CCRC COMMUNITY COLLEGE RESEARCH CENTER
TEACHERS COLLEGE, COLUMBIA UNIVERSITY

# Timing Matters:
# How Delaying College Enrollment Affects Earnings Trajectories

Yuxin Lin
Vivian Yuen Ting Liu

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*Address correspondence to:*

Yuxin Lin
Research Associate, Community College Research Center
Teachers College, Columbia University
525 W. 120th St., Box 174
New York, NY 10027
212-678-3091
Email: yl2879@tc.columbia.edu

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**Abstract**

Over one in three students who started college in 2012 did not enroll in the fall immediately following their high school graduation. Despite the prevalence of delayed college enrollment, however, little is known about its consequences for labor market outcomes. Using data from the National Longitudinal Survey of Youth 1997, this paper examines the characteristics and earnings trajectories of students who do not enroll in college immediately after high school ("delayers") and the effects of this choice on academic and labor market outcomes. Propensity score matching results show that delaying college enrollment decreases individuals' likelihood of enrolling in college and increases their tendency to enroll in two-year colleges if they do return to school. They also show that, consistent with the study's descriptive results, the early earnings benefits experienced by delayers fade out after their mid-20s and turn to significant losses over time. Oaxaca decomposition results indicate that differences in student characteristics only explain one third of the pay gap between the two groups; 60 percent of the pay gap is explained by delayers' reduced likelihood of attending and obtaining a degree at a four-year college.

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## 1. Introduction

In the literature on college enrollment and college choice, a common assumption is that college-intending students begin postsecondary education in the fall after their high school graduation. Yet according to the National Postsecondary Student Aid Study, 37 percent of undergraduate students in the 1992–93 academic year waited a year or more after high school graduation to attend college (Riccobono et al., 2001), as did a similar proportion of the 2011–12 cohort (Wine, Bryan, & Siegel, 2013). Despite the prevalence of delayed college enrollment, researchers have paid relatively little attention to this phenomenon or its consequences.

In recent years, educational counselors and universities have increasingly promoted the "gap year" model (Hoe, 2015). All eight Ivy League universities have encouraged admitted students to take a year after high school to travel, work, or engage in other productive activities that may help prepare them academically and developmentally for college. Some schools, including Princeton University, Tufts University, the University of North Carolina at Chapel Hill, the New School, and Elon University, even provide financial aid for students who take a gap year.

For students who have fewer resources or are not planning to attend selective institutions, however, a gap between high school graduation and college enrollment may mean something different. For the average student, given the rising cost of attending college, financial concerns heavily influence college enrollment behaviors. According to the Education Longitudinal Study of 2002, half of students who delayed college enrollment named financial concerns (20 percent) or preference to work (30 percent) as reasons for doing so. Only 15 percent indicated that they took a gap year to pursue personal interests or take a break. Working instead of enrolling in college allows individuals to save for college, defer paying college tuition, and enjoy short-term consumption benefits (Kane, 1996). Some also believe that accumulating work experience before college may increase students' competitiveness in the labor market after college (Dellas & Sakellaris, 2003), though the extent to which precollege experience matters for post-college employment remains unclear. Other life circumstances and events, such as military service, sickness, marriage, pregnancy, or a

death in the family, may also cause students to defer college enrollment (Bozick & DeLuca, 2005).

Regardless of students' reasons for delaying college enrollment, a review of the literature suggests that doing so may lower their likelihood of completing college, thus implicitly depressing the supply of skilled labor. Yet few studies have rigorously compared the earnings outcomes and trajectories of students who do not enroll in college immediately after high school (whom we refer to in this paper as *delayers*) and those who do (whom we refer to as *on-time enrollees*).

In the current paper, we use data from the National Longitudinal Survey of Youth 1997 (NLSY97) to address four research questions:

1. What are the characteristics of individuals who delay college enrollment?
2. Do different types of delayers and on-time enrollees have different labor market trajectories?
3. How does delaying college enrollment affect educational and labor market outcomes over time?
4. What are the key determinants of the wage differentials between on-time enrollees and delayers?

Our primary contributions to the research literature are threefold. First, while most studies on the returns to education have looked at outcomes four to six years after initial college enrollment, we analyze student outcomes up to 13 years after high school completion. Second, in addition to comparing earnings outcomes at certain points in time, we examine the effects of delayed college enrollment on earnings trajectories.[1] A sizable part of the returns to community college credentials is due not to immediate gains in earnings following graduation but to increases in earnings growth over time (Jaggars & Xu, 2016), so any earnings differences between delayers and on-time enrollees could also change over time. Comparing earnings over time for these two groups is also informative because of differences in the timing of their labor market participation: Delayers tend to

[1] This is a growing practice in the literature on the returns to education. See, for example, Böckerman, Haapanen, and Jepsen (2017); Hanushek, Schwerdt, Woessmann, and Zhang (2017); Jaggars and Xu (2016); and Minaya and Scott-Clayton (2017).

work before and during college, whereas on-time enrollees tend to accumulate less work experience prior to college graduation. Finally, most existing studies on the effects of delayed college enrollment on labor market outcomes are conditional on college enrollment and exclude delayers who never returned to college. Estimating on a sample conditional on an outcome in this way introduces selection bias (Angrist & Pischke, 2008); we attempt to reduce this bias by including non-college-attendees in the analysis. As our data provide no information on students' college intentions, we are likely including some students who had no intention of pursuing a postsecondary education, causing us to slightly overestimate the impacts of delaying enrollment.[2]

Our main results indicate that delayers enjoy an earnings advantage over on-time enrollees during the first five years after high school graduation, after which their earnings trajectories reverse and on-time enrollees experience much greater earnings gains than delayers do. The earnings penalty associated with delayed college enrollment is positively correlated with the duration of the delay. Differences in student characteristics explain only one third of the pay gap between delayers and on-time enrollees; the rest is explained by delayers' reduced likelihood of attending and obtaining a degree at a four-year college.

The rest of this paper is organized as follows. In Section 2, we review related literature on the outcomes associated with delayed college enrollment. In Section 3, we introduce a conceptual framework for college entry timing and predict the effects of delayed college enrollment on labor market trajectories. In Section 4, we describe our data and the empirical methods we use to estimate the effects of delayed college (propensity score matching, or PSM) and the mechanism of the effects (Oaxaca decomposition). Section 5 presents the results, and Section 6 concludes the paper.

[2] We attempt to mitigate such overestimation by examining cumulative effects and investigating changes in the effect sizes, which decreases the impact from students who never intended to enroll to some extent.

## 2. Background

Only a few studies have looked at the academic and employment outcomes of delayed college enrollment. Most of these focused on cohorts prior to 1990, and the only two more recent studies that employed quasi-experimental approaches used Canadian data. More research on this topic is clearly needed.

Prior studies have shown that college postponement may harm individuals' academic aspirations and outcomes. Using data from the National Education Longitudinal Study of 1988, Bozick and DeLuca (2005) found that delayers were 64 percent less likely to complete a bachelor's degree, since only 24 percent of delayers enrolled in four-year institutions. Niu and Tienda (2013), looking at a sample of students who graduated from Texas high schools in 2002, similarly found that delayers were 40 percentage points less likely than on-time enrollees to be enrolled at a baccalaureate-granting institution four years after high school. In a descriptive analysis, Horn, Cataldi, and Sikora (2005) found that delayers were 18 percentage points less likely than on-time enrollees to complete any college credential.

To our knowledge, only seven studies have examined the effects of interrupted schooling on labor market outcomes. Two looked specifically at interruptions between high school and college (Ferrer & Menendez, 2014; Holmlund, Liu, & Skans, 2008), and five investigated schooling interruptions that were less specific in timing (Fortin & Ragued, 2016; Griliches, 1980; Light, 1995; Marcus, 1984; Monks, 1997), with mixed results. Five of the studies found that interrupted schooling had a negative to zero effect on earnings (Griliches, 1980; Holmlund et al., 2008; Light, 1995; Marcus, 1984; Monks, 1997), while the two Canadian studies found positive returns.

As previous research has suggested that delayers tend to be of low socioeconomic status (SES) or relatively low academic ability (Bozick & DeLuca, 2005; Hearn, 1992; Horn et al., 2005; Johnson, 2013; Rowan-Kenyon, 2007), directly comparing the outcomes of delayers and on-time enrollees may produce biased estimates. Therefore, among the studies mentioned above, the three quasi-experimental studies—Light (1995), Ferrer and Menendez (2014), and Fortin and Ragued (2016)—are of greatest interest.

Using a random effect approach, Light (1995) found that work experience gained during gap years was not valued as highly in the labor market as work experience

obtained after college. She found that a college graduate who delays college enrollment to work for four years receives a 17 percent lower wage than an on-time enrollee who has four years of post-college work experience. This finding is consistent with descriptive results from Holmlund et al. (2008) indicating that the returns to post-college work experience at age 35 are 3.5 times larger than the returns to precollege work.

Fortin and Ragued (2016) and Ferrer and Menendez (2014) reached opposite results and suggested that full-time work before college can increase subsequent wages by helping delayers learn about their abilities and aspirations and the labor market returns to a degree. These two studies used an instrumental variable approach and different cohorts of the Canadian National Graduates Survey. Fortin and Ragued concluded that temporary schooling interruptions led to an average increase of 21 percent in post-college starting wages for men who worked full-time during their out-of-school spell. Ferrer and Menendez found that the returns to schooling interruptions between high school and college are 10 percent for bachelor's degree holders and 14 percent for two-year degree holders.

Overall, the literature on delayed college enrollment to date is mixed. Two quasi-experimental studies found positive results from delayed enrollment, but their focus on Canadian students means they may have limited implications within the context of the United States, and the restriction of their samples to college graduates means they do not capture any effects of the decision to delay on college enrollment and completion. Using a PSM method and national data from the United States, our paper contributes to the existing literature by addressing issues related to selection bias, focusing on a broader range of students, and providing implications for the U.S. postsecondary context.

## 3. Conceptual Framework

In the traditional model of human capital investment developed by Mincer (1958) and Becker (1962), the decision to defer college enrollment is based on its marginal benefits and costs. Kane (1996) argued that according to the human capital model, deferring college entry is not a rational decision in a perfect market with no borrowing constraints and perfect information: Postponing enrollment allows individuals to enjoy short-term employment benefits and defer the costs of college, but in doing so, they also defer the returns to postsecondary education. As long as higher education is beneficial, deferring college payoffs is more harmful in the long run, and postponing college entry would result in lower lifetime earnings.

To illustrate this theoretically, Figure 1 depicts earnings trajectories for on-time enrollees and delayers under the best-case scenario for delayers.[3] Suppose two individuals graduate from high school at the same time at age 18: One, represented by the solid red line, enrolls in college immediately after graduating high school, and the other, depicted by the black dashed line, works for four years between high school and college. We make three assumptions in our model:

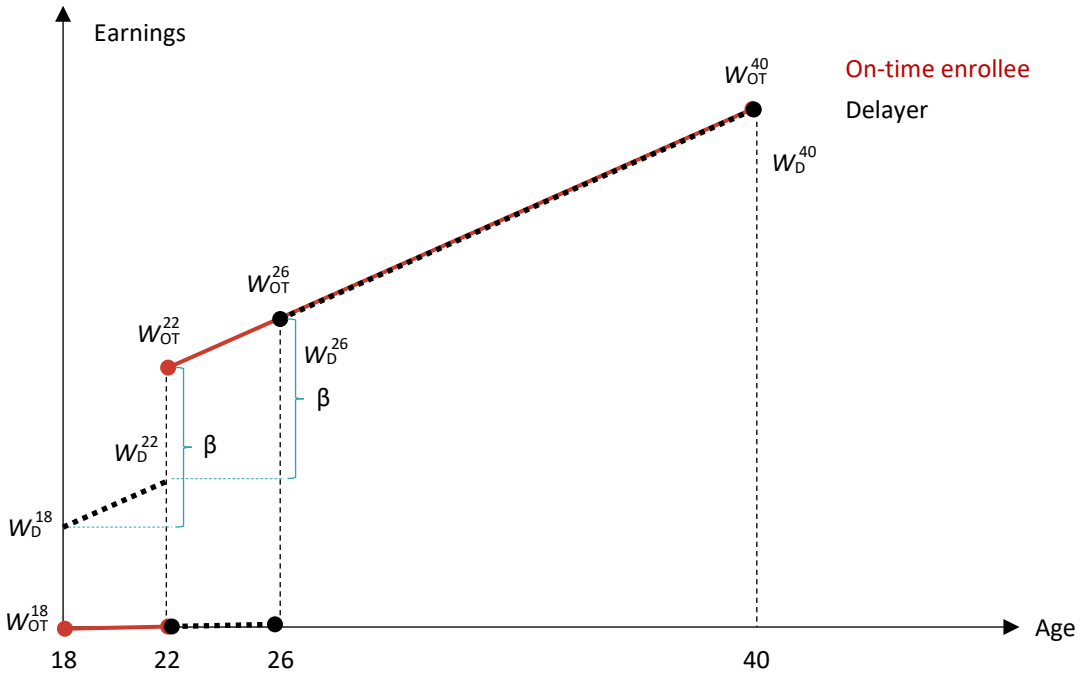
1. Both individuals take four years to complete college.
2. Returns to college are the same regardless of students' age at college entry.
3. Salaries increase at the same rate with experience regardless of whether the work experience takes place before or after college, following Kane's (1996) model.

