; Rice, 1999; Card and Lemieux, 2001; Sievertsen, 2016; Charles et al., 2018). Thus, for individuals old enough to work, the negative recession effect on their human capital development may be partly offset by the positive substitution effect toward college-going. As a result, the total AFC effect on educational outcomes could be less negative for older cohorts. Since college graduates find better-quality first jobs than those without college degrees, this would also lead to age-differential AFC effects on labor market outcomes.

Second, children who are younger may be more affected by the recession because those ages

[35] On the other hand, studies such as Aizer et al. (2016), Hoynes et al. (2016), and Charles et al. (2018) find significant effects of family income or local economic conditions on children's outcomes.

are "critical" periods in human capital development. According to research on the life-cycle approach to skill formation, different capacities are malleable at different stages of life, and hence children's development depends not only on total investment but also on its timing (Cunha et al., 2006; Heckman, 2007; Heckman and Mosso, 2014). This implies that the impact of shocks such as a recession would also depend on what stage the child was at that time.[36] Although we cannot identify the exact type of human capital affected (e.g., cognitive ability, non-cognitive ability, health), it is possible that the AFC disrupted the development of certain aspects more so for younger children.

Lastly, younger children may be more affected by the recession because of longer exposure to persistent effects following the event. Although South Korea's economy recovered rather quickly after the AFC (Figure A1), some consequences would linger for individuals. For instance, if the AFC increased the likelihood of parents' divorce due to financial reasons or dampened the quality of neighborhoods, younger children would be exposed to those circumstances for a longer period of time than adolescents. That is, even if there is no "critical" period in skill formation, long-lasting effects from the AFC could result in larger "dose" of the treatment among younger children. This channel is consistent with Chetty et al. (2016), who find a roughly linear pattern of exposure effects on children's long-term outcomes after moving to a better neighborhood.

6 Conclusion

This study examines the impact of a large-scale recession on higher education and early labor market outcomes, exploiting variation in age at exposure and regional unemployment spikes from the 1997–1998 Asian financial crisis (AFC) in South Korea. Using data on 1968–1996 birth cohorts from the Census and Youth Panel, our difference-in-differences analysis shows that exposure to the recession has significant effects on individuals' college education and early labor market outcomes.

[36]Using Norwegian data, Carneiro et al. (2021, 2022) find stronger detrimental effects of parental job separation on education outcomes of ages 0–5 and especially ages 11–16, compared to those of ages 6–10. The discrepancy in the age groups where we observe larger effects could stem from differences in institutional settings between Norway and South Korea and/or the fact that their papers focus on the impact of parental job loss rather than local economic conditions (regardless of parents being displaced).

Individuals from regions more severely affected by the crisis are less likely to attend and complete a four-year college than their peers in the same cohort. Conditional on college enrollment, exposure to the AFC leads to a significant decrease in humanities majors and an increase in STEM majors. While there is no effect on employment probability, we observe a deterioration in the quality of the first job, measured by wage, firm size, and white-collar status, among individuals who grew up in regions more hard-hit by the Asian financial crisis.

Importantly, the negative effects are substantial and more pronounced for those who experienced the economic downturn at a younger age (under age 13). A one standard deviation increase in the regional unemployment rate during the recession results in a 6.1–8.4% decrease in the college graduation rate, a 7.8% decrease in earnings at first job, and an 11.5% decrease in the probability of having a white-collar job. The magnitude of the effect is reduced by about half for those who were teenagers or young adults at the time of the recession. Further analysis shows that non-monetary and broader neighborhood factors, such as family instability or school quality, rather than household credit constraints, are likely to be primary channels driving these adverse recession effects. Heterogeneous effects by age at exposure, on the other hand, may be explained by differences in the size of contemporaneous labor market substitution effect, the presence of "crticial" periods in human capital development, and/or differences in the duration of exposure to the aftereffects of AFC.

Our findings provide two policy implications. First, children may bear larger long-term costs of recessions than young adults who are directly affected by a weak labor market. Thus, efforts to promote human capital investment among younger cohorts may be just as important as immediate stimulus measures or active labor market policies to reduce the costs of business cycles. Second, a substantial deterioration in human capital accumulation can occur following a large-scale recession even without significant reductions in educational spending within the household. This suggests that direct cash transfers to households alone may not be sufficient to mitigate the negative recession effects on children's human capital accumulation, without considering changes in non-monetary factors at the household level or in resources at the local level.

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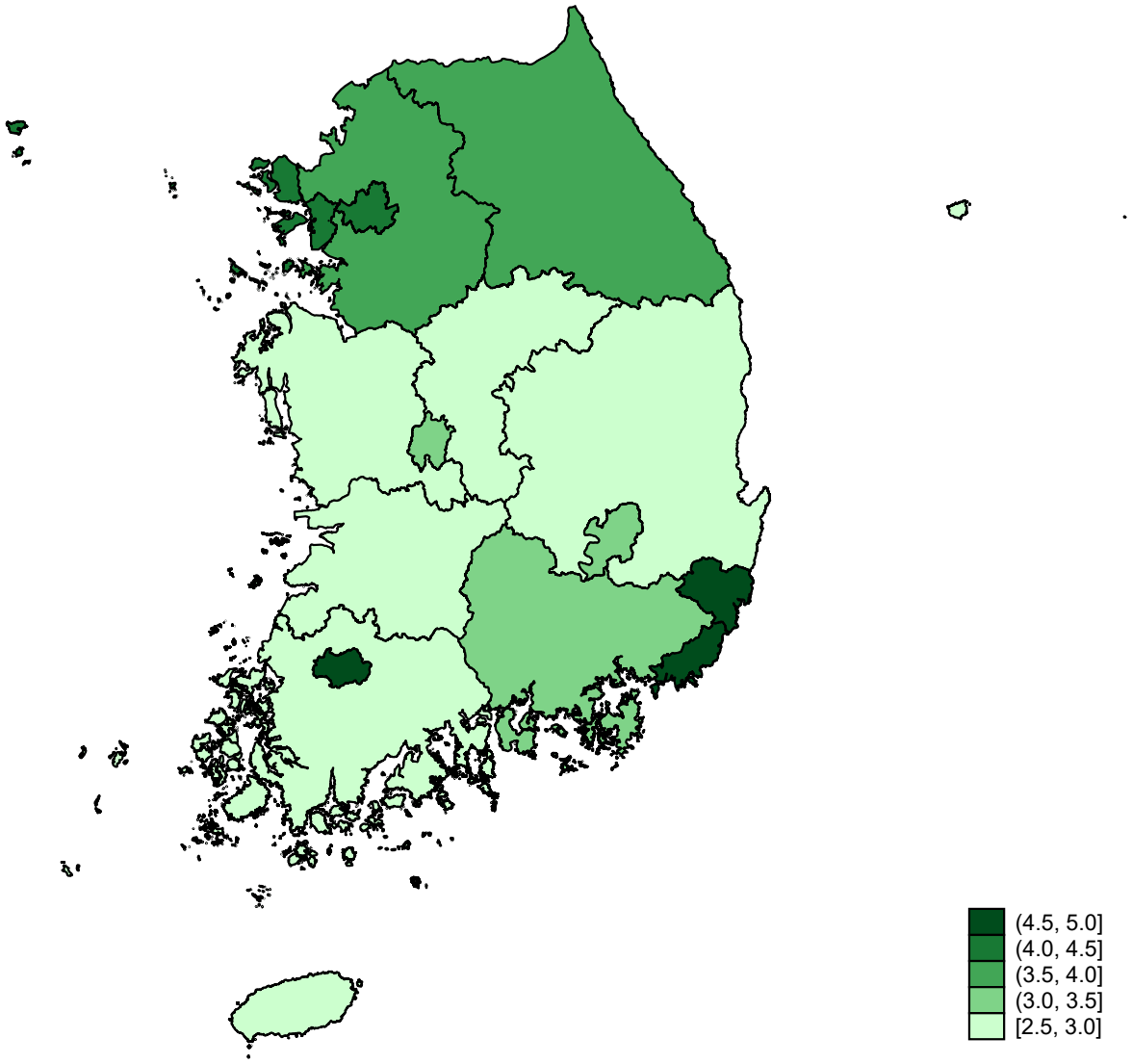


Figure 1: Regional Variation in Recession Severity (ΔUR_r^{97-99}) Induced by the Asian Financial Crisis

Notes. The severity of the recession in each region is measured by the difference in the annual unemployment rate between 1997 and 1999, ΔUR_r^{97-99}.

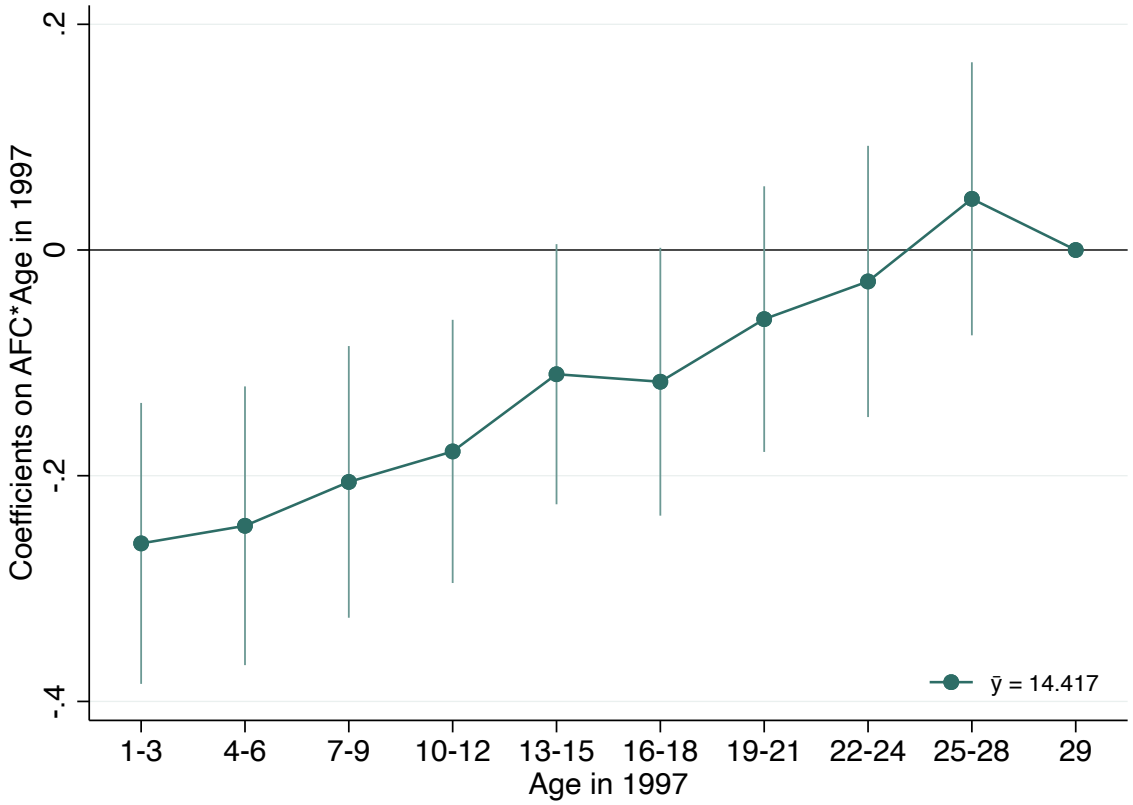


Figure 2: Effects on Years of Education (Census)

Notes. Vertical spikes around each point estimate represent the 95% confidence interval, clustered at the level of cohort by birth region. Regressions include the male dummy variable and fixed effects for age in 1997 and birth region. Observations are weighted using individual sample weights provided in the Census data.

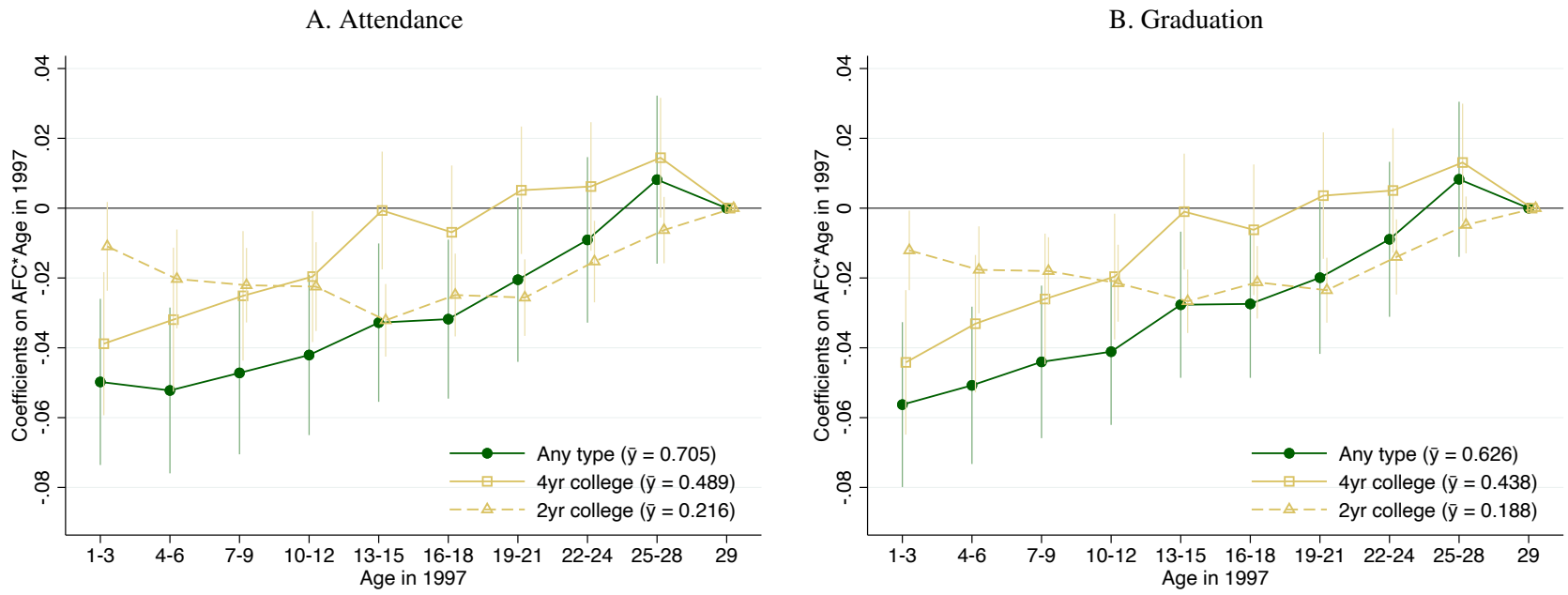


Figure 3: Effects on College Education (Census)

Notes. Vertical spikes around each point estimate represent the 95% confidence interval, clustered at the level of cohort by birth region. Regressions include the male dummy variable and fixed effects for age in 1997 and birth region. Observations are weighted using individual sample weights provided in the Census data.

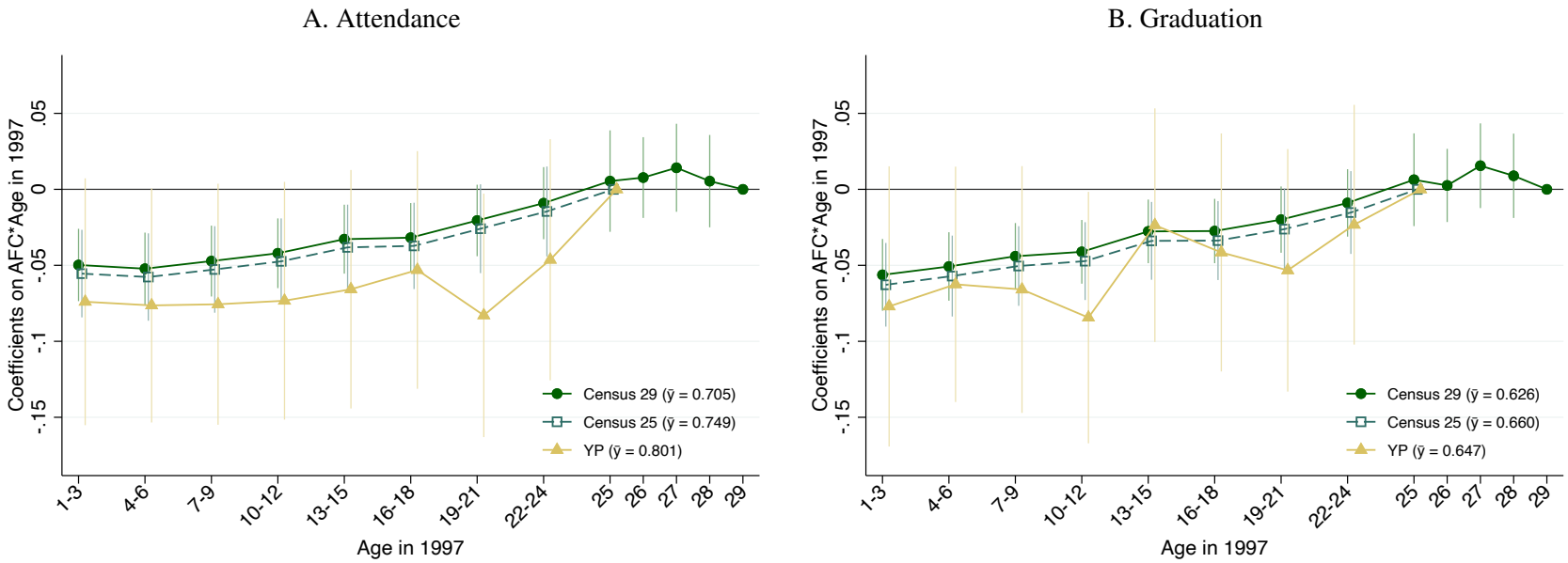


Figure 4: Effects on College Education (Census and YP)

Notes. Vertical spikes around each point estimate represent the 95% confidence interval, clustered at the level of cohort by birth region. Observations are weighted using individual sample weights provided in the Census or YP data. Regressions using the Census data include the male dummy variable and fixed effects for age in 1997 and birth region. Regressions using the YP data include dummies for male and father's and mother's education as well as fixed effects for age in 1997 and region at age 14. Missing values in background covariates are imputed using mean values, and dummies for missing observations are also controlled for.

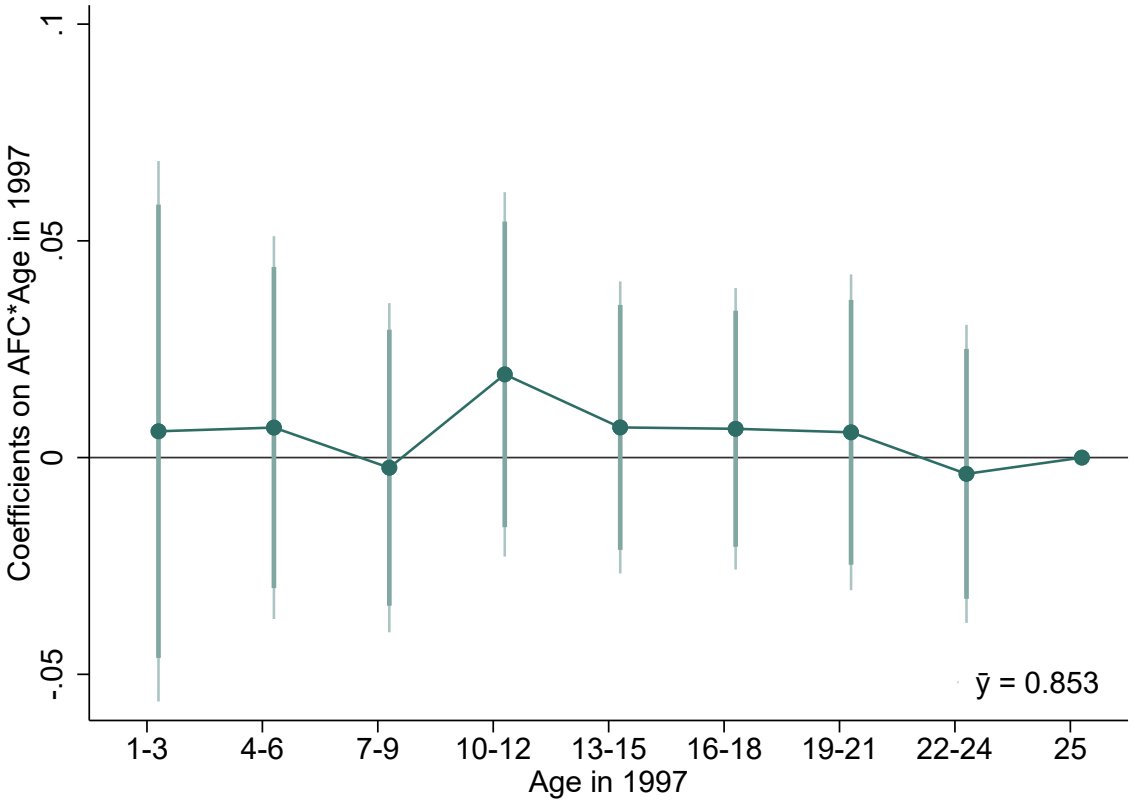


Figure 5: Effects on Ever Employed (YP)

Notes. Vertical spikes around each point estimate represent the 90% (marked darker and thicker) and 95% confidence intervals, clustered at the level of cohort by region at age 14. Regressions include fixed effects for age in 1997 and region at age 14. Controls for background characteristics include dummies for male and father's and mother's education. Missing values in background covariates are imputed using mean values, and dummies for missing observations are also controlled for. Observations are weighted using individual sample weights provided in the YP data.