Under these assumptions, the on-time enrollee begins college at age 18 and enters the workforce after graduating at age 22, earning a starting salary of $W_{\mathrm{OT}}^{22}$. Assuming wage growth is consistent over time, this individual will receive a salary of $W_{\mathrm{OT}}^{40}$ at age 40. The delayer, meanwhile, enters the workforce after high school graduation and earns a starting salary of $W_{\mathrm{D}}^{18}$. This salary grows to $W_{\mathrm{D}}^{22}$ by age 22, at which point the delayer enrolls in college. After graduating from college, the delayer earns $W_{\mathrm{D}}^{26}$, which equals the wage he

[3] Delayers who failed to reenroll in college are not specifically discussed in the theoretical framework, as their earnings trajectory is equivalent to the typical high school graduate's.

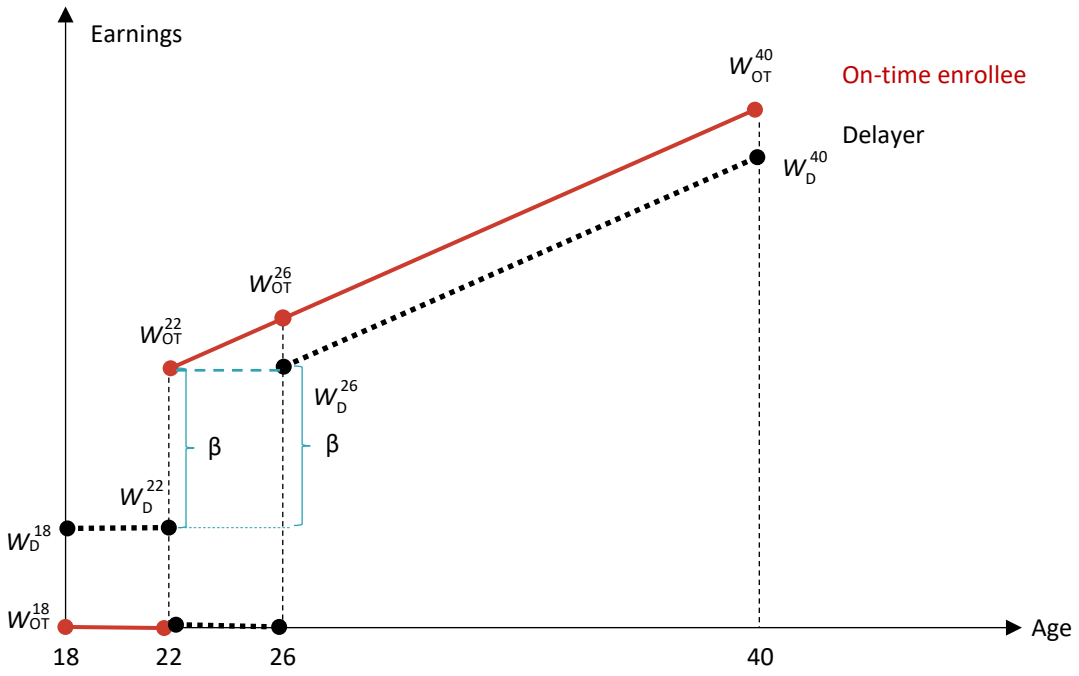
or she received prior to entering college plus the returns to a college degree, and from that point onward has the same wage trajectory as the on-time enrollee. In this model, the wage premium for having a college degree versus a high school diploma is $\beta = W_{\mathrm{D}}^{26} - W_{\mathrm{D}}^{22} = W_{\mathrm{OT}}^{22} - W_{\mathrm{D}}^{18}$ for both individuals; the delayer experiences no wage penalty.

**Figure 1**
**Theoretical Wage Trajectories for On-Time Enrollees and Delayers, Scenario 1: Both Groups Experience the Same Returns to College and Work Experience**



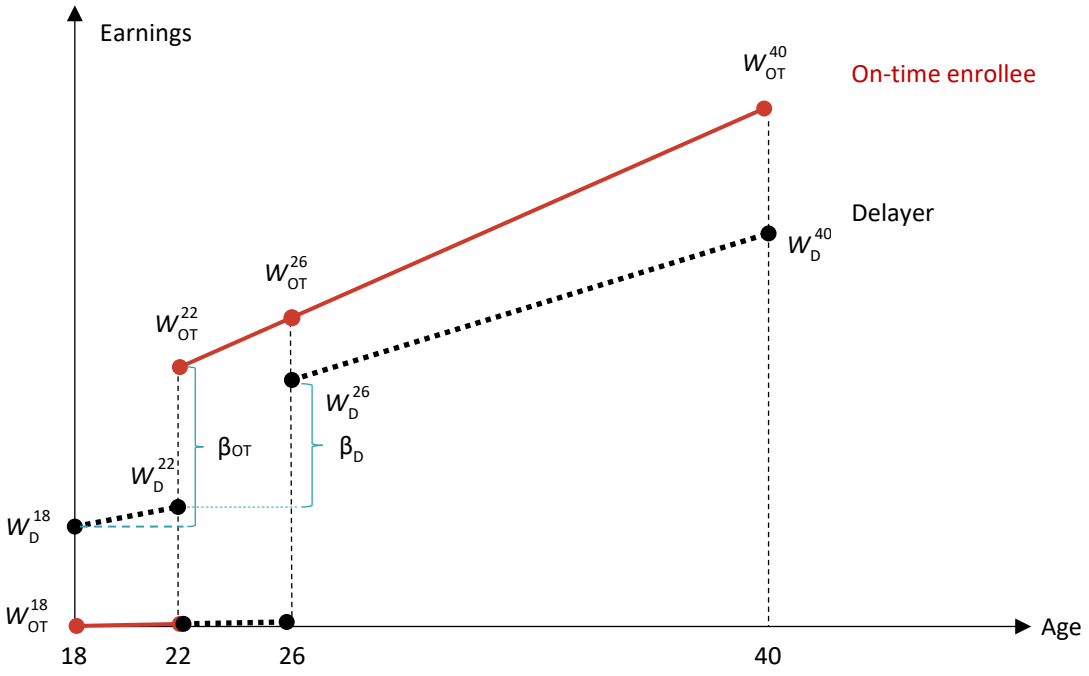
This model may not be realistic, however, since not all human capital investment and on-the-job training yields the same returns (Ben-Porath, 1967). Work experience accumulated prior to college may not be relevant to employers after college graduation, so the returns to this experience may be lower than the returns to post-college experience. In Figure 2, therefore, we relax our third assumption so that precollege work experience is not valued in the labor market after college. In this scenario, the delayer has a horizontal wage trajectory before college and the same starting salary as the on-time enrollee ($W_{\mathrm{D}}^{26} = W_{\mathrm{OT}}^{22}$). In this case, at every age post-college, the delayer makes less than the on-time enrollee.

**Figure 2**
**Theoretical Wage Trajectories for On-Time Enrollees and Delayers, Scenario 2: Precollege Work Experience Yields No Post-College Returns**



Finally, we relax our first and second assumptions to account for the potential effects of delayed enrollment on college choice, degree completion, and earnings. For example, most delayers do not have access to high school counselors after graduation, and without sufficient information on colleges, they may apply to and enroll in colleges that are poorly matched to their abilities (Dillon & Smith, 2013; Roderick, Nagaoka, & Coca, 2009). Horn et al. (2005) found that delayers are less likely to persist and graduate, thus lowering the returns to college education. Such a scenario is illustrated in Figure 3, where the delayer experiences lower returns to college ($W_{\mathrm{D}}^{26} - W_{\mathrm{D}}^{22} < W_{\mathrm{OT}}^{22} - W_{\mathrm{D}}^{18}$) and slower wage growth. Here, the loss experienced by the delayer is caused not only by the delayed college payoff but also by the wasted precollege work experience and lower returns to higher education.

**Figure 3**
**Theoretical Wage Trajectories for On-Time Enrollees and Delayers, Scenario 3: Precollege Work Experience Yields No Post-College Returns, and College Yields Lower Returns for Delayers**



Yet even Figure 3 may not truly reflect the difference in the earnings trajectories of delayers and on-time enrollees. Having received full-time earnings for a few years, it may be difficult for delayers to reduce their work hours and enroll full-time. The academic momentum literature indicates that part-time enrollment is related to lower completion rates and a longer time to degree (Calcagno, Crosta, Bailey, & Jenkins, 2007; Choy, 2002), so the earnings trajectories of delayers may be shifted to the right even further. For a similar reason, delayers may opt for short degree programs, such as those offered by community colleges (Horn et al., 2005). While some selective community college programs offer similar returns to a bachelor's degree, the average wage of a bachelor's degree holder is still higher than that of a community college graduate. For some, choosing to delay enrollment may prevent them from ever going to college. Under this worst-case scenario, the earning trajectories of delayers would be the same those of high school graduates.

## 4. Method

### 4.1 Data

To compare the outcomes of delayers and on-time enrollees, we draw on data from the NLSY97, a nationally representative longitudinal survey of Americans born between 1980 and 1984 who were 12 to 17 years old during their initial interview in 1997. This cohort has been surveyed 17 times—annually from 1997 to 2011 and biennially thereafter (in 2013 and 2015). The NLSY97 contains comprehensive data on educational and labor market outcomes, as well as detailed individual information on respondents' demographics, household characteristics, SES, academic performance, and social activities.

We define delayers as those not attending college by October of their high school graduation year if they graduated between January and July or by the following February if they graduated after July. Our definition includes individuals who eventually entered college and those who never attended college. Previous studies on delayed enrollment have often excluded individuals who never enrolled in college, but because delaying

enrollment may impact individuals' decision to enroll and their choice of college, examining outcomes conditional on college enrollment may positively bias our estimates.

Our final sample contains 6,717 respondents who graduated from high school between 1998 and 2003. Table 1 provides a descriptive summary of the sample disaggregated by enrollment timing. About 58 percent of respondents enrolled in college on time; 21 percent delayed college enrollment but enrolled by 2015; 21 percent never enrolled in college. Disproportionately more Black, Hispanic, and male students delayed college enrollment. Short-term delayers (those who delayed college enrollment less than three years) were more likely to live in metropolitan areas, where job opportunities may be ample. In general, delayers tended to come from families with lower parental education and fewer financial resources. Among delayers, those who delayed for over seven years were the least likely to live with both parents the year they completed high school. High school characteristics were comparable for delayers and on-time enrollees, Academic performance varied substantially across the groups, with greater lengths of delay corresponding with lower academic preparation levels (i.e., lower high school grade point averages [GPA]) and expectations regarding educational attainment. Delayers were also more likely to be married or cohabiting, to become pregnant or impregnate someone, to have children, to experience health problems, and to be arrested in the year of their high school graduation.

**Table 1**
**Descriptive Statistics Summary**

| | All | On-Time Enrollees | Delayed < 3 Years | Delayed 3–7 Years | Delayed > 7 Years | Never Enrolled |
|---|---|---|---|---|---|---|
| Individual demographics | | | | | | |
| White | 61% | 65% | 53% | 52% | 49% | 58% |
| Black | 24% | 21% | 28% | 34% | 35% | 27% |
| Hispanic | 20% | 17% | 25% | 23% | 19% | 24% |
| Other race | 13% | 13% | 17% | 13% | 14% | 14% |
| Female | 51% | 55% | 51% | 50% | 49% | 40% |
| Birth year | 1982 | 1982 | 1982 | 1982 | 1982 | 1982 |
| High school graduation year | 2000 | 2000 | 2000 | 2001 | 2000 | 2001 |
| Lived in urban area in 1997 | 73% | 73% | 79% | 73% | 73% | 67% |
| Lived in Northeast region in 1997 | 18% | 18% | 18% | 15% | 16% | 17% |
| Lived in North Central region in 1997 | 24% | 25% | 21% | 22% | 25% | 22% |
| Lived in Southern region in 1997 | 36% | 34% | 34% | 41% | 39% | 38% |
| Lived in metropolitan area in 1997 | 82% | 84% | 85% | 79% | 76% | 77% |
| Household demographics | | | | | | |
| Household size | 4.49 | 4.42 | 4.54 | 4.49 | 4.54 | 4.64 |
| Highest year of parental education | 13.57 | 14.33 | 12.98 | 12.96 | 12.76 | 12.05 |
| Household net worth in 1997 | $78,234 | $101,130 | $53,535 | $49,979 | $41,030 | $42,241 |
| Household income in high school graduation year | $61,196 | $73,127 | $48,402 | $39,989 | $37,932 | $45,174 |
| Lived with both parents in high school graduation year | 55% | 62% | 47% | 40% | 31% | 46% |
| High school characteristics | | | | | | |
| Public school | 94% | 91% | 96% | 98% | 99% | 98% |
| < 299 students | 6% | 7% | 5% | 6% | 6% | 6% |
| 300–499 students | 10% | 10% | 8% | 8% | 10% | 10% |
| 500–749 students | 20% | 20% | 20% | 17% | 17% | 20% |
| 750–999 students | 16% | 15% | 14% | 18% | 12% | 19% |
| Pupil–teacher ratio < 14 | 22% | 23% | 18% | 21% | 22% | 22% |
| Pupil–teacher ratio 14 to < 18 | 33% | 33% | 31% | 31% | 36% | 32% |
| Pupil–teacher ratio 18 to < 22 | 21% | 21% | 22% | 23% | 15% | 21% |
| Academic preparation | | | | | | |
| High school GPA | 2.91 | 3.10 | 2.75 | 2.64 | 2.51 | 2.55 |
| ASVAB score percentile | 50.90 | 60.17 | 46.39 | 42.12 | 39.22 | 29.94 |
| Expectation to earn college degree by 30 | 78% | 88% | 77% | 67% | 66% | 59% |
| Other characteristics in high school graduation year | | | | | | |
| Married or cohabiting | 6% | 3% | 7% | 11% | 13% | 12% |
| Pregnant or got someone pregnant | 6% | 3% | 9% | 14% | 16% | 10% |
| Number of children | 0.06 | 0.02 | 0.09 | 0.15 | 0.14 | 0.09 |
| Health condition (5 = excellent) | 4.04 | 4.12 | 3.94 | 3.97 | 3.96 | 3.87 |
| Arrests | 0.06 | 0.03 | 0.07 | 0.07 | 0.10 | 0.11 |
| Ever drank alcohol | 61% | 64% | 60% | 55% | 60% | 53% |
| *N* | 6,717 | 3,919 | 762 | 349 | 269 | 1,418 |

*Note*. ASVAB = Armed Services Vocational Aptitude Battery.