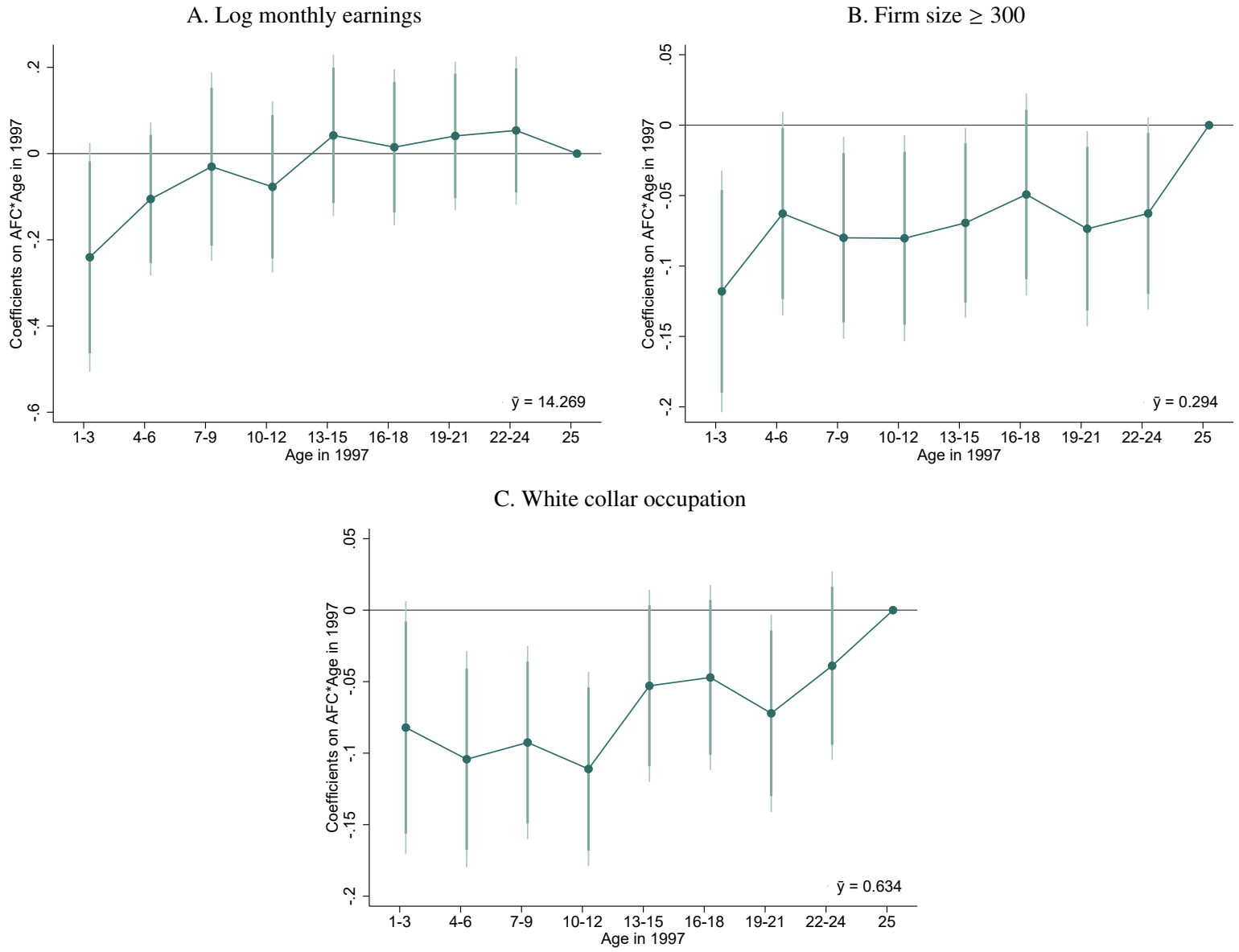


Figure 6: Effects on Quality of First Job (YP)

Notes. Vertical spikes around each point estimate represent the 90% (marked darker and thicker) and 95% confidence intervals, clustered at the level of cohort by region at age 14. Regressions include fixed effects for age in 1997 and region at age 14. Controls for background characteristics include dummies for male and father's and mother's education. Missing values in background covariates are imputed using mean values, and dummies for missing observations are also controlled for. Observations are weighted using individual sample weights provided in the YP data.

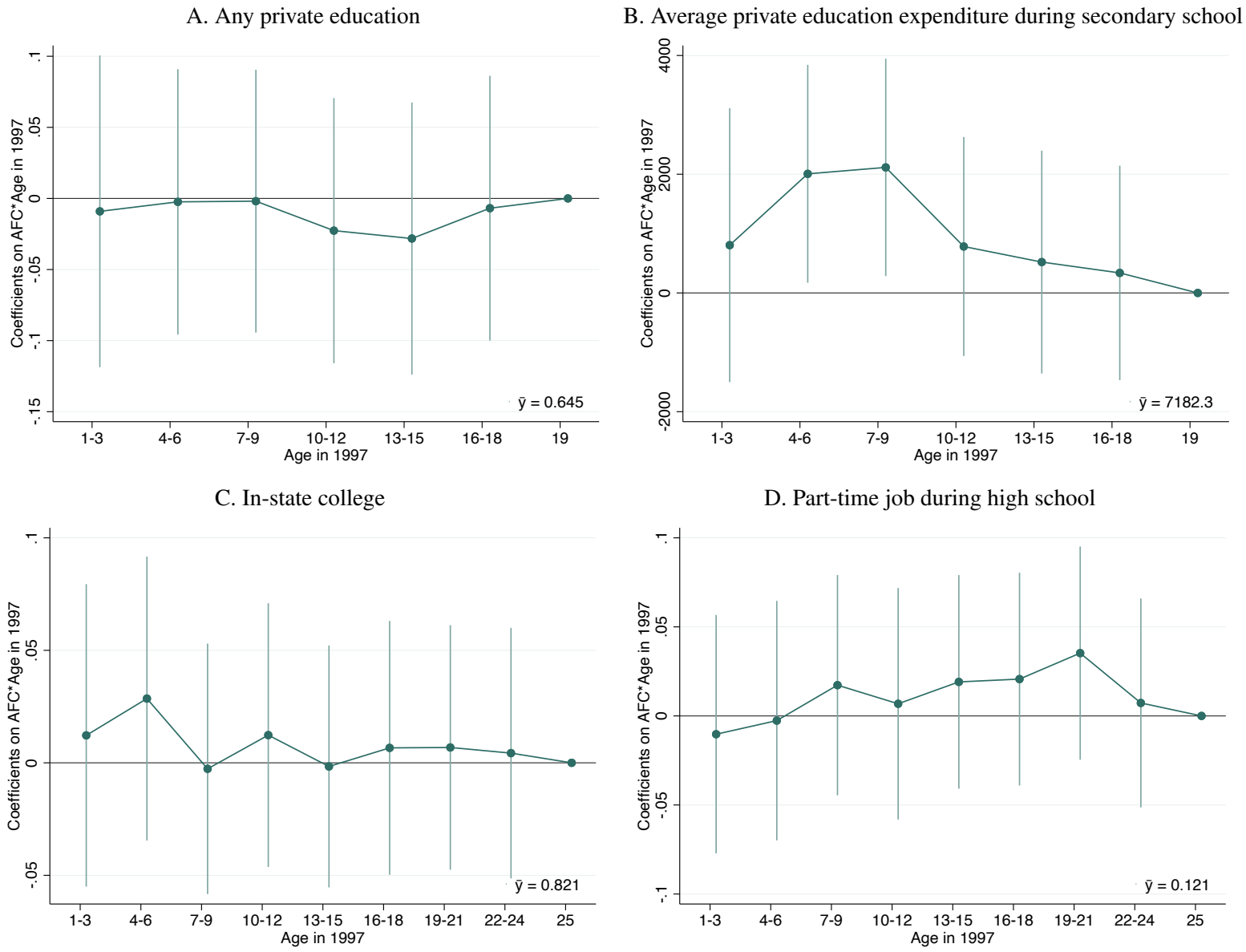
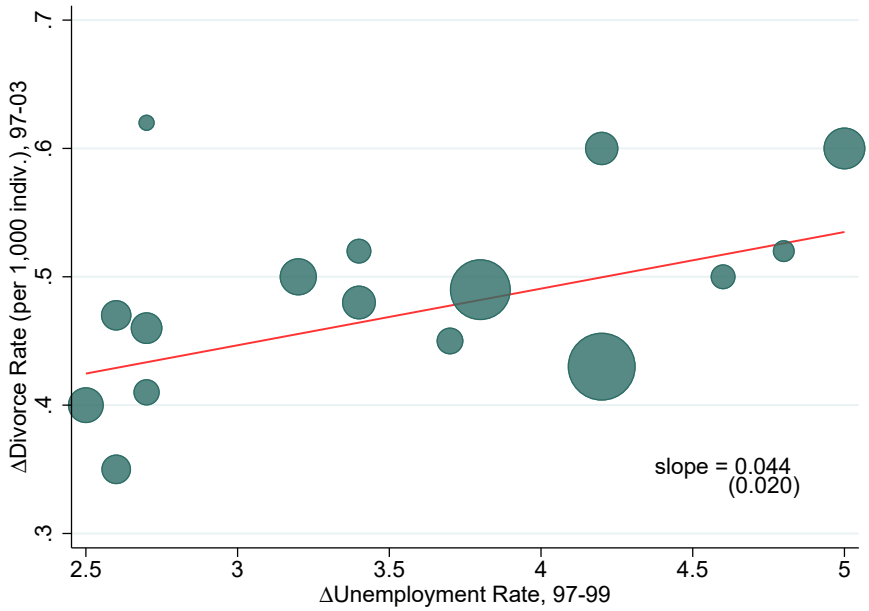


Figure 7: Effects on Monetary Inputs (YP)

Notes. The dependent variable in each panel are as follows: A) whether an individual received any private out-of-school education during middle and high school; B) the amount of spending (in 1,000 KRW) on private out-of-school education during middle and high school; C) whether an individual attended in-state college; D) whether an individual had a part-time job during high school. Vertical spikes around each point estimate represent the 95% confidence interval, clustered at the level of cohort by region at age 14. Regressions include fixed effects for age in 1997 and region at age 14. Controls for background characteristics include dummies for male and father's and mother's education. Missing values in background covariates are imputed using mean values, and dummies for missing observations are also controlled for. Observations are weighted using individual sample weights provided in the YP data.

A. Divorce due to financial reasons



B. Education expenditure per capita

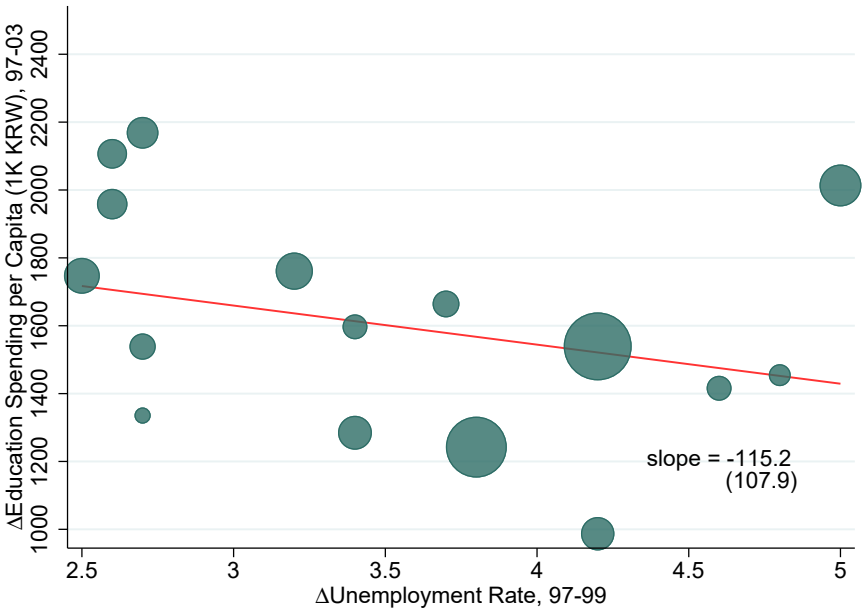


Figure 8: Change in Divorce Rate and Education Spending by Region

Notes. Panel A shows the correlation between the change in the regional unemployment rate (1997–1999) and the change in the regional divorce rate due to financial reasons (1997–2003). Divorce data come from the Civil Registration and Vital Statistics. Panel B shows the correlation between the change in the regional unemployment rate (1997–1999) and the change in the regional education spending per capita (1997–2003). Data on education spending comes from the Statistical Yearbook of Education published by the Korean Educational Statistics Service. Per capita expenditure is computed by dividing the total expenditure on kindergarten, primary and secondary schools by the number of students in those grades. Expenditure is inflation-adjusted using 2020 as the base year. Regressions are population weighted.

Table 1: Summary Statistics

	Census			YP		
	Mean (1)	**SD** (2)	**N** (3)	**Mean** (4)	**SD** (5)	**N** (6)
A. Treatment variable						
AFC (= ΔUR^{97-99})	3.600	[0.790]	369,816	3.709	[0.746]	13,878
Age in 1997	15.928	[8.466]	369,816	12.857	[6.906]	13,878
B. Background characteristics						
Male	0.511	[0.500]	369,816	0.511	[0.500]	13,878
Father's education						
Less than high school				0.255	[0.436]	13,787
Some high school or high school graduate				0.464	[0.499]	13,787
Some college or more				0.281	[0.450]	13,787
Father's education missing				0.007	[0.085]	13,878
Mother's education						
Less than high school				0.344	[0.475]	13,809
Some high school or high school graduate				0.512	[0.500]	13,809
Some college or more				0.145	[0.352]	13,809
Mother's education missing				0.005	[0.073]	13,878
C. Educational outcomes						
Educational attainment						
Years of education	14.417	[2.100]	369,816			
High school graduate w/o college education	0.275	[0.447]	369,816	0.192	[0.394]	13,877
Ever attended college	0.705	[0.456]	369,816	0.801	[0.399]	13,878
Ever attended 4-year college	0.489	[0.500]	369,816	0.527	[0.499]	13,874
Ever attended 2-year college	0.216	[0.411]	369,816	0.271	[0.445]	13,874
Graduated college	0.626	[0.484]	369,816	0.647	[0.478]	13,877
Graduated 4-year college	0.438	[0.496]	369,816	0.418	[0.493]	13,873
Graduated 2-year college	0.188	[0.391]	369,816	0.230	[0.421]	13,873
College major (among college attendees)						
Humanities & social sciences				0.350	[0.477]	10,976
STEMM				0.478	[0.500]	10,976
D. Labor market outcomes						
Ever employed				0.853	[0.355]	13,878
Quality of first job (among employed)						
Monthly earnings (in 1,000 of 2020 KRW)				1,873.2	[918.3]	11,141
Log monthly earnings				14.269	[1.191]	11,141
Firm size $\geq$ 300				0.294	[0.456]	11,702
White collar occupation				0.634	[0.482]	11,706

Notes. The number of observations varies due to missing values. The analysis samples include 369,816 individuals from the Census and 13,878 individuals from the YP. 1 USD is worth approximately 1,300 KRW. The means and standard deviations are calculated using individual sample weights provided in the Census or YP data.

Table 2: Effects on College Major Choice (YP)

	Humanities & Social sciences			**STEMM**		
	All	**Humanities**	**Social sci.**	**All**	**STEM**	**Medicine**
	(1)	(2)	(3)	(4)	(5)	(6)
$AFC \times 1$[Age in 1997 = 1–12]	−0.101*	−0.077**	−0.025	0.061	0.062	−0.001
	(0.056)	(0.039)	(0.038)	(0.052)	(0.048)	(0.019)
$AFC \times 1$[Age in 1997 = 13–24]	−0.085	−0.075*	−0.010	0.051	0.050	0.002
	(0.055)	(0.038)	(0.037)	(0.051)	(0.047)	(0.017)
Adjusted R^2	0.022	0.032	0.010	0.065	0.106	0.045
N	10,976	10,976	10,976	10,976	10,976	10,976
Dependent variable mean	0.350	0.116	0.234	0.478	0.409	0.069

Notes. Besides fixed effects for age in 1997 and region at age 14, control variables include dummies for male and father's and mother's education. Missing values in background covariates are imputed using mean values, and dummies for missing observations are also controlled for. Observations are weighted using individual sample weights provided in the YP data. Robust standard errors in parentheses are clustered at the level of cohort by region at age 14. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Heterogeneous Effects by Parental Education (YP)

	College education		College major		Ever	Quality of first job		
	Attendance (1)	**Graduation** (2)	**HSS** (3)	**STEMM** (4)	**employed** (5)	**Log earnings** (6)	**Firm size ≥ 300** (7)	**White collar** (8)
$AFC \times 1[\text{Age in 1997} = 1\text{–}12] \times 1[\text{Both parents w/o college edu} = 1]$	−0.076*	−0.079*	−0.114***	0.014	−0.001	−0.089	−0.070*	−0.055*
	(0.041)	(0.044)	(0.039)	(0.033)	(0.017)	(0.090)	(0.038)	(0.030)
$AFC \times 1[\text{Age in 1997} = 1\text{–}12] \times 1[\text{Both parents w/o college edu} = 0]$	−0.080*	−0.089**	−0.112***	0.014	−0.001	−0.096	−0.081**	−0.080***
	(0.041)	(0.043)	(0.038)	(0.031)	(0.017)	(0.084)	(0.037)	(0.029)
$AFC \times 1[\text{Age in 1997} = 13\text{–}24] \times 1[\text{Both parents w/o college edu} = 1]$	−0.067	−0.047	−0.099***	0.017	−0.005	0.050	−0.053	−0.016
	(0.041)	(0.043)	(0.038)	(0.031)	(0.015)	(0.080)	(0.037)	(0.029)
$AFC \times 1[\text{Age in 1997} = 13\text{–}24] \times 1[\text{Both parents w/o college edu} = 0]$	−0.062	−0.041	−0.098***	0.016	0.001	0.044	−0.054	−0.037
	(0.041)	(0.042)	(0.037)	(0.030)	(0.014)	(0.077)	(0.036)	(0.028)
$AFC \times 1[\text{Age in 1997} = 25] \times 1[\text{Both parents w/o college edu} = 1]$	−0.004	−0.014	−0.033	0.022	−0.012	0.018	0.018	0.050***
	(0.015)	(0.019)	(0.021)	(0.019)	(0.010)	(0.043)	(0.020)	(0.019)
Age in 1997 = 1–12: F-statistic for testing AFC effects identical across parental education groups	0.323	1.267	0.034	0.000	0.009	0.064	1.311	7.888
	[0.570]	[0.261]	[0.853]	[0.985]	[0.924]	[0.801]	[0.253]	[0.005]
Age in 1997 = 13–24: F-statistic for testing AFC effects identical across parental education groups	0.649	0.486	0.010	0.008	0.790	0.057	0.004	5.092
	[0.421]	[0.486]	[0.920]	[0.929]	[0.375]	[0.811]	[0.947]	[0.025]
Adjusted R^2	0.098	0.075	0.029	0.052	0.148	0.020	0.020	0.097
N	13,878	13,877	13,486	13,486	13,878	11,141	11,702	11,706
Dependent variable mean	0.801	0.647	0.279	0.380	0.853	14.269	0.294	0.634

Notes. The reference group is individuals who were aged 25 in 1997 and have at least one parent with college education. Besides fixed effects for age in 1997 and region at age 14, control variables include dummies for male and father's and mother's education. Missing values in background covariates are imputed using mean values, and dummies for missing observations are also controlled for. Observations are weighted using individual sample weights provided in the YP data. Robust standard errors in parentheses are clustered at the level of cohort by region at age 14. p-values in brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Effects on Life Events (YP)

	Death of parent (1)	**Death of family member** (2)	**Parental divorce** (3)
$AFC \times 1[\text{Age in 1997} = 4\text{–}6]$	−0.006	0.034***	0.007
	(0.007)	(0.010)	(0.006)
$AFC \times 1[\text{Age in 1997} = 7\text{–}9]$	−0.002	0.021***	−0.002
	(0.004)	(0.007)	(0.003)
$AFC \times 1[\text{Age in 1997} = 10\text{–}12]$	−0.005	0.015***	0.003
	(0.004)	(0.006)	(0.003)
$AFC \times 1[\text{Age in 1997} = 13\text{–}15]$	−0.003	0.007	0.004**
	(0.004)	(0.005)	(0.002)
$AFC \times 1[\text{Age in 1997} = 16\text{–}18]$	0.000	0.002	−0.001
	(0.003)	(0.004)	(0.002)
Adjusted R^2	0.011	0.061	0.012
N	10,178	10,178	10,178
Dependent variable mean	0.007	0.026	0.010

Notes. The dependent variable is whether an individual experienced a life event between his/her age in 1997 and age 15. Death of family member excludes parental death. The reference group is individuals who were aged 19 in 1997. Besides fixed effects for age in 1997 and region at age 14, control variables include dummies for male and father's and mother's education. Missing values in background covariates are imputed using mean values, and dummies for missing observations are also controlled for. Observations are weighted using individual sample weights provided in the YP data. Robust standard errors in parentheses are clustered at the level of cohort by region at age 14. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix Figures and Tables