### 4.2 Propensity Score Matching

The ideal way to estimate the effects of delayed college enrollment on student outcomes would be to randomly assign students to delay or enroll on time, so that any difference in their outcomes could be attributed to their enrollment timing. However, such randomization is not possible in practice. Even if a group of students were willing to participate in a randomized controlled trial (which is extremely unlikely), the ideal random assignment would involve multiple steps. First, after high school graduation, some students would need to be randomly selected to attend college and others to decline to enroll. Second, among college attendees, some would need to be randomly selected to attend college immediately and some to delay their enrollment. Third, researchers would need to track these students for a lifetime and compare their educational and employment outcomes. Moreover, the effects of delaying college enrollment would accumulate over time, such that students would encounter obstacles impeding them from reenrolling and completing college. For researchers to estimate the effects of delaying enrollment conditional on college enrollment or completion, they would have to conduct additional randomizations to assign some students to return to college, and then to complete college, making this "ideal" experimental design extremely complex.

Even if a randomized experiment fulfilled all these requirements, it still would not be able to provide evidence on the real-world factors that cause students to delay college enrollment, which is necessary to inform policy. We are therefore unable to employ an experimental design, so we need to address issues of selection bias in our empirical strategy. However, this "ideal experiment" guides our empirical approach to studying the effects of delayed college enrollment in cumulative ways.

To mitigate observable selection bias, we use a propensity score matching (PSM) approach to compare the outcomes of delayers and on-time enrollees with similar propensities to delay college enrollment. Although PSM does not eliminate unobservable selection bias, incorporating PSM still confers several advantages above a simple ordinary least squares (OLS) regression. First, OLS can only control for confounding factors by adding covariates, but observations lacking common support cannot be compared directly by linear exploration via covariates. PSM ensures that the treated individuals are compared only with those in the control group who are most similar in

terms of observable characteristics. Second, a PSM approach sheds light on the treatment selection process, describing factors that correlate with delayed college enrollment.

Even though it is impossible to rule out unobservable biases using PSM, this approach is suitable for investigating our research questions. First, our data are longitudinal and include measures of the main time-variant and time-invariant factors that we suspect lead to delayed enrollment, such as detailed individual demographics, family income, school characteristics, student ability, and some key life events, Second, other than these controlled factors, enrollment delay can be affected by some known idiosyncratic components, such as sudden economic or academic shocks. Third, our sample includes a large number of delayers, enabling us to build treatment and control groups with enough common support.

To investigate the determinants of delayed enrollment empirically, then, we first model student enrollment timing using logistic regression:

$$Pr(Delay = 1) = \Phi(X'\beta) \quad (1)$$

In this model, $\Phi$ is the cumulative distribution function of a standard normal distribution, and $X$ is a vector of factors that might affect enrollment timing. According to our conceptual framework, the timing of students' college enrollment choice is a function of the marginal benefits and marginal costs of college enrollment. We include geographic information,[4] high school graduation year, and their interaction in the model to control for local market differences. (For a complete list of variables included, see Table 2.) We also implement the logistic regression model for men and women separately to see if the determinants affect them differently.[5]

To implement PSM, we apply the resulting parameters from the first logistic model to construct each individual's propensity score. The basic idea of PSM is to form a counterfactual comparison group of on-time enrollees whose likelihood of delaying

[4] Detailed geographic information, such as state, metropolitan statistical area, and county, is not available in the public-use NLSY97 data. The smallest geographic division we are able to disaggregate our sample by is census region.

[5] In addition to looking at the determinants of delayed enrollment in general, we use a multinomial logistic model to examine the determinants of different lengths of delay. The full results are presented in the appendix.

college enrollment is similar to the delayers'. By comparing the outcomes of two groups with similar pretreatment characteristics, we can calculate the differences in outcomes that can be attributed to the treatment. The underlying identifying assumption is that the selection is based on observable characteristics. Any factors that jointly affect both treatment and subsequent outcomes have to be included in the model. If the assumption holds and there is overlap between the groups, the PSM estimator for the average treatment effect for the treated is the mean difference in outcomes of the treatment and comparison groups with sufficient common support, appropriately weighted by the propensity score distribution of delayers. Our outcomes of interest include enrollment and completion at four- and two-year colleges, earnings, and work hours, all of which we examine by years relative to high school graduation.

We then use caliper matching with a radius caliper of 0.05, with replacement and excluding observations without common support. This procedure allows us to match each delayer with an on-time enrollee within 0.05 on either side of the treatment propensity score.[6] We also use alternative methods of matching, but the results are highly robust, as we discuss in the results section.

### 4.3 Oaxaca Decomposition

To examine the factors contributing to the wage gap between delayers and on-time enrollees, we use a Oaxaca decomposition (Oaxaca, 1973). Equations 4 and 5 model the wages of on-time enrollees and delayers respectively as a function of college enrollment ($Enroll$), degree attainment ($Degree$), and individual characteristics ($X$).

$$wage_{\mathrm{OT}} = \beta^1_{\mathrm{OT}} Enroll_{\mathrm{OT}} + \beta^2_{\mathrm{OT}} Degree_{\mathrm{OT}} + \beta^3_{\mathrm{OT}} X_{\mathrm{OT}} + \mu_{\mathrm{OT}} \quad (4)$$

$$wage_{\mathrm{D}} = \beta^1_{\mathrm{D}} Enroll_{\mathrm{D}} + \beta^2_{\mathrm{D}} Degree_{\mathrm{D}} + \beta^3_{\mathrm{D}} X_{\mathrm{D}} + \mu_{\mathrm{D}} \quad (5)$$

A Oaxaca decomposition disaggregates the raw differences in log earnings between the two groups into portions that can be explained by differences in these three types of

[6] Caliper matching helps us avoid the risk of bad matching posed by nearest-neighbor matching if the nearest neighbor is far away. The caliper imposes a tolerance level on the maximum propensity score distance that meets the requirement of common support.

factors. In our analysis, we focus on how college enrollment and degree completion contribute to the earnings difference between the groups. Including both college enrollment and degree completion in the same equation could cause a severe multi-collinearity problem, so we conduct separate decompositions for them.

## 5. Results

### 5.1 Earnings Trajectories

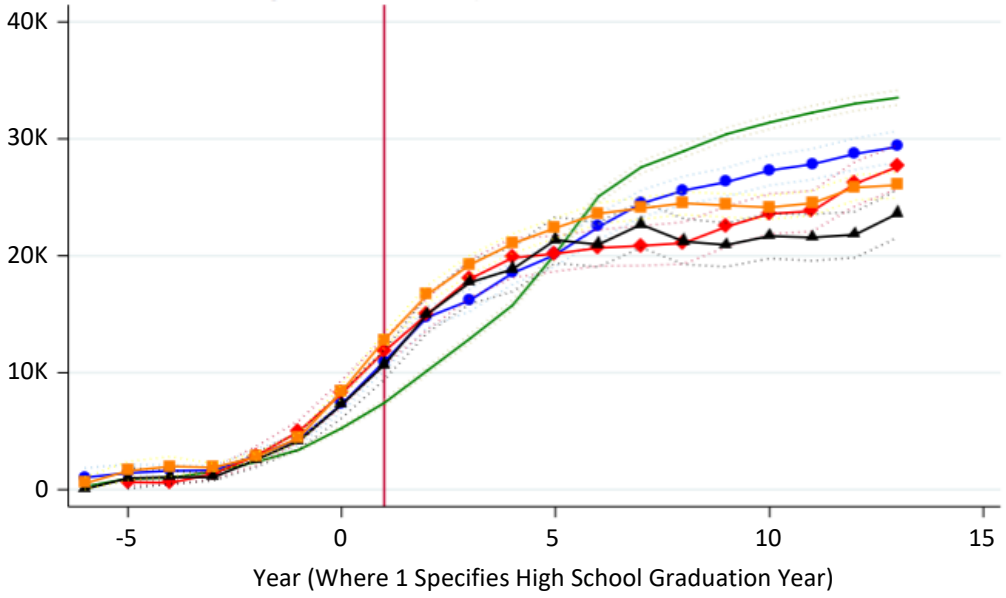
We begin by taking a graphical look at labor market trajectories for on-time enrollees and different types of delayers. Figures 4 and 5 show the patterns of annual earnings and hours worked over time by initial college enrollment timing relative to high school graduation.

On-time enrollees started out earning less than the other groups and eventually earned the most. Their annual earnings were around $35,000 13 years after high school graduation, while delayers earned slightly above $30,000 at most.[7] The earnings for on-time enrollees started to grow faster and exceed the earnings of delayers in the sixth year. From the seventh year onward, the earnings of on-time enrollees continued on an upward trajectory, while the earnings growth for the rest of the sample decelerated. These trajectories are most consistent with the third scenario we outlined in our conceptual framework (Figure 3). Individuals who delayed college enrollment for more than seven years had the least favorable outcomes, with earnings trajectories even lower than those of individuals who never enrolled in college—which suggests that the college completion rate for this group is likely very low and that college is not worth the cost for long-term delayers.

[7] Only positive earnings are included here. Panel B of Figure 4 shows the earnings trajectories with zero earnings included, and the trends are similar but magnified.

**Figure 4**
**Adjusted Yearly Earnings by Enrollment Status**

**Panel A: $0 Excluded**




**Panel B: Valid $0 Included**

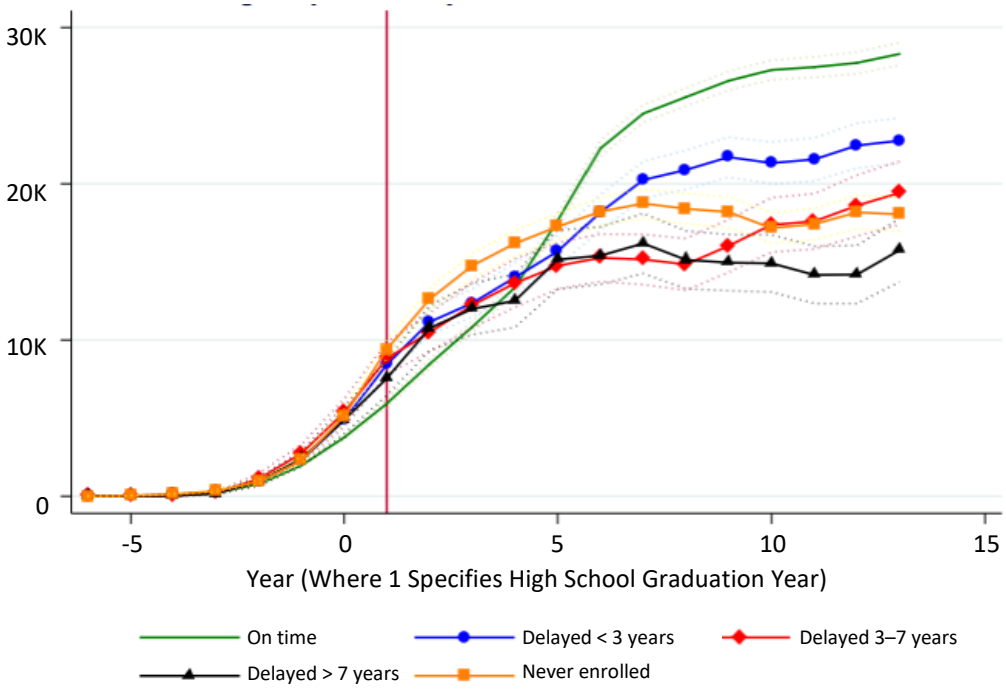
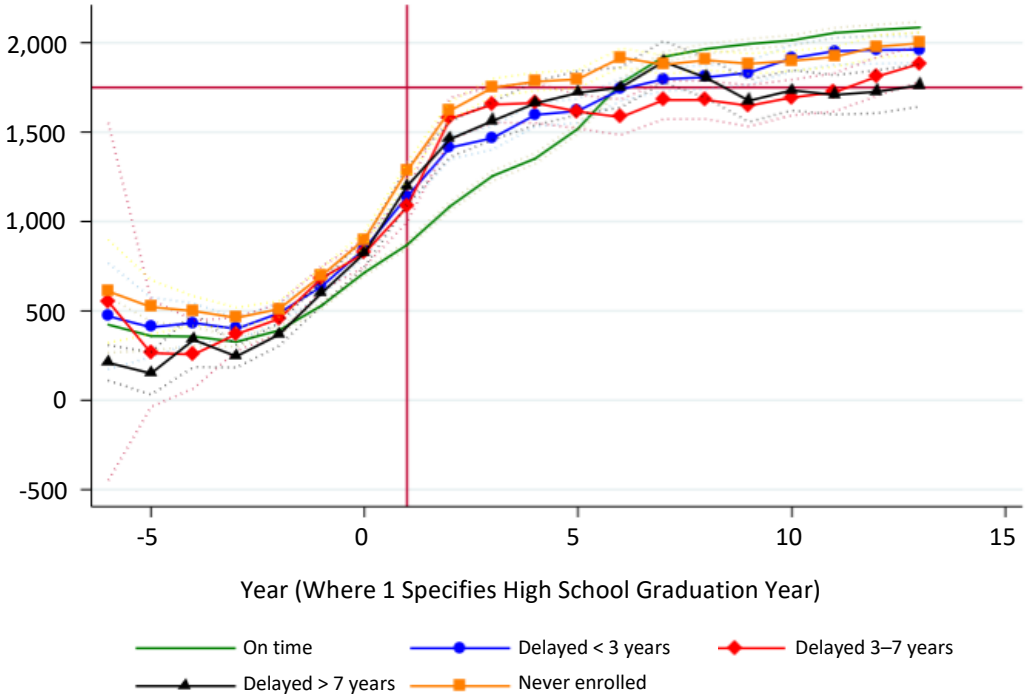