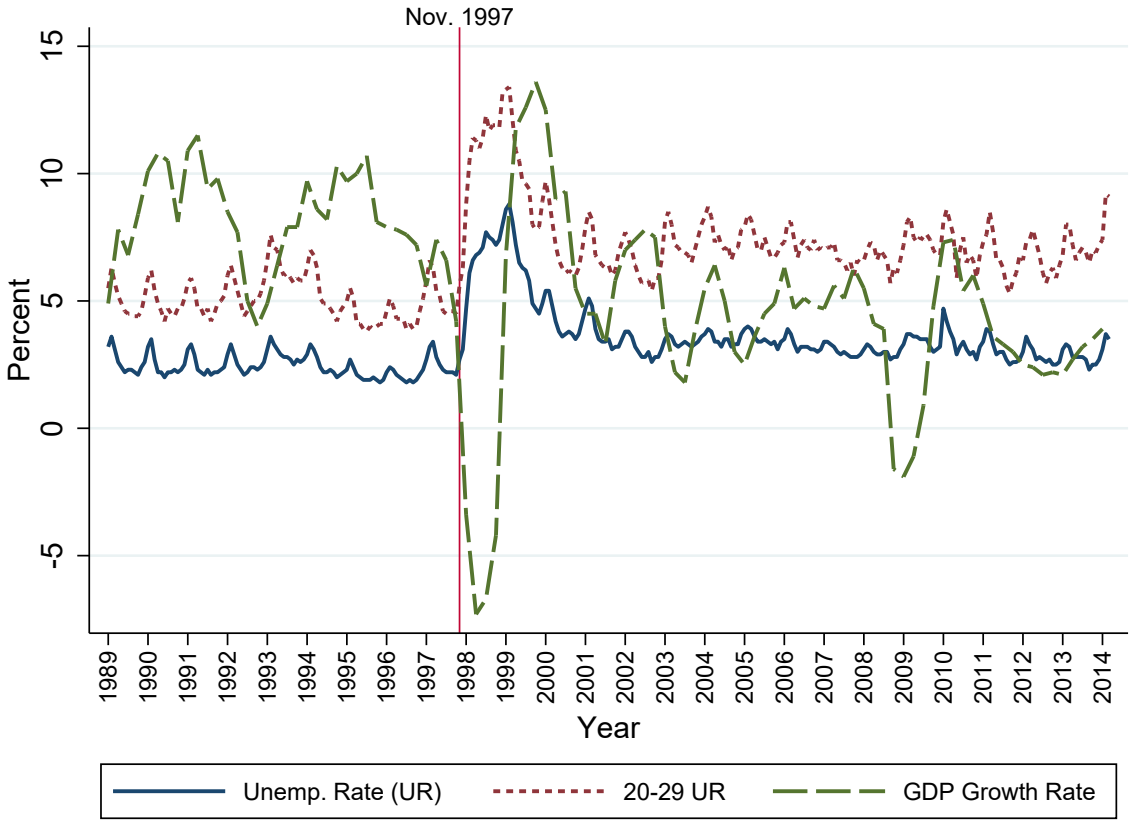


Figure A1: Macroeconomic Statistics

Notes. Taken from Choi et al. (2020) Figure 1. Monthly unemployment rates are from Statistics Korea. Quarterly real GDP growth rates are from the Bank of Korea, and measure the growth rate compared to the same quarter of the previous year.

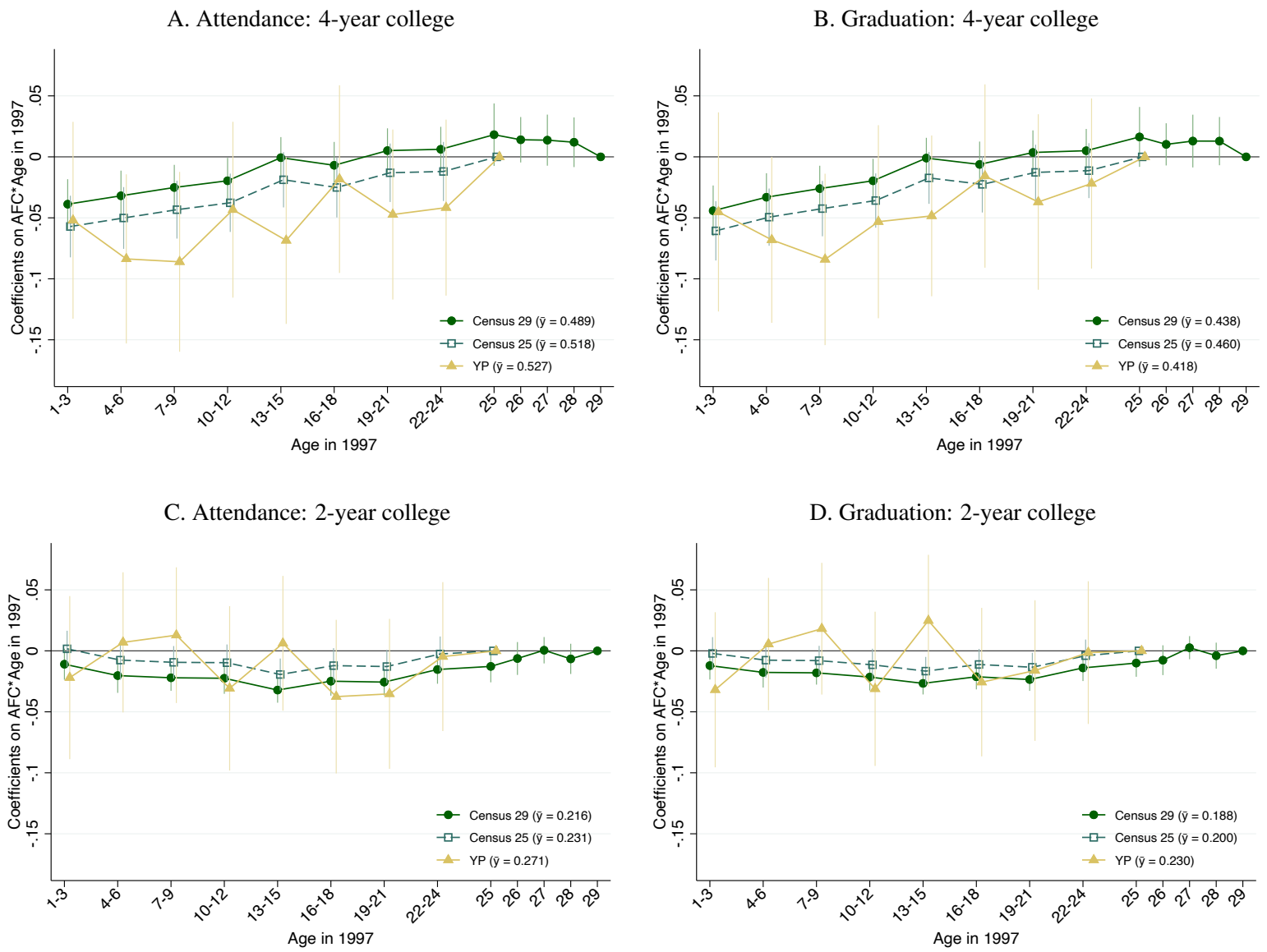


Figure A2: Effects on College Education, by College Type (Census and YP)

Notes. Vertical spikes around each point estimate represent the 95% confidence interval, clustered at the level of cohort by birth region. Observations are weighted using individual sample weights provided in the Census or YP data. Regressions using the Census data include the male dummy variable and fixed effects for age in 1997 and birth region. Regressions using the YP data include dummies for male and father's and mother's education as well as fixed effects for age in 1997 and region at age 14. Missing values in background covariates are imputed using mean values, and dummies for missing observations are also controlled for.

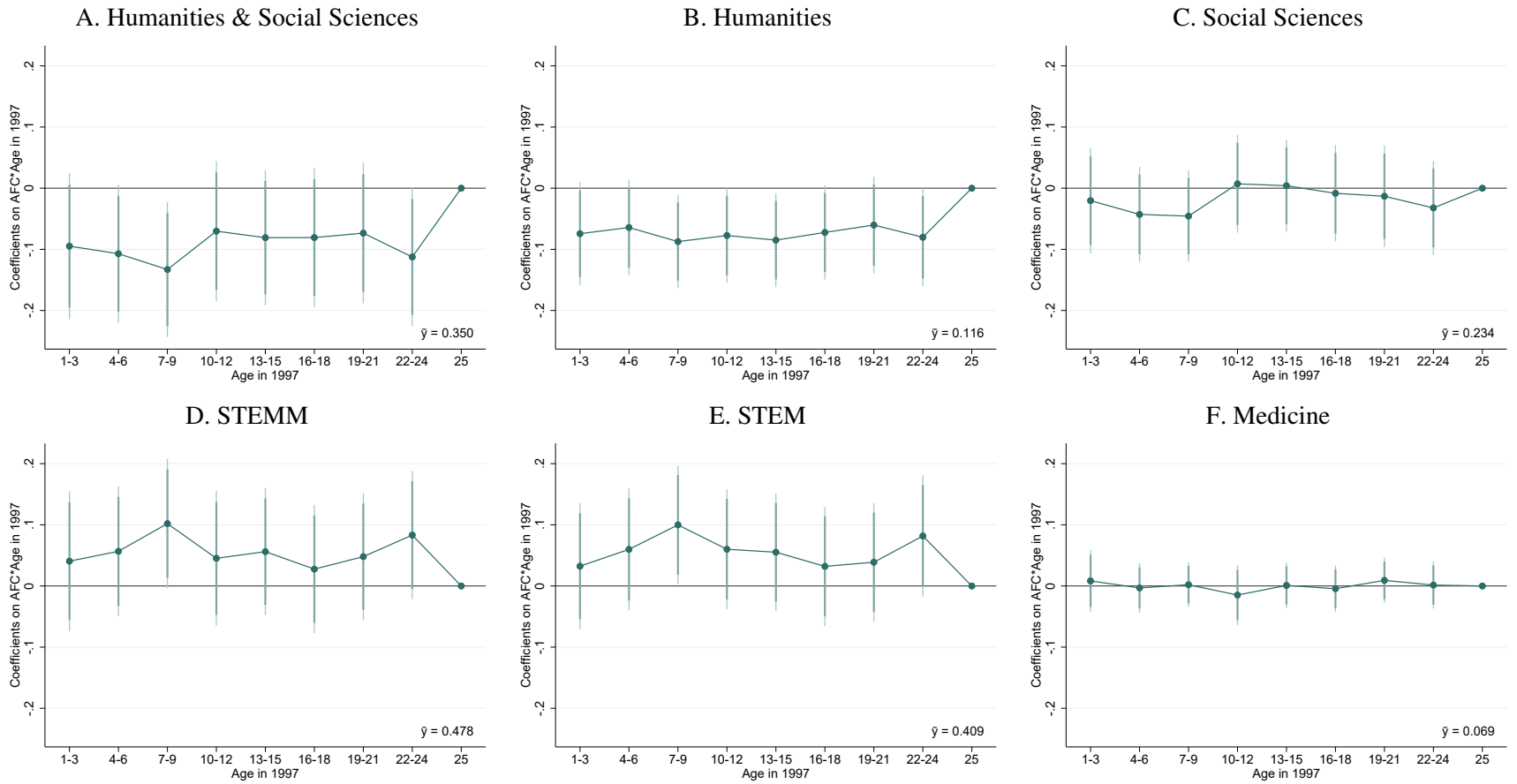


Figure A3: Effects on College Major Choice (YP)

Notes. Vertical spikes around each point estimate represent the 90% (marked darker and thicker) and 95% confidence intervals, clustered at the level of cohort by region at age 14. Regressions include fixed effects for age in 1997 and region at age 14. Controls for background characteristics include dummies for male and father's and mother's education. Missing values in background covariates are imputed using mean values, and dummies for missing observations are also controlled for. Observations are weighted using individual sample weights provided in the YP data.