**Figure 5**
**Annual Work Hours by Enrollment Status**




*Note*. Full-time employment is defined as 1,750 hours. Zero hours are excluded.

Figure 5 presents the annual work hour trajectories for different types of delayers and on-time enrollees. The horizontal red line marks 1,750 hours, which is equivalent to full-time employment.[8] There are three important observations to be made from this figure. First, on-time enrollees tended to work part-time during college and started to have similar work hours to delayers after the sixth year post–high school graduation, as members of both groups on average worked full-time then. Second, delayers tended to work full-time even after they went back to school, which might explain why they experienced lower returns to postsecondary education: Full-time workers tend to choose two-year colleges or part-time programs that usually have lower completion rates (Bozick & DeLuca, 2005). Finally, short-term delayers (those who delayed enrollment less than three years) tended to work part-time before entering college, while longer term delayers more often worked full-time. Therefore, for short-term delayers, the opportunity cost of returning to school and studying full-time was lower than it was for longer term delayers.

[8] The full-time employment definition is from the U.S. Department of Labor's Bureau of Labor Statistics (2014) and the United States Census Bureau (2000) and is equivalent to 35 hours per week for 50 weeks.

Both the earnings trajectories and the work hour trajectories suggest that delaying college enrollment produces less desirable labor market outcomes. Returning to school is also not an optimal choice for those who have delayed college enrollment for over seven years.

### 5.2 Logistic Regression

Table 2 reports the coefficients for each potential factor predicting delayed college enrollment for the full sample and by gender. Table A1 in the appendix reports the multinomial regression results for selection into different delay lengths.

Both Black and Hispanic high school graduates are less likely than Whites to delay college enrollment. This is an unexpected finding, given that a higher proportion of Black and Hispanic students delayed college enrollment. It is possible that the job market for high school graduates prefers White candidates, so White graduates are more likely to work and delay college enrollment. Compared with women, men are more likely to delay enrollment, which probably reflects men's preference for work, military duty, or other activities.

Household characteristics are also important for predicting college enrollment timing. Students with more educated parents are less likely to delay enrollment, as more educated parents are able to provide more educational resources and more support during the college application and matriculation process, which helps keep students on the traditional education track. Both household net worth and household income are also negatively correlated with delayed enrollment, as more financial inputs decrease students' need to work to save for college.

School inputs influence college enrollment timing via school type and class size. Smaller class size is negatively correlated with delayed enrollment. Compared with private high school students, public high school students have a higher tendency to delay enrollment. Two proxies for academic ability, ASVAB scores and high school GPA, are both positively related to on-time college enrollment.

**Table 2**
**Logistic Regression Analysis: Potential Determinants of Delayed College Enrollment**

| | All | | Male | | Female | |
|---|---|---|---|---|---|---|
| | Coefficient | *SE* | Coefficient | *SE* | Coefficient | *SE* |
| Individual demographics | | | | | | |
| Black | -0.526*** | [0.088] | -0.522*** | [0.126] | -0.549*** | [0.128] |
| Hispanic | -0.250** | [0.101] | -0.135 | [0.140] | -0.369** | [0.149] |
| Other race (except White) | -0.181* | [0.106] | -0.360** | [0.149] | 0.008 | [0.152] |
| Female | -0.505*** | [0.064] | | | | |
| Birth year | -0.130** | [0.051] | -0.234*** | [0.070] | -0.008 | [0.076] |
| High school graduation year | -0.004 | [0.073] | 0.101 | [0.101] | -0.120 | [0.107] |
| Lived in urban area in 1997 | -0.033 | [0.078] | -0.094 | [0.109] | 0.033 | [0.114] |
| Lived in Northeast region in 1997 | 0.488 | [0.357] | 0.788 | [0.482] | 0.042 | [0.558] |
| Lived in North Central region in 1997 | -0.056 | [0.309] | 0.122 | [0.411] | -0.278 | [0.476] |
| Lived in Southern region in 1997 | 0.409 | [0.287] | 0.351 | [0.393] | 0.452 | [0.427] |
| Lived in metropolitan area in 1997 | -0.313*** | [0.088] | -0.347*** | [0.124] | -0.276** | [0.128] |
| Household demographics | | | | | | |
| Household size | 0.040* | [0.022] | 0.055* | [0.031] | 0.024 | [0.031] |
| Highest year of parental education | -0.123*** | [0.012] | -0.127*** | [0.017] | -0.120*** | [0.018] |
| Household net worth in 1997 (thousands) | -0.002*** | [0.000] | -0.002*** | [0.000] | -0.001*** | [0.000] |
| Household income in high school graduation year (thousands) | -0.004*** | [0.001] | -0.004*** | [0.001] | -0.003*** | [0.001] |
| Lived with both parents in high school graduation year | -0.324*** | [0.066] | -0.328*** | [0.093] | -0.324*** | [0.097] |
| High school characteristics | | | | | | |
| Public school | 0.892*** | [0.186] | 0.815*** | [0.248] | 0.981*** | [0.286] |
| < 299 students | 0.154 | [0.143] | 0.110 | [0.197] | 0.246 | [0.210] |
| 300–499 students | -0.128 | [0.120] | -0.131 | [0.168] | -0.121 | [0.175] |
| 500–749 students | 0.039 | [0.093] | 0.029 | [0.131] | 0.037 | [0.136] |
| 750–999 students | -0.009 | [0.095] | -0.030 | [0.135] | 0.014 | [0.138] |
| Pupil–teacher ratio < 14 | -0.261** | [0.105] | -0.169 | [0.147] | -0.366** | [0.152] |
| Pupil–teacher ratio 14 to < 18 | -0.121 | [0.090] | -0.137 | [0.128] | -0.109 | [0.129] |
| Pupil–teacher ratio 18 to < 22 | -0.113 | [0.093] | -0.118 | [0.133] | -0.124 | [0.131] |
| Academic preparation | | | | | | |
| High school GPA | -1.307*** | [0.079] | -1.226*** | [0.111] | -1.403*** | [0.116] |
| ASVAB score percentile | -0.019*** | [0.001] | -0.020*** | [0.002] | -0.017*** | [0.002] |
| Other characteristics in high school graduation year | | | | | | |
| Married or cohabiting | 0.865*** | [0.136] | 0.650** | [0.270] | 0.995*** | [0.161] |
| Pregnant or got someone pregnant | 0.583*** | [0.136] | 0.297 | [0.216] | 0.725*** | [0.177] |
| Number of children | 0.683*** | [0.153] | 0.330 | [0.530] | 0.719*** | [0.164] |
| Health condition (5 = excellent) | -0.167*** | [0.036] | -0.172*** | [0.052] | -0.175*** | [0.050] |
| Arrests | 0.422*** | [0.119] | 0.415*** | [0.137] | 0.446* | [0.244] |
| Ever drank alcohol | 0.010 | [0.069] | 0.095 | [0.098] | -0.083 | [0.100] |
| Observations | 6,454 | | 3,177 | | 3,277 | |
| Year * region interaction | Yes | | Yes | | Yes | |

*$p$ < .1. **$p$ < .05. ***$p$ < .01.

Unexpected life events in high school also affect college enrollment timing by imposing time constraints on students. Marriage and parenthood are the two major sources of such constraints. The role of spouse or parent alters time use and the distribution of financial resources (Bozick & DeLuca, 2005). Notably, most of the negative effects of marriage and parenthood on college enrollment timing are experienced by women. Arrests and health problems increase the likelihood of delayed enrollment equally for men and women.

Overall, the logistic regression results are consistent with human capital theory and other sociological theories that posit that financial and time constraints obstruct on-time college enrollment.

### 5.3 Propensity Score Matching

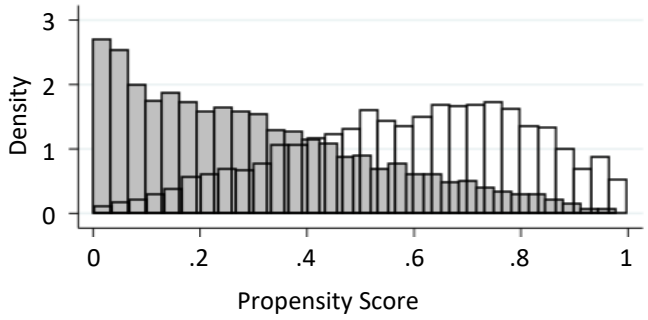
Using the logistic regression results, we first show common support between the delayers and on-time enrollees in terms of their propensity to delay college enrollment. Figure 6 plots the distributions of delayers and on-time enrollees across the range of estimated propensity scores before and after matching. After matching, both groups have similar propensity scores. There is also sufficient overlap between the groups across the range of propensity scores, assuring common support.

Next, we check the match quality. Figure 7 shows that our observations for both delayers and on-time enrollees are well matched across the selected observable covariates. Each circle and asterisk represents the standard bias of the unmatched and matched observable covariates respectively.[9] In most empirical studies, a standard bias below 5 percent after matching is seen as sufficient (Caliendo & Kopeinig, 2008). In our model, the standard bias of most covariates is under 5 percent, except for Hispanic (7.5 percent) and living in a metropolitan statistical area (5.7 percent). Given the small bias for the large number of other characteristics, we consider our model to be balanced.[10]

[9] The standardized bias is the difference between the sample means of the treated and untreated subsamples as a percentage of the square root of the average sample variance in both groups.
[10] Full results and the balance test are provided in the appendix.

**Figure 6**
**Density of Propensity Scores Pre- and Post-Matching**

**Panel A: Pre-Match**




**Panel B: Post-Match**

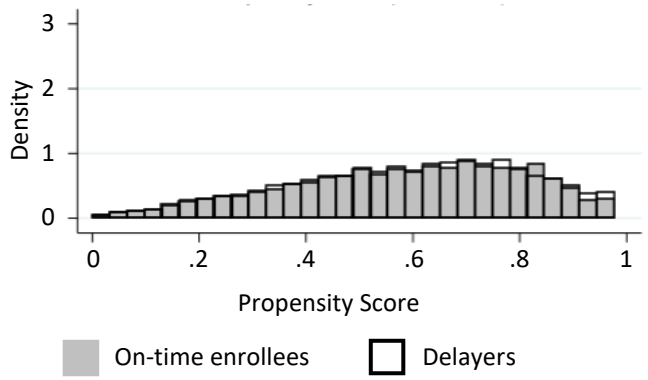
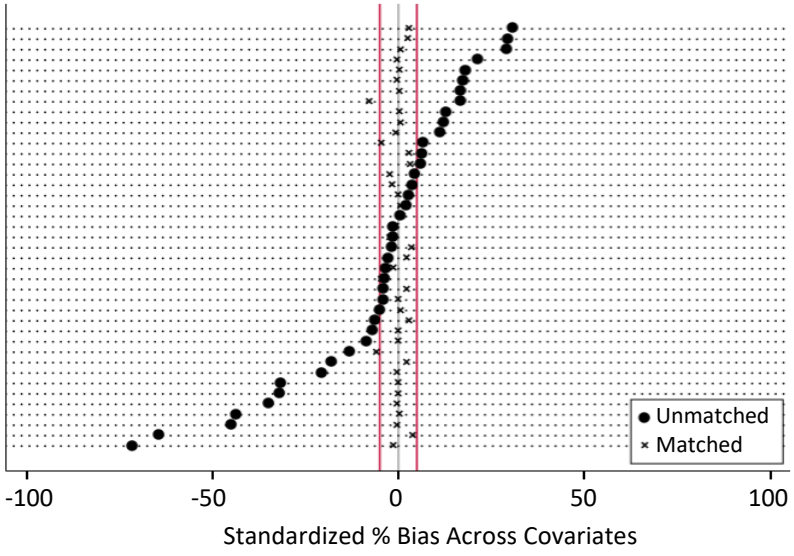



**Figure 7**
**Bias Reduction From the Propensity Score Matching Procedure**



We then examine two types of outcomes—education and labor market outcomes. The appendix tables include the complete results for both the OLS and PSM estimates of college enrollment, degree completion, and labor market outcomes by year and type of college. In general, the results confirm a small negative bias of the OLS estimations as a result of the selection into the decision to delay college enrollment.