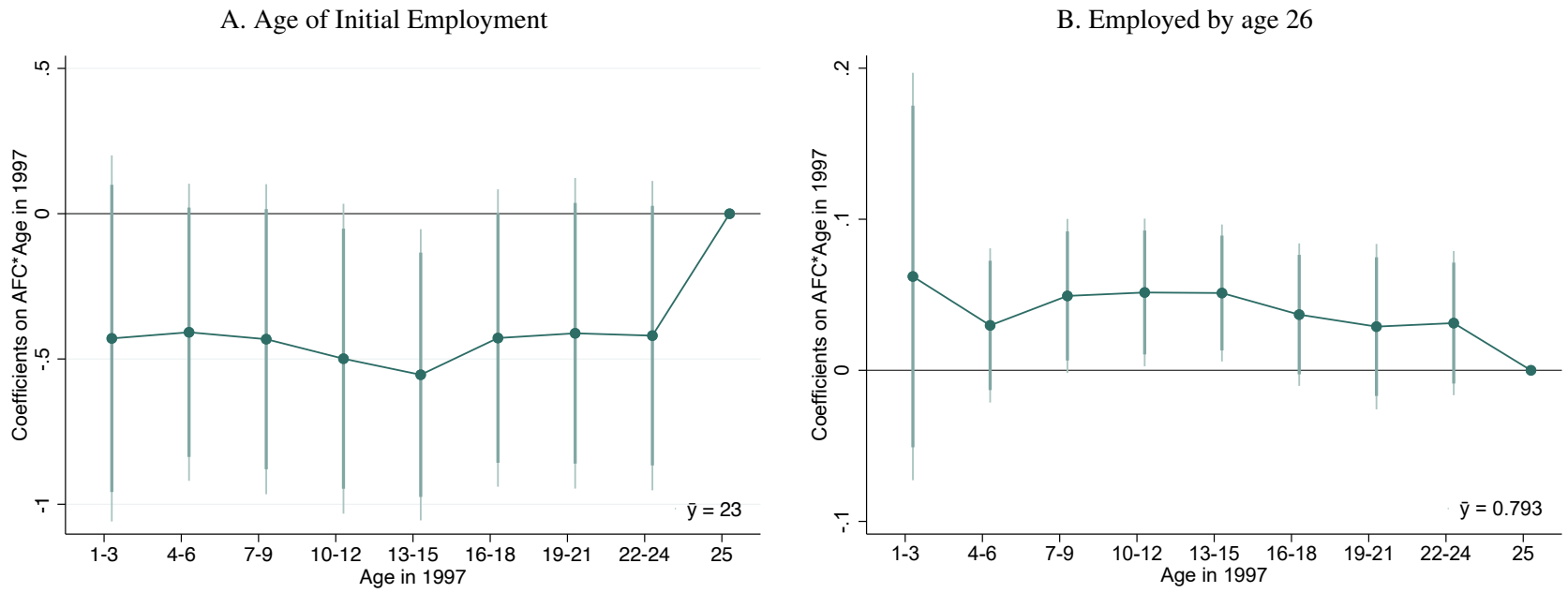


Figure A4: Effects on Timing of Initial Employment (YP)

Notes. Panel A shows coefficient estimates from a censored regression. Vertical spikes around each point estimate represent the 90% (marked darker and thicker) and 95% confidence intervals, clustered at the level of cohort by region at age 14. Regressions include fixed effects for age in 1997 and region at age 14. Controls for background characteristics include dummies for male and father's and mother's education. Missing values in background covariates are imputed using mean values, and dummies for missing observations are also controlled for. Observations are weighted using individual sample weights provided in the YP data.

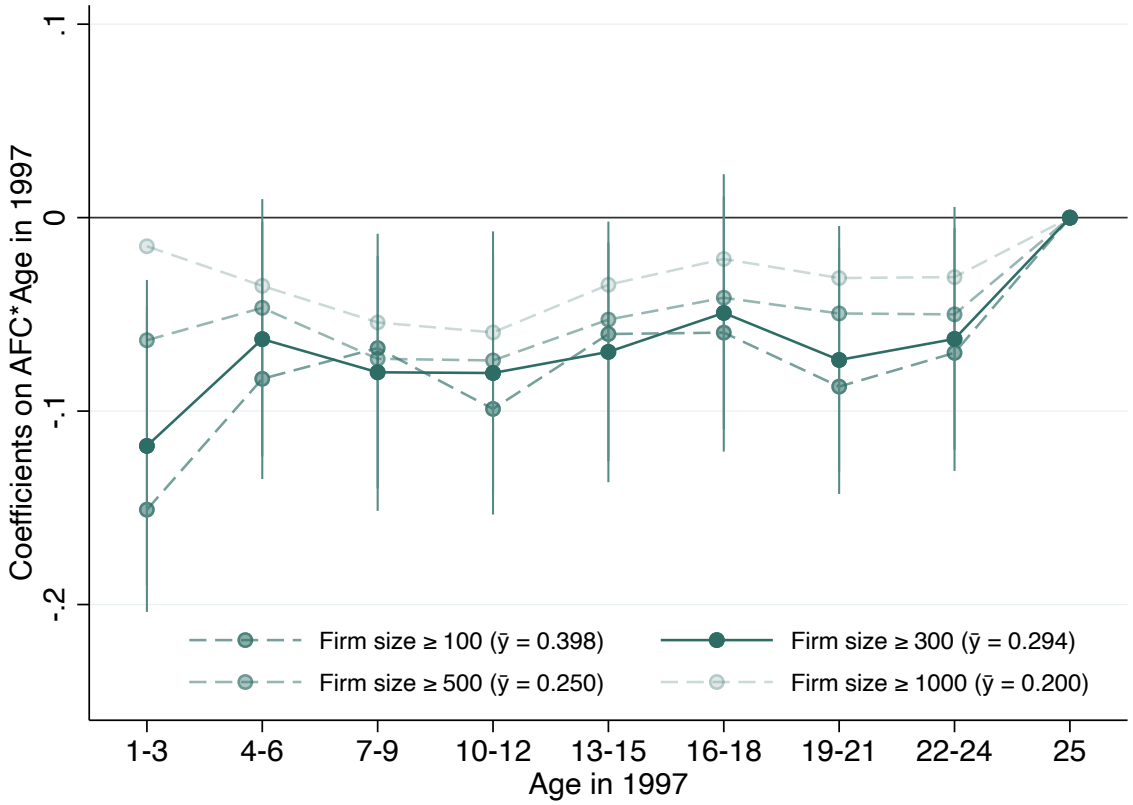


Figure A5: Effects on Firm Size at First Job (YP)

Notes. Vertical spikes around each point estimate represent the 95% confidence interval, clustered at the level of cohort by region at age 14. Regressions include fixed effects for age in 1997 and region at age 14. Controls for background characteristics include dummies for male and father's and mother's education. Missing values in background covariates are imputed using mean values, and dummies for missing observations are also controlled for. Observations are weighted using individual sample weights provided in the YP data.

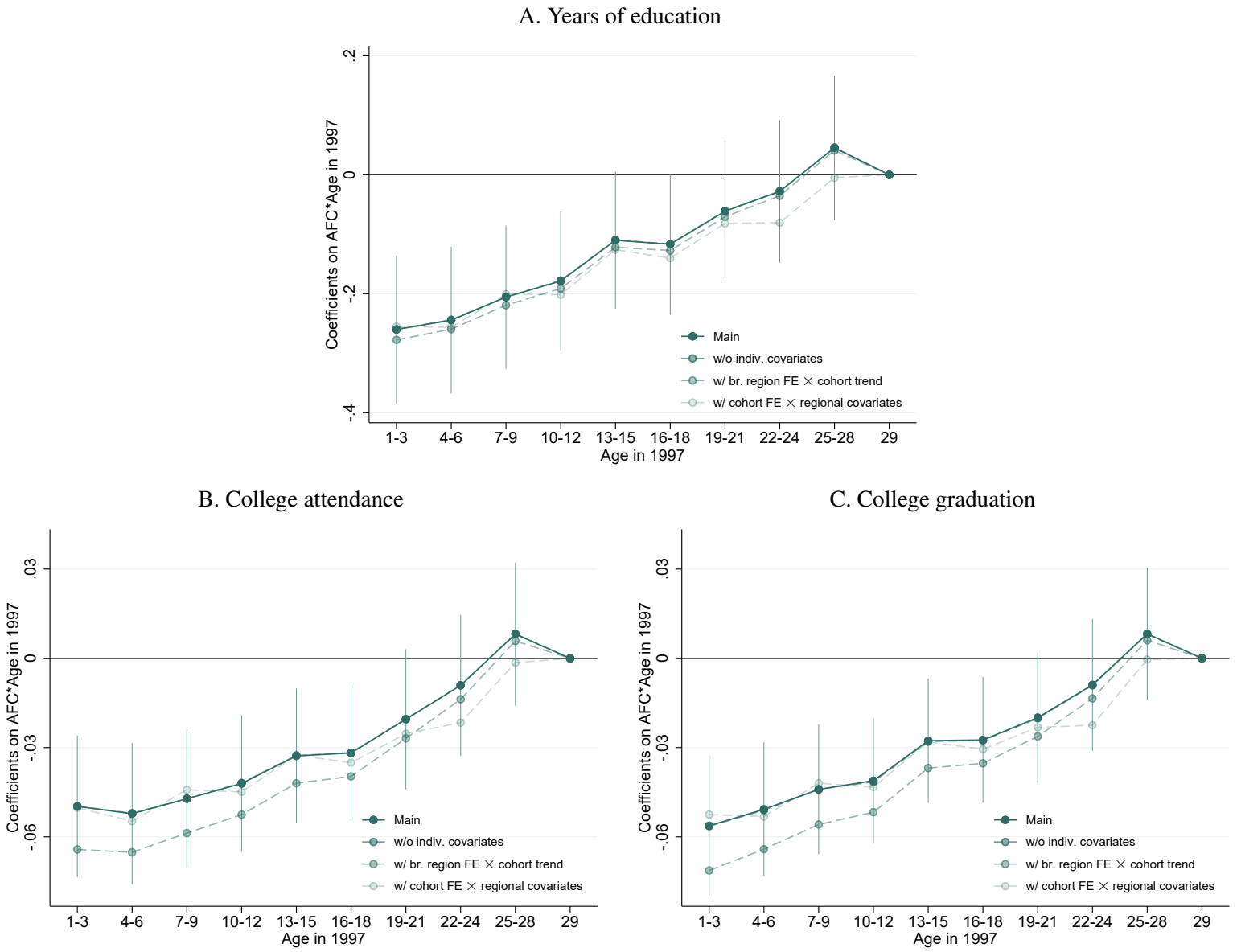


Figure A6: Alternative Specifications: Effects on Educational Attainment (Census)

Notes. Vertical spikes around each point estimate represent the 95% confidence interval, clustered at the level of cohort by birth region. Regressions include the male dummy variable and fixed effects for age in 1997 and birth region. Observations are weighted using individual sample weights provided in the Census data.