Figure 8 plots the PSM results for ever having enrolled in college by year, where each data point is a separate regression representing the effect of delaying college by the *x*th year after high school graduation.[11] In the first year after high school graduation, delayers were 87 percentage points less likely to have ever enrolled in any type of college. The absolute value of the effect size decreases with time, suggesting that some delayers have entered college gradually. By the 13th year after high school graduation, delayers were still over 50 percentage points less likely to have ever attended college. Notably, the trends for ever having enrolled in four-year and two-year colleges move in opposite directions, implying that delayers who returned to school were less likely to enroll in a four-year college. By the 13th year after high school graduation, delayers were 37 and 34 percentage points less likely than on-time enrollees to have ever attended four-year colleges and two-year colleges respectively.[12]

Figure 9 displays the PSM results for bachelor's degree and associate degree completion over time. In general, delayed enrollment produces long-term negative effects on degree completion, and the gap between delayers and on-time enrollees does not shrink over time. By the seventh year, when many on-time enrollees have completed postsecondary education, the gap in the overall completion rates reaches 32 percentage points. The pattern is similar when broken down into bachelor's and associate degree completion, though the overall gap in associate degree completion rates is about 5 percentage points smaller than the overall gap in bachelor's degree completion rates. The PSM results show that even though the enrollment gap between delayers and on-time enrollees narrows with time, delayers are unlikely to complete a degree, resulting in a stubborn gap in completion.

[11] All the results are statistically significant.
[12] The sum of the effects on two-year and four-year college enrollment does not equal to the overall effect because some students attended both types of institutions.

**Figure 8**
**PSM Effects of Delaying on College Enrollment**

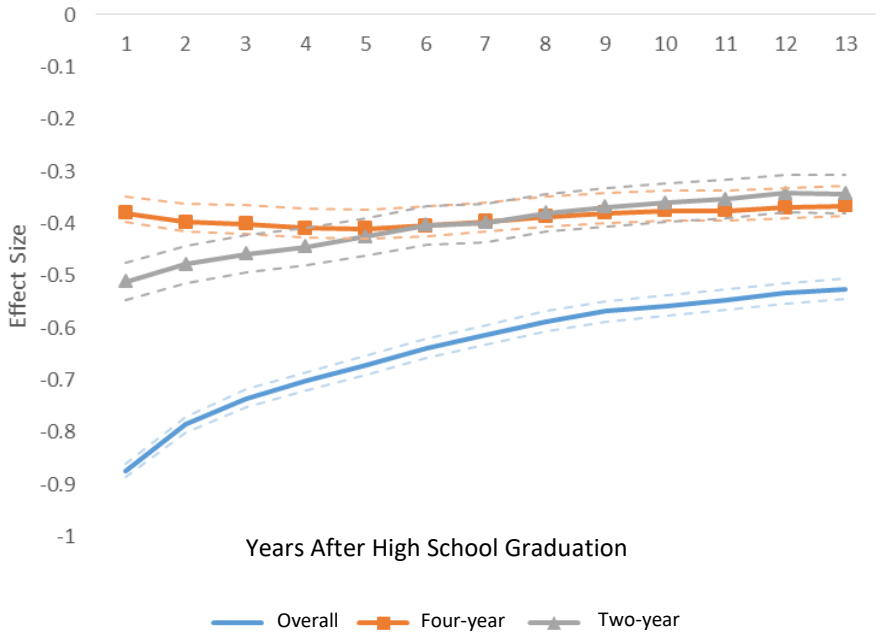
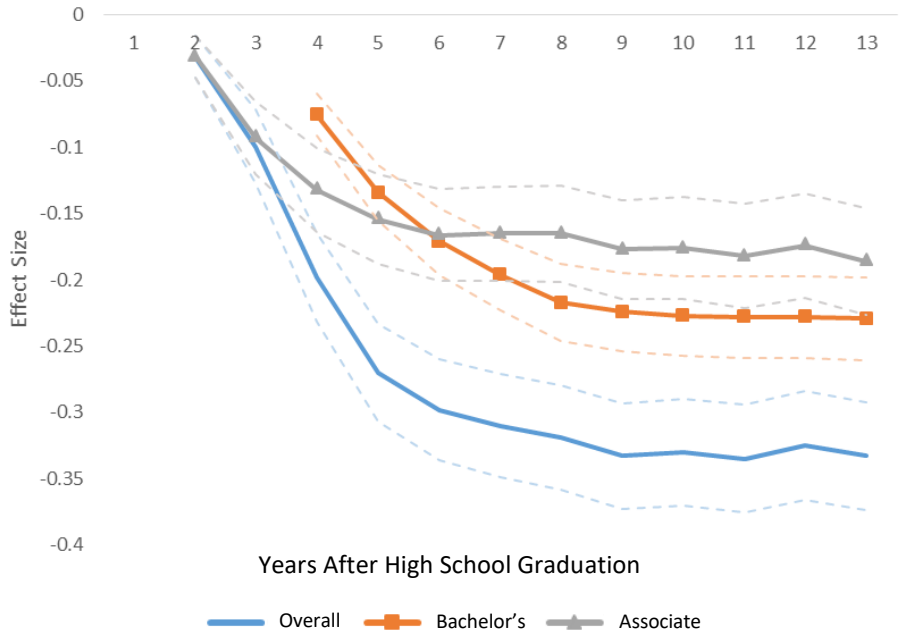
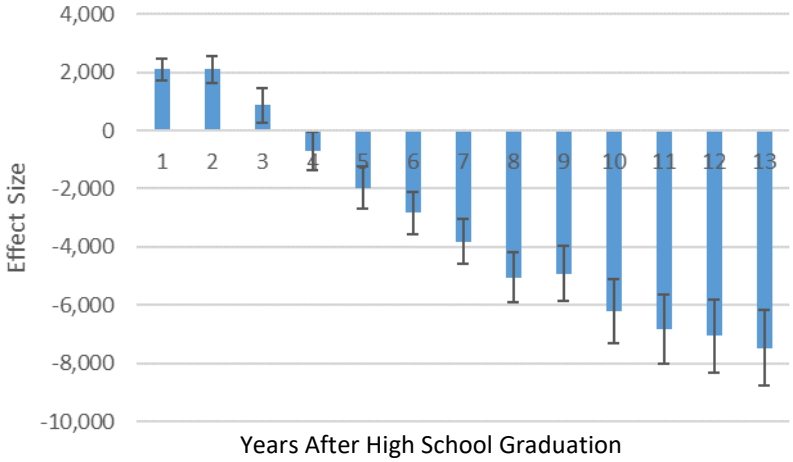



**Figure 9**
**PSM Effects of Delaying on College Completion**



We next examine the effects of delayed college enrollment on labor market outcomes and trajectories. Figures 10–12 show that delaying college enrollment has a negative impact on long-term earnings, work hours, and full-time employment. As shown in Figure 10, in the first three years after high school graduation, delayers had higher annual earnings than did on-time enrollees, since most of the latter were still enrolled in college, while the delayers were working. In the second year after high school graduation, delayers earned $2,097 more than on-time enrollees did. However, delayers' earnings gains in the fourth year dropped to -$704, as on-time enrollees began completing their postsecondary education and starting to work full-time. After that point, the earnings losses experienced by delayers only deepened. In the 13th year after high school graduation, delayers earned $7,470 less than on-time enrollees. The growing disparities between the two groups suggest that delayers earned much less than on-time enrollees did as a result of their lower college enrollment and completion rates. The early earnings benefits of delaying college enrollment cannot offset this long-term earnings penalty.

**Figure 10**
**PSM Effects of Delaying on Annual Earnings by Year**




The trends for work hours (Figure 11) and full-time employment (Figure 12) are similar. In the first four years after high school, delayers worked more and were more likely to work full-time. After that, the effects of delayed college enrollment on work hours were slightly negative. Delayers worked 100 to 200 hours less per year than on-time enrollees did and were approximately 4 to 9 percentage points less likely to work full-

time. The impacts on work hours and employment status are relatively small, given that on-time enrollees worked 1,875 hours on average and that 66 percent of them worked full-time in the 13th year after high school graduation. Consistent with the results shown in Figure 5, Figures 11 and 12 indicate that delayers were very likely to work full-time while in school and tended to work longer hours than on-time enrollees did when enrolled.

**Figure 11**
**PSM Effects of Delaying on Annual Work Hours by Year**

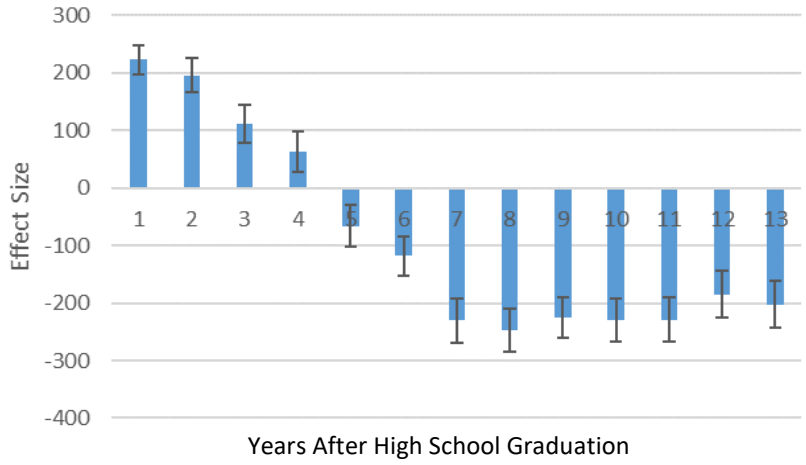
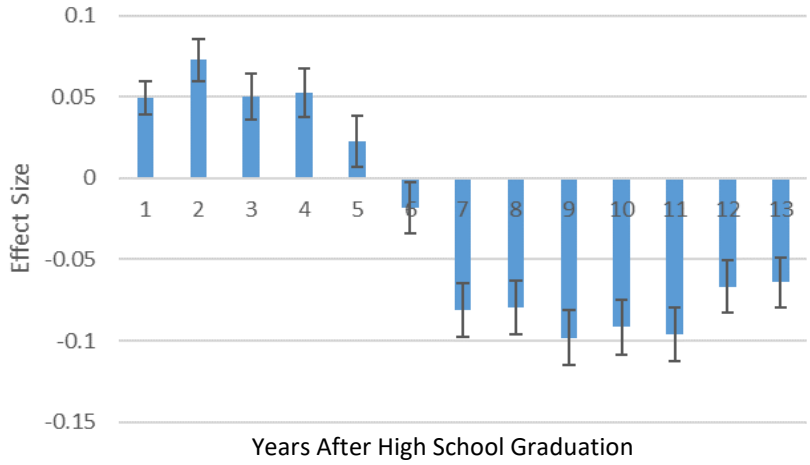



**Figure 12**
**PSM Effects of Delaying on Full-Time Employment by Year**



### 5.4 Robustness to Alternative Specifications

One major criticism of the PSM approach is that it may not adequately account for self-selection bias. If our model ensures that two individuals have the same propensity to delay college enrollment, then what explains why one enrolls on-time and the other does not? For students at the margin of delaying college enrollment (who have a low propensity to delay), enrollment timing may be determined by some idiosyncratic variations (e.g., exogenous variations in local labor markets or sudden life shocks). But for students who have a higher propensity to delay but do not delay, the decision to enroll in college is more likely to be based on self-selection, and we may fail to capture this endogenous selection in the matching process.

To eliminate such endogenous selection, we run a robustness check for inframarginal individuals only (observations with *p*-scores less than .6) as proposed by Scott-Clayton and Minaya (2015). The full results are presented in Appendix Tables A6–A8. The effects of delaying on enrollment, completion, and employment are still negative and significant, but the effect sizes are slightly smaller.

In addition, we test the robustness of our results using a wider caliper, using nearest-neighbor matching, and using a probit regression instead of a logit regression to calculate *p*-scores. Our results are consistent across all these alternative specifications.

### 5.5 Sensitivity to Unobservable Selection

Even after controlling for an extensive list of observable factors, we cannot rule out the possibility that delayers are different from on-time enrollees in unobservable ways. For this reason, it is important to measure the extent to which unobservables would bias our estimators. Following Oster's (2017) approach, which assumes that unobservable selection is proportional to observable selection, for each estimation we calculate $\delta$, the degree of selection on unobservables relative to observables that would be necessary to cancel out the effect. We use Oster's recommended cutoff of $\delta = 1$, meaning the unobservables must be at least as important as the observables to produce a treatment effect of zero.

The results show that the effect of delaying on overall enrollment within 13 years is robust to unobservables that are up to 2.65 times as important as observables. The effect of delaying enrollment on overall degree completion is robust to unobservable

factors that are up to 3.59 times as important as observed factors. Finally, the negative δs for the effects on earnings means that adding unobservable controls increases the magnitude of the effects, so unobservable bias would have to go in the opposite direction to cancel out any observable effects. The full results can be found in Appendix Table A9.

### 5.6 Oaxaca Decomposition

Table 3 presents the results for three Oaxaca decomposition models, indicating the portion of the earnings gap between delayers and on-time enrollees explained by (1) student characteristics alone, (2) student characteristics and college enrollment, and (3) student characteristics and degree completion.[13] On-time enrollees earned $12,126 more than delayers in the 13th year after high school graduation. Model 1 shows that student characteristics alone explain $6,227, or 51 percent, of the gap. After adding college enrollment information, Model 2 is able to explain 61 percent of the earnings gap: 42 percent is explained by individual characteristics and 19 percent by enrollment outcomes.[14] Finally, Model 3 controls for both individual characteristics and degree completion, which is collinear with college enrollment. The explanatory power of the entire model increases to 85 percent—30 percent due to student characteristics and 55 percent due to the lack of degree attainment, mainly bachelor's degree attainment, among delayers.

The Oaxaca decomposition results have three key takeaways. First, individual characteristics explain only one third of the earnings gap between delayers and on-time enrollees, suggesting that the earnings gap could be drastically reduced by encouraging on-time enrollment. Second, four-year college enrollment and bachelor's degree completion are the most influential factors contributing to the earnings gap between delayers and on-time enrollees. Finally, the ability of Model 3 to explain 85 percent of the wage gap gives us confidence in the validity of our Oaxaca decomposition model.

[13] We also tested the model by including student characteristics, college enrollment, *and* degree completion. The results suffered severely from multicollinearity; the contribution from college enrollment was almost absorbed by the contribution from degree completion.

[14] Up to 23 percent of the wage gap can be explained by lower four-year enrollment rates among delayers. Yet since more delayers earn two-year degrees, reducing the wage gap, only 19 percent of the wage gap is explained by college enrollment overall.

**Table 3**
**Oaxaca Decomposition of the Earnings Gap Between On-Time Enrollees and Delayers**

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| | Mean ($) | % of Raw Difference | Mean ($) | % of Raw Difference | Mean ($) | % of Raw Difference |
| Raw difference (annual wage) between on-time enrollees and delayers | 12,126*** | 100% | 12,126*** | 100% | 12,126*** | 100% |
| Total explained by the predictors | 6,227*** | 51% | 7,441*** | 61% | 10,338*** | 85% |
| Student characteristics | 6,227*** | 51% | 5,101*** | 42% | 3,612*** | 30% |
| College enrollment | | | 2,339*** | 19% | | |
| 4-year college | | | 2,759*** | 23% | | |
| 2-year college | | | -420*** | -3% | | |
| College completion | | | | | 6,726*** | 55% |
| Bachelor's degree | | | | | 6,534*** | 54% |
| Associate degree | | | | | 192*** | 2% |
| Unexplained | 5,899*** | 49% | 4,685*** | 39% | 1,788** | 15% |

*Note.* We compare the earnings in the 13th year after high school graduation.

*$p$ < .1. **$p$ < .05. ***$p$ < .01.

## 6. Conclusion

High school graduates often delay college enrollment. Over 40 percent of those in our sample did not enroll in college immediately, and 21 percent never enrolled in college. Factors such as family resources, high school quality, academic performance, marriage, and teen pregnancy are key determinants of college enrollment timing. Female high school graduates are especially vulnerable to teen pregnancy compared with their male peers.

Delaying college enrollment has long-term consequences for students' academic attainment. Our PSM results suggest that delayers are much less likely to enroll in college, and if they do, they tend to attend two-year colleges. Compared with on-time enrollees, delayers in our sample were 37 percentage points less likely to have ever enrolled in a four-year college and 34 percentage points less likely to have ever enrolled in a two-year college 13 years after high school graduation. Delayers were also 23 percentage points less likely to have completed a bachelor's degree and 19 percentage points less likely to have completed an associate degree by the end of the tracking period.

Furthermore, though delayers earn more during the first several years after high school graduation, while on-time enrollees are attending college, their earnings soon

begin to lag behind those of on-time enrollees, and this earnings gap increases substantially with time. The total earnings penalty experienced by delayers compared with on-time enrollees is at least $41,000 in the first 13 years after high school graduation. The lifetime penalty would be at least three times higher. Our Oaxaca decomposition results show that bachelor's degree completion is the most important factor contributing to the earnings gap between delayers and on-time enrollees; differences in individual characteristics only explain about one third of the wage gap.

In considering the implications of our findings, it is important to keep in mind that there are several limitations to this study. First, our definition of delay may overestimate the number of "true delayers" by including individuals who do not intend to enroll in college. The lower college enrollment rates among delayers may therefore not entirely reflect decisions by high school graduates to delay college enrollment. Yet limiting the sample to college enrollees would obscure one of the most important effects of delayed enrollment—its role in impeding students from reenrolling in college, which is the primary consideration for students making decisions on enrollment timing. Second, although we found that individuals who delay college enrollment for different lengths of time have different labor market trajectories, the small sample size of the NLSY97 prohibits us from conducting a causal analysis for each type of delayer. Finally, though our validity tests provide some assurance that our method for estimating the effects of delayed enrollment is reasonable, our PSM results may still contain residual bias, as it is impossible to prove that we have fully accounted for all unobservable characteristics in our matching procedure.

Despite these limitations, our study has clear policy implications. Delayed college enrollment is associated with lower college completion rates and lifetime earnings trajectories. Therefore, policymakers should encourage on-time enrollment and provide financial and informational guidance, especially for low-SES high school graduates. One obvious way to increase college-going would be to prevent "summer melt," the phenomenon in which recent high school graduates who have been accepted to college decide not to enroll in the fall. Castleman, Arnold, and Wartman (2012) found that targeted college counseling and nudging text messages during the summer after high school graduation lead to substantially higher rates of college enrollment in the fall.

Interventions could also potentially target recent high school graduates who are not in college and therefore have access to neither high school nor college counselors. High schools generally keep records of which of their students went to college, and reaching out to recent graduates who did not enroll in college could potentially increase their college enrollment and improve their college choices.

Finally, our descriptive results show that long-term delayers have lower earnings than students with no college experience. Long-term delayers may encounter greater barriers in transitioning from being a full-time worker to being a college student. Addressing the barriers experienced by nontraditional enrollees is thus important, especially for four-year universities, which serve primarily traditional students.

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# Appendix

## Table A1
## Multinomial Regression Analysis: Potential Determinants of the Length of Delay

| | Delayed | Delayed < 3 Years | Delayed 3–7 Years | Delayed > 7 Years | Never Enrolled |
|---|---|---|---|---|---|
| Individual demographics | | | | | |
| Black | -0.526*** | -0.193 | -0.214 | -0.411** | -0.874*** |
| | [0.088] | [0.125] | [0.174] | [0.196] | [0.110] |
| Hispanic | -0.250** | -0.014 | 0.051 | -0.502** | -0.470*** |
| | [0.101] | [0.139] | [0.207] | [0.252] | [0.126] |
| Other race (except White) | -0.181* | -0.026 | -0.246 | 0.148 | -0.346*** |
| | [0.106] | [0.143] | [0.220] | [0.251] | [0.132] |
| Female | -0.505*** | -0.255*** | -0.429*** | -0.430*** | -0.711*** |
| | [0.064] | [0.091] | [0.132] | [0.151] | [0.080] |
| Birth year | -0.130** | -0.038 | 0.075 | -0.039 | -0.241*** |
| | [0.051] | [0.073] | [0.100] | [0.109] | [0.060] |
| High school graduation year | -0.004 | -0.054 | -0.246 | -0.266* | 0.135 |
| | [0.073] | [0.098] | [0.153] | [0.153] | [0.088] |
| Lived in urban area in 1997 | -0.033 | 0.207* | 0.053 | 0.011 | -0.220** |
| | [0.078] | [0.117] | [0.162] | [0.184] | [0.095] |
| Lived in Northeast region in 1997 | 0.488 | 0.422 | 1.235* | 0.67 | 0.305 |
| | [0.357] | [0.484] | [0.701] | [0.789] | [0.420] |
| Lived in North Central region in 1997 | -0.056 | -0.558 | 0.468 | -0.985 | 0.174 |
| | [0.309] | [0.466] | [0.664] | [0.916] | [0.360] |
| Lived in Southern region in 1997 | 0.409 | 0.108 | 1.314** | -0.018 | 0.365 |
| | [0.287] | [0.401] | [0.603] | [0.736] | [0.340] |
| Lived in metropolitan area in 1997 | -0.313*** | -0.174 | -0.449*** | -0.485** | -0.341*** |
| | [0.088] | [0.131] | [0.172] | [0.190] | [0.107] |
| Household demographics | | | | | |
| Household size | 0.040* | 0.032 | 0.018 | 0.085* | 0.045* |
| | [0.022] | [0.030] | [0.042] | [0.045] | [0.026] |
| Highest year of parental education | -0.123*** | -0.079*** | -0.064** | -0.086*** | -0.179*** |
| | [0.012] | [0.017] | [0.025] | [0.029] | [0.015] |
| Household net worth in 1997 (thousands) | -0.002*** | -0.001*** | -0.001* | -0.002** | -0.002*** |
| | [0.000] | [0.000] | [0.001] | [0.001] | [0.000] |
| Household income in high school graduation year (thousands) | -0.004*** | -0.004*** | -0.007*** | -0.007*** | -0.003*** |
| | [0.001] | [0.001] | [0.002] | [0.002] | [0.001] |
| Lived with both parents in high school graduation year | -0.324*** | -0.273*** | -0.382*** | -0.828*** | -0.264*** |
| | [0.066] | [0.094] | [0.135] | [0.158] | [0.082] |

**Table A1 (cont.)**
**Multinomial Regression Analysis: Potential Determinants of the Length of Delay**

| | Delayed | Delayed < 3 Years | Delayed 3–7 Years | Delayed > 7 Years | Never Enrolled |
|---|---|---|---|---|---|
| High school characteristics | | | | | |
| Public school | 0.892*** | 0.681*** | 1.320** | 1.728** | 0.852*** |
| | [0.186] | [0.261] | [0.524] | [0.732] | [0.257] |
| < 299 students | 0.154 | 0.014 | 0.196 | 0.312 | 0.2 |
| | [0.143] | [0.216] | [0.282] | [0.327] | [0.175] |
| 300–499 students | -0.128 | -0.094 | -0.433* | 0.088 | -0.131 |
| | [0.120] | [0.177] | [0.262] | [0.266] | [0.147] |
| 500–749 students | 0.039 | 0.182 | -0.153 | -0.14 | 0.023 |
| | [0.093] | [0.128] | [0.191] | [0.220] | [0.115] |
| 750–999 students | -0.009 | -0.141 | 0.018 | -0.291 | 0.107 |
| | [0.095] | [0.140] | [0.187] | [0.235] | [0.115] |
| Pupil–teacher ratio < 14 | -0.261** | -0.453*** | -0.171 | -0.461* | -0.114 |
| | [0.105] | [0.149] | [0.212] | [0.239] | [0.130] |
| Pupil–teacher ratio 14 to < 18 | -0.121 | -0.230* | -0.162 | -0.113 | -0.031 |
| | [0.090] | [0.125] | [0.184] | [0.200] | [0.113] |
| Pupil–teacher ratio 18 to < 22 | -0.113 | -0.163 | -0.038 | -0.564** | -0.026 |
| | [0.093] | [0.127] | [0.184] | [0.227] | [0.115] |
| Academic preparation | | | | | |
| High school GPA | -1.307*** | -0.993*** | -1.380*** | -1.715*** | -1.482*** |
| | [0.079] | [0.106] | [0.149] | [0.168] | [0.097] |
| ASVAB score percentile | -0.019*** | -0.008*** | -0.010*** | -0.014*** | -0.031*** |
| | [0.001] | [0.002] | [0.003] | [0.003] | [0.002] |
| Other characteristics in high school graduation year | | | | | |
| Married or cohabiting | 0.865*** | 0.479** | 0.660*** | 0.998*** | 1.128*** |
| | [0.136] | [0.192] | [0.241] | [0.247] | [0.156] |
| Pregnant or got someone pregnant | 0.583*** | 0.463** | 0.949*** | 0.815*** | 0.501*** |
| | [0.136] | [0.181] | [0.219] | [0.238] | [0.160] |
| Number of children | 0.683*** | 0.749*** | 0.822*** | 0.853*** | 0.560*** |
| | [0.153] | [0.189] | [0.221] | [0.235] | [0.174] |
| Health condition (5 = excellent) | -0.167*** | -0.131*** | -0.109 | -0.068 | -0.219*** |
| | [0.036] | [0.050] | [0.071] | [0.079] | [0.043] |
| Arrests | 0.422*** | 0.397*** | 0.403*** | 0.446*** | 0.445*** |
| | [0.119] | [0.134] | [0.141] | [0.139] | [0.124] |
| Ever drank alcohol | 0.01 | 0.121 | -0.074 | -0.003 | -0.031 |
| | [0.069] | [0.099] | [0.139] | [0.157] | [0.085] |
| Year * region interaction | Yes | Yes | Yes | Yes | Yes |
| Observations | 6,454 | 6,454 | 6,454 | 6,454 | 6,454 |