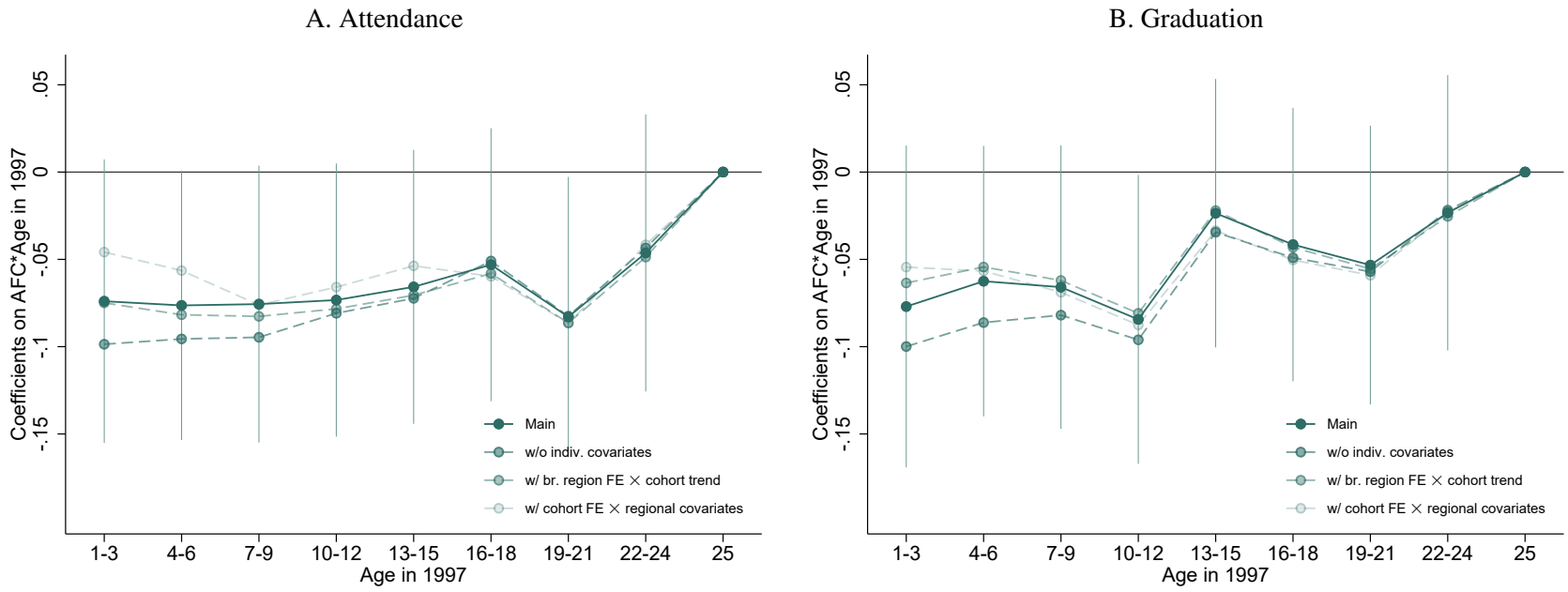


Figure A7: Alternative Specifications: Effects on College Education (YP)

Notes. Vertical spikes around each point estimate represent the 95% confidence interval, clustered at the level of cohort by region at age 14. Regressions include fixed effects for age in 1997 and region at age 14. Controls for background characteristics include dummies for male and father's and mother's education. Missing values in background covariates are imputed using mean values, and dummies for missing observations are also controlled for. Observations are weighted using individual sample weights provided in the YP data.

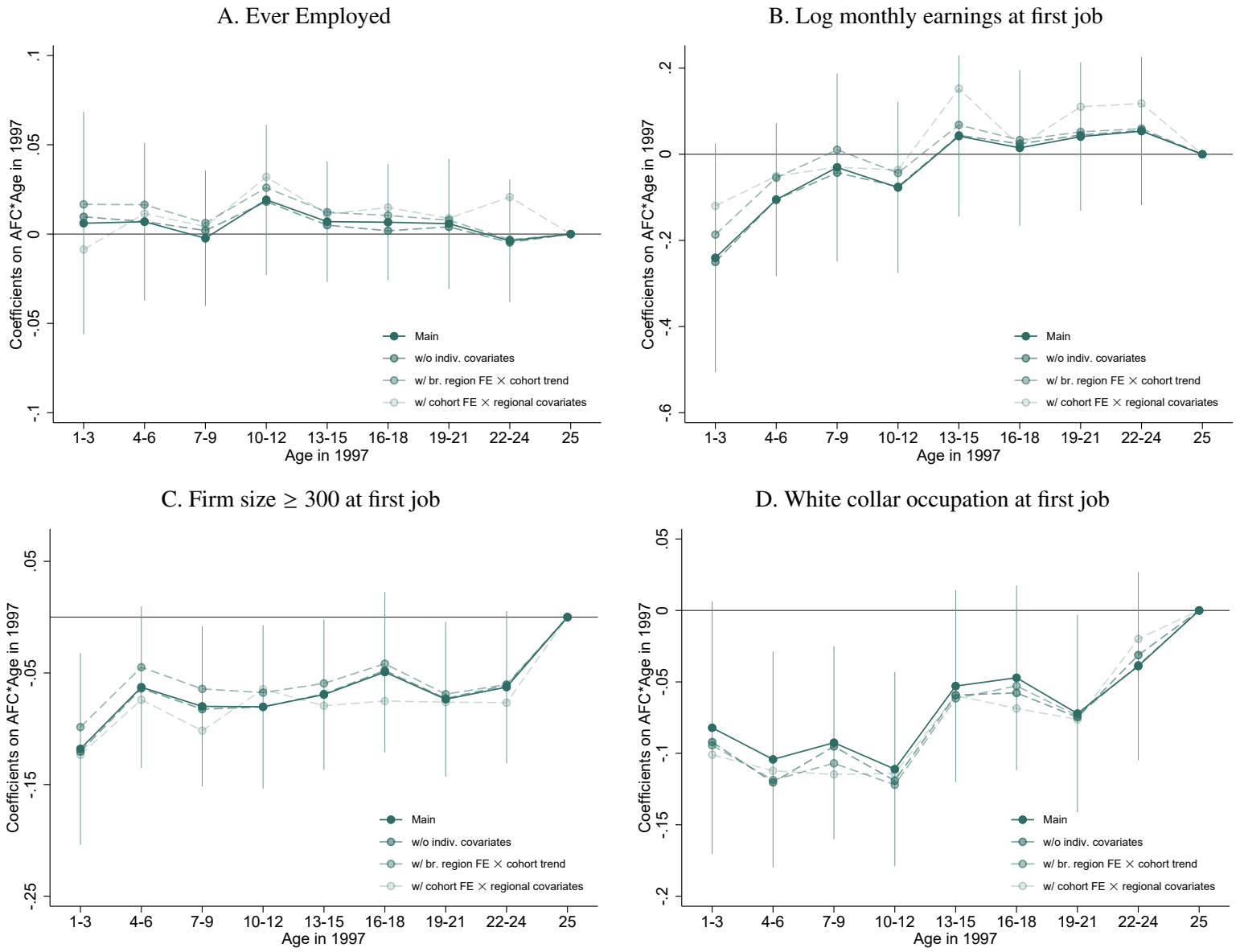


Figure A8: Alternative Specifications: Early Labor Market Outcomes (YP)

Notes. Vertical spikes around each point estimate represent the 95% confidence interval, clustered at the level of cohort by region at age 14. Regressions include fixed effects for age in 1997 and region at age 14. Controls for background characteristics include dummies for male and father's and mother's education. Missing values in background covariates are imputed using mean values, and dummies for missing observations are also controlled for. Observations are weighted using individual sample weights provided in the YP data.

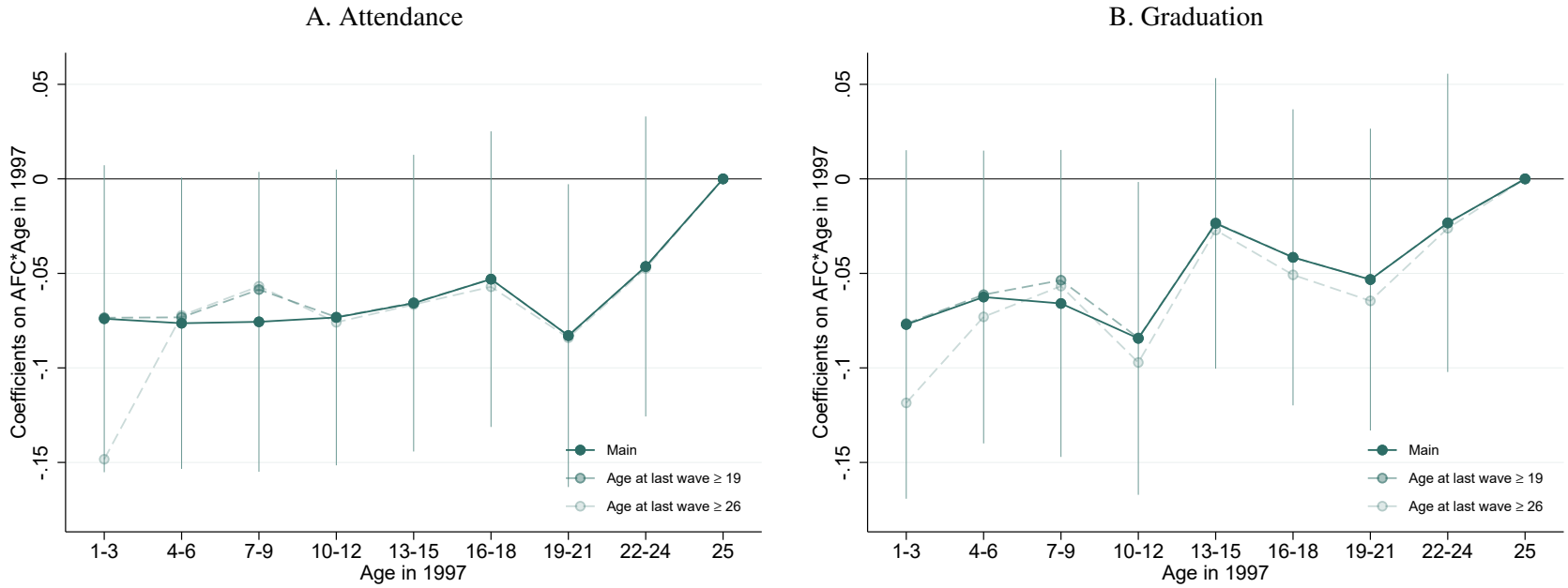


Figure A9: Alternative Sample Restrictions: Effects on College Education (YP)

Notes. Vertical spikes around each point estimate represent the 95% confidence interval, clustered at the level of cohort by region at age 14. Regressions include fixed effects for age in 1997 and region at age 14. Controls for background characteristics include dummies for male and father's and mother's education. Missing values in background covariates are imputed using mean values, and dummies for missing observations are also controlled for. Observations are weighted using individual sample weights provided in the YP data.