**Table A2**
**Balance Check: Summary Statistics by Treatment Status**
**Before and After Propensity Score Matching**

| Variable | Unmatched/ Matched | Mean | | % reduction | | *t*-test | |
|---|---|---|---|---|---|---|---|
| | | Treatment | Control | % bias | \|bias\| | *t* | *p* > \|*t*\| |
| Black | Unmatched | 0.2733 | 0.19872 | 17.6 | | 7.05 | 0 |
| | Matched | 0.2734 | 0.27347 | 0 | 99.9 | -0.01 | 0.996 |
| Hispanic | Unmatched | 0.23168 | 0.16422 | 17 | | 6.81 | 0 |
| | Matched | 0.23143 | 0.26116 | -7.5 | 55.9 | -2.53 | 0.011 |
| Other race (except White) | Unmatched | 0.14328 | 0.12062 | 6.7 | | 2.67 | 0.008 |
| | Matched | 0.14339 | 0.15831 | -4.4 | 34.1 | -1.53 | 0.126 |
| Female | Unmatched | 0.44862 | 0.55068 | -20.5 | | -8.14 | 0 |
| | Matched | 0.44874 | 0.45007 | -0.3 | 98.7 | -0.1 | 0.922 |
| Birth year 1980 | Unmatched | 0.19705 | 0.17892 | 4.6 | | 1.85 | 0.065 |
| | Matched | 0.19651 | 0.20519 | -2.2 | 52.1 | -0.8 | 0.426 |
| Birth year 1981 | Unmatched | 0.21768 | 0.20781 | 2.4 | | 0.96 | 0.338 |
| | Matched | 0.21842 | 0.21464 | 0.9 | 61.6 | 0.34 | 0.736 |
| Birth year 1982 | Unmatched | 0.21657 | 0.20112 | 3.8 | | 1.51 | 0.131 |
| | Matched | 0.21582 | 0.22118 | -1.3 | 65.4 | -0.48 | 0.635 |
| Birth year 1983 | Unmatched | 0.19374 | 0.20433 | -2.7 | | -1.05 | 0.293 |
| | Matched | 0.19354 | 0.18418 | 2.3 | 11.7 | 0.88 | 0.381 |
| Birth year 1984 | Unmatched | 0.17495 | 0.20781 | -8.4 | | -3.3 | 0.001 |
| | Matched | 0.17571 | 0.17481 | 0.2 | 97.3 | 0.09 | 0.931 |
| High school graduation year | Unmatched | 2000.5 | 2000.4 | 6.6 | | 2.62 | 0.009 |
| | Matched | 2000.5 | 2000.5 | 3.2 | 51.1 | 1.2 | 0.23 |
| Household size | Unmatched | 4.5871 | 4.4204 | 11.4 | | 4.59 | 0 |
| | Matched | 4.5806 | 4.5871 | -0.4 | 96.1 | -0.15 | 0.878 |
| Highest year of parental education | Unmatched | 12.49 | 14.327 | -64.3 | | -25.38 | 0 |
| | Matched | 12.501 | 12.382 | 4.1 | 93.6 | 1.47 | 0.143 |
| Household net worth in 1997 (thousands) | Unmatched | 48.095 | 104.06 | -43.4 | | -16.62 | 0 |
| | Matched | 48.335 | 47.897 | 0.3 | 99.2 | 0.17 | 0.864 |
| Household income in high school graduation year (thousands) | Unmatched | 29.569 | 47.235 | -32 | | -12.31 | 0 |
| | Matched | 29.658 | 29.58 | 0.1 | 99.6 | 0.07 | 0.947 |
| Attended public high school | Unmatched | 0.6954 | 0.71356 | -4 | | -1.58 | 0.114 |
| | Matched | 0.69428 | 0.69318 | 0.2 | 93.9 | 0.09 | 0.93 |
| Lived in urban area in 1997 | Unmatched | 0.71455 | 0.73014 | -3.5 | | -1.38 | 0.167 |
| | Matched | 0.71471 | 0.73394 | -4.3 | -23.4 | -1.58 | 0.114 |
| Lived in Northeast region in 1997 | Unmatched | 0.16538 | 0.18374 | -4.8 | | -1.91 | 0.056 |
| | Matched | 0.16493 | 0.16152 | 0.9 | 81.4 | 0.34 | 0.735 |
| Lived in North Central region in 1997 | Unmatched | 0.22983 | 0.25568 | -6 | | -2.38 | 0.017 |
| | Matched | 0.22994 | 0.21742 | 2.9 | 51.6 | 1.1 | 0.27 |
| Lived in Southern region in 1997 | Unmatched | 0.36759 | 0.33779 | 6.2 | | 2.48 | 0.013 |
| | Matched | 0.36887 | 0.35288 | 3.3 | 46.3 | 1.22 | 0.222 |
| Lived in metropolitan area in 1997 | Unmatched | 0.79153 | 0.84194 | -13.1 | | -5.22 | 0 |
| | Matched | 0.79309 | 0.81495 | -5.7 | 56.6 | -2.02 | 0.043 |

**Table A2 (cont.)**
**Balance Check: Summary Statistics by Treatment Status**
**Before and After Propensity Score Matching**

| Variable | Unmatched/ Matched | Mean | | % reduction | | *t*-test | |
|---|---|---|---|---|---|---|---|
| | | Treatment | Control | % bias | \|bias\| | *t* | *p* > \|*t*\| |
| < 299 students at high school | Unmatched | 0.06041 | 0.0698 | -3.8 | | -1.5 | 0.133 |
| | Matched | 0.05944 | 0.05349 | 2.4 | 36.7 | 0.95 | 0.345 |
| 300–499 students at high school | Unmatched | 0.09576 | 0.10538 | -3.2 | | -1.26 | 0.207 |
| | Matched | 0.0951 | 0.0982 | -1 | 67.7 | -0.39 | 0.7 |
| 500–749 students at high school | Unmatched | 0.19558 | 0.20059 | -1.3 | | -0.5 | 0.619 |
| | Matched | 0.19651 | 0.19855 | -0.5 | 59.2 | -0.19 | 0.851 |
| 750–999 students at high school | Unmatched | 0.16317 | 0.15245 | 2.9 | | 1.17 | 0.243 |
| | Matched | 0.16382 | 0.1628 | 0.3 | 90.5 | 0.1 | 0.92 |
| Pupil–teacher ratio < 14 | Unmatched | 0.20884 | 0.23723 | -6.8 | | -2.7 | 0.007 |
| | Matched | 0.20951 | 0.20916 | 0.1 | 98.8 | 0.03 | 0.975 |
| Pupil–teacher ratio 14 to < 18 | Unmatched | 0.32486 | 0.33271 | -1.7 | | -0.66 | 0.508 |
| | Matched | 0.32281 | 0.30543 | 3.7 | -121.5 | 1.37 | 0.17 |
| Pupil–teacher ratio 18 to < 22 | Unmatched | 0.20958 | 0.20647 | 0.8 | | 0.3 | 0.762 |
| | Matched | 0.20951 | 0.20531 | 1 | -35.2 | 0.38 | 0.704 |
| High school GPA | Unmatched | 1.831 | 2.4209 | -44.7 | | -17.63 | 0 |
| | Matched | 1.8349 | 1.8373 | -0.2 | 99.6 | -0.07 | 0.943 |
| ASVAB score percentile | Unmatched | 30.002 | 51.463 | -71.5 | | -27.99 | 0 |
| | Matched | 30.155 | 30.541 | -1.3 | 98.2 | -0.52 | 0.6 |
| Lived with both parents in high school graduation year | Unmatched | 0.46262 | 0.63359 | -34.9 | | -13.87 | 0 |
| | Matched | 0.46397 | 0.46543 | -0.3 | 99.1 | -0.11 | 0.914 |
| Married or cohabiting in high school graduation year | Unmatched | 0.10424 | 0.03076 | 29.6 | | 12.25 | 0 |
| | Matched | 0.09955 | 0.09241 | 2.9 | 90.3 | 0.89 | 0.374 |
| Pregnant or got someone pregnant in high school graduation year | Unmatched | 0.1046 | 0.03183 | 29.2 | | 12.06 | 0 |
| | Matched | 0.10067 | 0.09859 | 0.8 | 97.1 | 0.26 | 0.799 |
| Ever had a child | Unmatched | 0.08287 | 0.01658 | 30.9 | | 12.92 | 0 |
| | Matched | 0.07875 | 0.07183 | 3.2 | 89.6 | 0.96 | 0.336 |
| Health condition in high school graduation year (5 = excellent) | Unmatched | 3.6243 | 3.9874 | -31.5 | | -12.65 | 0 |
| | Matched | 3.6282 | 3.6264 | 0.2 | 99.5 | 0.05 | 0.959 |
| Ever arrested | Unmatched | 0.05267 | 0.02728 | 13 | | 5.28 | 0 |
| | Matched | 0.05052 | 0.04986 | 0.3 | 97.4 | 0.11 | 0.912 |
| Ever drank alcohol | Unmatched | 0.56022 | 0.64643 | -17.7 | | -7.04 | 0 |
| | Matched | 0.56092 | 0.54866 | 2.5 | 85.8 | 0.9 | 0.366 |
| Household income missing | Unmatched | 0.35617 | 0.36266 | -1.4 | | -0.54 | 0.592 |
| | Matched | 0.3581 | 0.36858 | -2.2 | -61.4 | -0.8 | 0.424 |
| Public vs. private high school attendance missing | Unmatched | 0.28766 | 0.21423 | 17 | | 6.79 | 0 |
| | Matched | 0.28863 | 0.28709 | 0.4 | 97.9 | 0.13 | 0.901 |
| High school GPA missing | Unmatched | 0.30018 | 0.22038 | 18.3 | | 7.3 | 0 |
| | Matched | 0.30163 | 0.2994 | 0.5 | 97.2 | 0.18 | 0.858 |
| ASVAB score percentile missing | Unmatched | 0.1989 | 0.15218 | 12.3 | | 4.92 | 0 |
| | Matched | 0.19948 | 0.19694 | 0.7 | 94.6 | 0.23 | 0.815 |
| Health condition in high school missing | Unmatched | 0.09797 | 0.04306 | 21.6 | | 8.81 | 0 |
| | Matched | 0.09881 | 0.09908 | -0.1 | 99.5 | -0.03 | 0.973 |