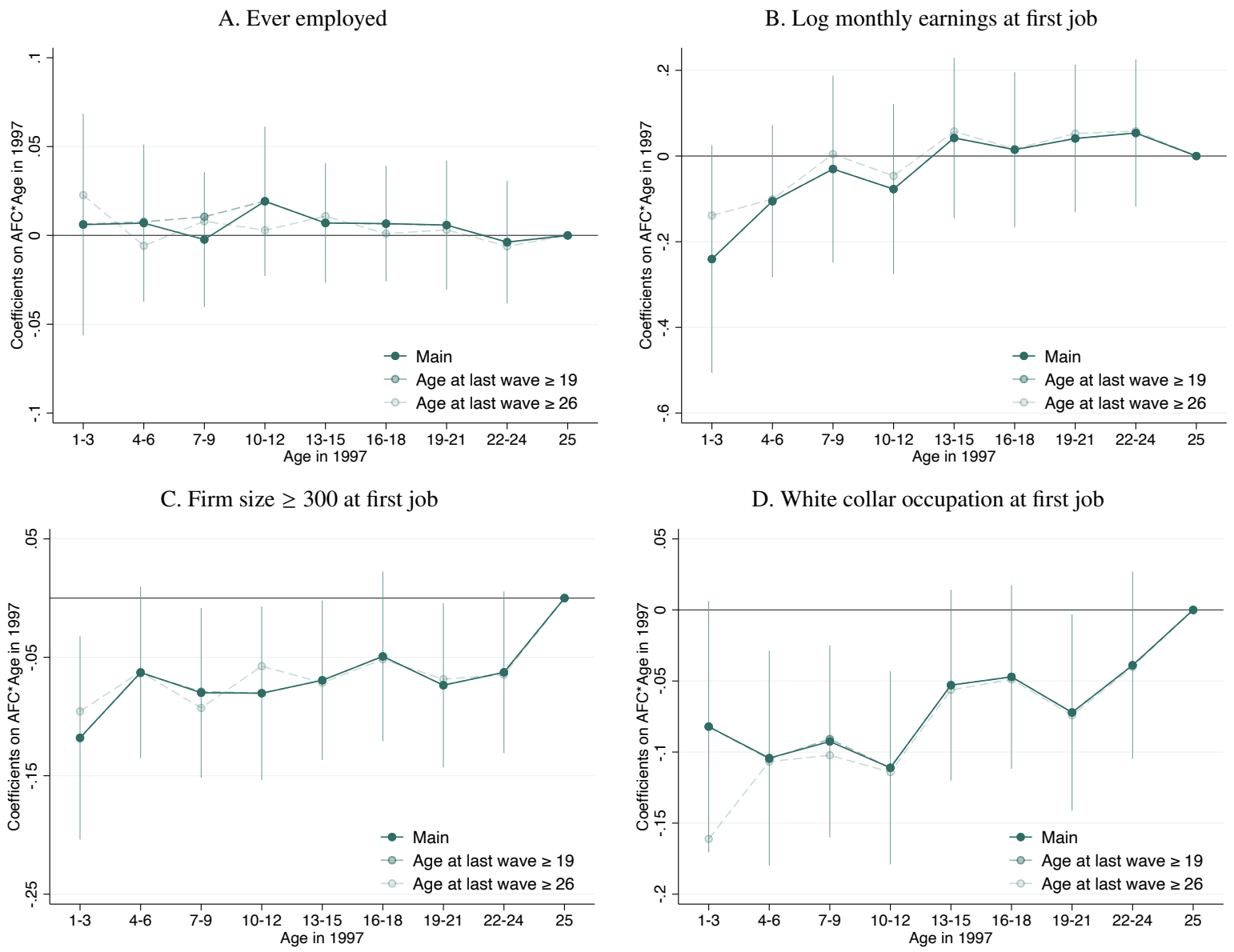


Figure A10: Alternative Sample Restrictions: Early Labor Market Outcomes (YP)

Notes. Vertical spikes around each point estimate represent the 95% confidence interval, clustered at the level of cohort by region at age 14. Regressions include fixed effects for age in 1997 and region at age 14. Controls for background characteristics include dummies for male and father's and mother's education. Missing values in background covariates are imputed using mean values, and dummies for missing observations are also controlled for. Observations are weighted using individual sample weights provided in the YP data.

Table A1: Shift-share IV Estimates: Effects on Educational Attainment (Census)

	Years of education		**College attendance**		**College graduation**	
	OLS	**2SLS**	**OLS**	**2SLS**	**OLS**	**2SLS**
	(1)	(2)	(3)	(4)	(5)	(6)
$AFC \times 1$[Age in 1997 = 1–3]	−0.260***	−0.132	−0.050***	−0.014	−0.056***	−0.015
	(0.063)	(0.098)	(0.012)	(0.023)	(0.012)	(0.023)
$AFC \times 1$[Age in 1997 = 4–6]	−0.244***	−0.086	−0.052***	−0.010	−0.051***	−0.007
	(0.063)	(0.096)	(0.012)	(0.023)	(0.011)	(0.022)
$AFC \times 1$[Age in 1997 = 7–9]	−0.205***	−0.105	−0.047***	−0.017	−0.044***	−0.019
	(0.061)	(0.092)	(0.012)	(0.022)	(0.011)	(0.020)
$AFC \times 1$[Age in 1997 = 10–12]	−0.178***	−0.070	−0.042***	−0.013	−0.041***	−0.016
	(0.059)	(0.089)	(0.012)	(0.021)	(0.011)	(0.019)
$AFC \times 1$[Age in 1997 = 13–15]	−0.110*	−0.024	−0.033***	−0.012	−0.028***	−0.008
	(0.059)	(0.087)	(0.012)	(0.020)	(0.011)	(0.019)
$AFC \times 1$[Age in 1997 = 16–18]	−0.117*	−0.079	−0.032***	−0.025	−0.027**	−0.020
	(0.060)	(0.087)	(0.012)	(0.020)	(0.011)	(0.019)
$AFC \times 1$[Age in 1997 = 19–21]	−0.061	−0.052	−0.020*	−0.017	−0.020*	−0.017
	(0.060)	(0.088)	(0.012)	(0.021)	(0.011)	(0.019)
$AFC \times 1$[Age in 1997 = 22–24]	−0.028	0.011	−0.009	−0.000	−0.009	−0.003
	(0.061)	(0.090)	(0.012)	(0.021)	(0.011)	(0.020)
$AFC \times 1$[Age in 1997 = 25–28]	0.045	0.071	0.008	0.016	0.008	0.013
	(0.062)	(0.091)	(0.012)	(0.021)	(0.011)	(0.020)
Adjusted R^2	0.064	0.063	0.100	0.100	0.066	0.065
N	369,816	369,816	369,816	369,816	369,816	369,816
Dependent variable mean	14.417	14.417	0.705	0.705	0.626	0.626

Notes. Regressions include the male dummy variable and fixed effects for age in 1997 and birth region. Observations are weighted using individual sample weights provided in the Census data. Robust standard errors in parentheses are clustered at the level of cohort by birth region. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A2: Shift-share IV Estimates: Effects on College Education and Early Labor Market Outcomes (YP)

	College education						Quality of first job					
	Attendance		Graduation		Ever employed		Log earnings		Firm size ≥ 300		White collar	
	OLS (1)	**2SLS** (2)	**OLS** (3)	**2SLS** (4)	**OLS** (5)	**2SLS** (6)	**OLS** (7)	**2SLS** (8)	**OLS** (9)	**2SLS** (10)	**OLS** (11)	**2SLS** (12)
$AFC \times 1$[Age in 1997 = 1–3]	−0.074*	−0.084	−0.077	−0.069	0.006	0.066	−0.240*	−0.562**	−0.118***	−0.148**	−0.082*	0.074
	(0.041)	(0.066)	(0.047)	(0.083)	(0.032)	(0.068)	(0.135)	(0.268)	(0.044)	(0.067)	(0.045)	(0.097)
$AFC \times 1$[Age in 1997 = 4–6]	−0.076*	−0.056	−0.063	−0.049	0.007	0.064	−0.105	−0.213**	−0.063*	−0.063	−0.104***	−0.102
	(0.039)	(0.061)	(0.039)	(0.057)	(0.022)	(0.048)	(0.090)	(0.107)	(0.037)	(0.046)	(0.038)	(0.065)
$AFC \times 1$[Age in 1997 = 7–9]	−0.076*	−0.048	−0.066	−0.063	−0.002	0.007	−0.030	−0.166	−0.080**	−0.074*	−0.093***	−0.069
	(0.040)	(0.059)	(0.041)	(0.057)	(0.019)	(0.047)	(0.111)	(0.152)	(0.036)	(0.043)	(0.034)	(0.063)
$AFC \times 1$[Age in 1997 = 10–12]	−0.073*	−0.064	−0.084**	−0.060	0.019	0.084*	−0.077	−0.240*	−0.080**	−0.096*	−0.111***	−0.104*
	(0.040)	(0.060)	(0.042)	(0.061)	(0.021)	(0.048)	(0.101)	(0.129)	(0.037)	(0.051)	(0.035)	(0.062)
$AFC \times 1$[Age in 1997 = 13–15]	−0.066	−0.087	−0.024	−0.052	0.007	0.061	0.042	−0.120	−0.069**	−0.088**	−0.053	−0.062
	(0.040)	(0.060)	(0.039)	(0.058)	(0.017)	(0.043)	(0.095)	(0.118)	(0.034)	(0.043)	(0.034)	(0.062)
$AFC \times 1$[Age in 1997 = 16–18]	−0.053	−0.029	−0.042	−0.004	0.007	0.066	0.015	−0.098	−0.049	−0.069	−0.047	−0.013
	(0.040)	(0.060)	(0.040)	(0.061)	(0.017)	(0.043)	(0.092)	(0.110)	(0.036)	(0.045)	(0.033)	(0.063)
$AFC \times 1$[Age in 1997 = 19–21]	−0.083**	−0.079	−0.053	−0.059	0.006	0.047	0.041	−0.124	−0.074**	−0.075*	−0.072**	−0.015
	(0.041)	(0.059)	(0.041)	(0.057)	(0.019)	(0.044)	(0.088)	(0.101)	(0.035)	(0.041)	(0.035)	(0.061)
$AFC \times 1$[Age in 1997 = 22–24]	−0.046	−0.071	−0.023	−0.046	−0.004	0.023	0.054	−0.143	−0.063*	−0.075**	−0.039	−0.050
	(0.040)	(0.059)	(0.040)	(0.057)	(0.017)	(0.044)	(0.087)	(0.100)	(0.035)	(0.037)	(0.033)	(0.060)
Adjusted R^2	0.096	0.095	0.072	0.071	0.148	0.146	0.021	0.020	0.020	0.020	0.095	0.091
N	13,878	13,878	13,877	13,877	13,878	13,878	11,141	11,141	11,702	11,702	11,706	11,706
Dependent variable mean	0.801	0.801	0.647	0.647	0.853	0.853	14.269	14.269	0.294	0.294	0.634	0.634

Notes. Besides fixed effects for age in 1997 and region at age 14, control variables include dummies for male and father's and mother's education. Missing values in background covariates are imputed using mean values, and dummies for missing observations are also controlled for. Observations are weighted using individual sample weights provided in the YP data. Robust standard errors in parentheses are clustered at the level of cohort by region at age 14. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$