**Table A3**
**Effects of Delay on College Enrollment by Year, OLS and PSM**

| | OLS | | PSM | |
|---|---|---|---|---|
| Outcomes | Coefficient | *SE* | Coefficient | *SE* |
| Panel A: Ever enrolled in college by… | | | | |
| 1 year after high school completion | -0.844*** | (0.00821) | -0.872*** | (0.00646) |
| 2 years after high school completion | -0.744*** | (0.00966) | -0.785*** | (0.00791) |
| 3 years after high school completion | -0.685*** | (0.0102) | -0.735*** | (0.00849) |
| 4 years after high school completion | -0.651*** | (0.0104) | -0.703*** | (0.00877) |
| 5 years after high school completion | -0.617*** | (0.0105) | -0.671*** | (0.00900) |
| 6 years after high school completion | -0.583*** | (0.0106) | -0.639*** | (0.00918) |
| 7 years after high school completion | -0.557*** | (0.0106) | -0.614*** | (0.00930) |
| 8 years after high school completion | -0.532*** | (0.0106) | -0.587*** | (0.00940) |
| 9 years after high school completion | -0.515*** | (0.0105) | -0.570*** | (0.00944) |
| 10 years after high school completion | -0.504*** | (0.0105) | -0.558*** | (0.00948) |
| 11 years after high school completion | -0.493*** | (0.0105) | -0.547*** | (0.00950) |
| 12 years after high school completion | -0.480*** | (0.0105) | -0.534*** | (0.00951) |
| 13 years after high school completion | -0.473*** | (0.0104) | -0.527*** | (0.00952) |
| Panel B: Ever enrolled in a four-year college by… | | | | |
| 1 year after high school completion | -0.453*** | (0.0112) | -0.387*** | (0.0133) |
| 2 years after high school completion | -0.458*** | (0.0119) | -0.402*** | (0.0141) |
| 3 years after high school completion | -0.455*** | (0.0123) | -0.407*** | (0.0145) |
| 4 years after high school completion | -0.458*** | (0.0126) | -0.417*** | (0.0150) |
| 5 years after high school completion | -0.455*** | (0.0127) | -0.418*** | (0.0151) |
| 6 years after high school completion | -0.447*** | (0.0129) | -0.414*** | (0.0152) |
| 7 years after high school completion | -0.438*** | (0.0130) | -0.406*** | (0.0154) |
| 8 years after high school completion | -0.428*** | (0.0131) | -0.396*** | (0.0155) |
| 9 years after high school completion | -0.422*** | (0.0132) | -0.389*** | (0.0156) |
| 10 years after high school completion | -0.416*** | (0.0132) | -0.383*** | (0.0157) |
| 11 years after high school completion | -0.413*** | (0.0133) | -0.382*** | (0.0158) |
| 12 years after high school completion | -0.409*** | (0.0133) | -0.377*** | (0.0158) |
| 13 years after high school completion | -0.407*** | (0.0133) | -0.375*** | (0.0158) |
| Panel C: Ever enrolled in a two-year college by… | | | | |
| 1 year after high school completion | -0.454*** | (0.0119) | -0.523*** | (0.0141) |
| 2 years after high school completion | -0.408*** | (0.0130) | -0.484*** | (0.0146) |
| 3 years after high school completion | -0.389*** | (0.0134) | -0.462*** | (0.0148) |
| 4 years after high school completion | -0.375*** | (0.0136) | -0.448*** | (0.0149) |
| 5 years after high school completion | -0.357*** | (0.0137) | -0.433*** | (0.0148) |
| 6 years after high school completion | -0.334*** | (0.0140) | -0.411*** | (0.0149) |
| 7 years after high school completion | -0.321*** | (0.0141) | -0.400*** | (0.0149) |
| 8 years after high school completion | -0.304*** | (0.0142) | -0.381*** | (0.0150) |
| 9 years after high school completion | -0.292*** | (0.0142) | -0.370*** | (0.0149) |
| 10 years after high school completion | -0.284*** | (0.0143) | -0.362*** | (0.0149) |
| 11 years after high school completion | -0.277*** | (0.0143) | -0.354*** | (0.0149) |
| 12 years after high school completion | -0.268*** | (0.0143) | -0.345*** | (0.0150) |
| 13 years after high school completion | -0.267*** | (0.0143) | -0.345*** | (0.0149) |

*$p < .1$. **$p < .05$. ***$p < .01$.

**Table A4**
**Effects of Delay on Degree Completion by Year, OLS and PSM**

| | OLS | | PSM | |
|---|---|---|---|---|
| Outcomes | Coefficient | *SE* | Coefficient | *SE* |
| Panel A: Ever received a college degree by… | | | | |
| 2 years after high school completion | -0.0230*** | (0.00400) | -0.0252*** | (0.00501) |
| 3 years after high school completion | -0.0836*** | (0.00677) | -0.0850*** | (0.00892) |
| 4 years after high school completion | -0.195*** | (0.00988) | -0.181*** | (0.0116) |
| 5 years after high school completion | -0.274*** | (0.0116) | -0.247*** | (0.0133) |
| 6 years after high school completion | -0.315*** | (0.0122) | -0.287*** | (0.0142) |
| 7 years after high school completion | -0.332*** | (0.0128) | -0.309*** | (0.0148) |
| 8 years after high school completion | -0.334*** | (0.0131) | -0.314*** | (0.0152) |
| 9 years after high school completion | -0.340*** | (0.0133) | -0.326*** | (0.0156) |
| 10 years after high school completion | -0.336*** | (0.0135) | -0.326*** | (0.0159) |
| 11 years after high school completion | -0.329*** | (0.0136) | -0.322*** | (0.0161) |
| 12 years after high school completion | -0.320*** | (0.0138) | -0.314*** | (0.0162) |
| 13 years after high school completion | -0.318*** | (0.0138) | -0.318*** | (0.0162) |
| Panel B: Ever received a bachelor's degree by… | | | | |
| 4 years after high school completion | -0.0959*** | (0.00671) | -0.0714*** | (0.00574) |
| 5 years after high school completion | -0.171*** | (0.00869) | -0.126*** | (0.00771) |
| 6 years after high school completion | -0.214*** | (0.00957) | -0.166*** | (0.00930) |
| 7 years after high school completion | -0.240*** | (0.0102) | -0.190*** | (0.0102) |
| 8 years after high school completion | -0.259*** | (0.0107) | -0.209*** | (0.0110) |
| 9 years after high school completion | -0.266*** | (0.0110) | -0.217*** | (0.0116) |
| 10 years after high school completion | -0.269*** | (0.0112) | -0.219*** | (0.0119) |
| 11 years after high school completion | -0.271*** | (0.0114) | -0.221*** | (0.0121) |
| 12 years after high school completion | -0.271*** | (0.0116) | -0.220*** | (0.0123) |
| 13 years after high school completion | -0.272*** | (0.0118) | -0.221*** | (0.0125) |
| Panel C: Ever received an associate degree by… | | | | |
| 2 years after high school completion | -0.0217*** | (0.00396) | -0.0246*** | (0.00500) |
| 3 years after high school completion | -0.0730*** | (0.00642) | -0.0777*** | (0.00866) |
| 4 years after high school completion | -0.109*** | (0.00836) | -0.118*** | (0.0107) |
| 5 years after high school completion | -0.126*** | (0.00972) | -0.137*** | (0.0120) |
| 6 years after high school completion | -0.140*** | (0.0105) | -0.155*** | (0.0130) |
| 7 years after high school completion | -0.140*** | (0.0113) | -0.161*** | (0.0137) |
| 8 years after high school completion | -0.139*** | (0.0118) | -0.161*** | (0.0141) |
| 9 years after high school completion | -0.143*** | (0.0122) | -0.168*** | (0.0147) |
| 10 years after high school completion | -0.141*** | (0.0126) | -0.172*** | (0.0151) |
| 11 years after high school completion | -0.137*** | (0.0129) | -0.170*** | (0.0154) |
| 12 years after high school completion | -0.130*** | (0.0132) | -0.164*** | (0.0156) |
| 13 years after high school completion | -0.129*** | (0.0134) | -0.171*** | (0.0158) |

*$p < .1$. **$p < .05$. ***$p < .01$.

## Table A5
## Effects of Delay on Labor Market Outcomes, OLS and PSM

| | OLS | | PSM | |
|---|---|---|---|---|
| Outcomes | Coefficient | *SE* | Coefficient | *SE* |
| Panel A: Annual Income (adjusted 2010 dollars) | | | | |
| 1st year after high school completion | 2,309*** | (277.1) | 2,094*** | (340.0) |
| 2nd year after high school completion | 2,462*** | (344.9) | 2,097*** | (383.8) |
| 3rd year after high school completion | 1,443*** | (416.3) | 871.7* | (480.8) |
| 4th year after high school completion | -9.650 | (458.6) | -704.3 | (560.8) |
| 5th year after high school completion | -1,507*** | (504.1) | -1,961*** | (603.4) |
| 6th year after high school completion | -3,131*** | (544.0) | -2,836*** | (591.3) |
| 7th year after high school completion | -4,933*** | (580.1) | -3,814*** | (634.1) |
| 8th year after high school completion | -6,116*** | (638.7) | -5,046*** | (677.8) |
| 9th year after high school completion | -6,266*** | (678.4) | -4,915*** | (698.2) |
| 10th year after high school completion | -7,285*** | (729.0) | -6,208*** | (803.4) |
| 11th year after high school completion | -7,864*** | (783.7) | -6,818*** | (881.3) |
| 12th year after high school completion | -8,224*** | (835.2) | -7,048*** | (924.5) |
| 13th year after high school completion | -8,596*** | (917.3) | -7,470*** | (978.4) |
| Panel B: Total work hours | | | | |
| 1st year after high school completion | 223.4*** | (22.50) | 222.7*** | (25.72) |
| 2nd year after high school completion | 223.5*** | (26.46) | 196.2*** | (30.37) |
| 3rd year after high school completion | 131.7*** | (28.34) | 111.6*** | (33.81) |
| 4th year after high school completion | 112.9*** | (29.62) | 63.46* | (34.95) |
| 5th year after high school completion | -26.94 | (29.78) | -65.66* | (36.53) |
| 6th year after high school completion | -112.1*** | (29.70) | -117.6*** | (34.19) |
| 7th year after high school completion | -212.7*** | (30.58) | -230.3*** | (37.96) |
| 8th year after high school completion | -259.1*** | (30.77) | -247.0*** | (36.89) |
| 9th year after high school completion | -259.0*** | (30.76) | -225.0*** | (35.57) |
| 10th year after high school completion | -257.7*** | (31.92) | -229.0*** | (37.40) |
| 11th year after high school completion | -250.6*** | (32.30) | -228.8*** | (37.93) |
| 12th year after high school completion | -229.9*** | (33.30) | -184.5*** | (39.75) |
| 13th year after high school completion | -237.0*** | (33.91) | -202.2*** | (40.46) |
| Panel C: Full-time work status (> 35 hours/week for 50 weeks) | | | | |
| 1st year after high school completion | 0.0605*** | (0.0091) | 0.0493*** | (0.0104) |
| 2nd year after high school completion | 0.0823*** | (0.0114) | 0.0728*** | (0.0129) |
| 3rd year after high school completion | 0.0622*** | (0.0126) | 0.0505*** | (0.0142) |
| 4th year after high school completion | 0.0710*** | (0.0132) | 0.0525*** | (0.0147) |
| 5th year after high school completion | 0.0412*** | (0.0136) | 0.0225 | (0.0156) |
| 6th year after high school completion | -0.0216 | (0.0140) | -0.0180 | (0.0158) |
| 7th year after high school completion | -0.0742*** | (0.0144) | -0.0810*** | (0.0165) |
| 8th year after high school completion | -0.0805*** | (0.0144) | -0.0797*** | (0.0164) |
| 9th year after high school completion | -0.105*** | (0.0145) | -0.0980*** | (0.0166) |
| 10th year after high school completion | -0.0897*** | (0.0145) | -0.0916*** | (0.0166) |
| 11th year after high school completion | -0.0943*** | (0.0146) | -0.0957*** | (0.0166) |
| 12th year after high school completion | -0.0803*** | (0.0142) | -0.0666*** | (0.0161) |
| 13th year after high school completion | -0.0726*** | (0.0135) | -0.0641*** | (0.0156) |

*Note*. NLSY97 follow-up surveys were not conducted annually after 2011. We imputed the labor market outcomes for 2012 and 2014 by averaging the outcomes from the years immediately before and after.

*$p < .1$. **$p < .05$. ***$p < .01$.

**Table A6**
**Effects of Delay on College Enrollment by Year, Restricted to "Thick Support" Sample**

| | OLS | | PSM | |
|---|---|---|---|---|
| Outcomes | Coefficient | *SE* | Coefficient | *SE* |
| Panel A: Ever enrolled in college by… | | | | |
| 1 year after high school completion | -0.844*** | (0.00821) | -0.827*** | (0.0103) |
| 2 years after high school completion | -0.744*** | (0.00966) | -0.713*** | (0.0123) |
| 3 years after high school completion | -0.685*** | (0.0102) | -0.644*** | (0.0130) |
| 4 years after high school completion | -0.651*** | (0.0104) | -0.607*** | (0.0132) |
| 5 years after high school completion | -0.617*** | (0.0105) | -0.569*** | (0.0134) |
| 6 years after high school completion | -0.583*** | (0.0106) | -0.532*** | (0.0134) |
| 7 years after high school completion | -0.557*** | (0.0106) | -0.510*** | (0.0134) |
| 8 years after high school completion | -0.532*** | (0.0106) | -0.487*** | (0.0134) |
| 9 years after high school completion | -0.515*** | (0.0105) | -0.469*** | (0.0134) |
| 10 years after high school completion | -0.504*** | (0.0105) | -0.458*** | (0.0134) |
| 11 years after high school completion | -0.493*** | (0.0105) | -0.447*** | (0.0133) |
| 12 years after high school completion | -0.480*** | (0.0105) | -0.432*** | (0.0133) |
| 13 years after high school completion | -0.473*** | (0.0104) | -0.424*** | (0.0133) |
| Panel B: Ever enrolled in a four-year college by… | | | | |
| 1 year after high school completion | -0.453*** | (0.0112) | -0.482*** | (0.0138) |
| 2 years after high school completion | -0.458*** | (0.0119) | -0.482*** | (0.0148) |
| 3 years after high school completion | -0.455*** | (0.0123) | -0.470*** | (0.0154) |
| 4 years after high school completion | -0.458*** | (0.0126) | -0.460*** | (0.0158) |
| 5 years after high school completion | -0.455*** | (0.0127) | -0.454*** | (0.0160) |
| 6 years after high school completion | -0.447*** | (0.0129) | -0.443*** | (0.0163) |
| 7 years after high school completion | -0.438*** | (0.0130) | -0.431*** | (0.0164) |
| 8 years after high school completion | -0.428*** | (0.0131) | -0.421*** | (0.0167) |
| 9 years after high school completion | -0.422*** | (0.0132) | -0.414*** | (0.0167) |
| 10 years after high school completion | -0.416*** | (0.0132) | -0.406*** | (0.0168) |
| 11 years after high school completion | -0.413*** | (0.0133) | -0.402*** | (0.0169) |
| 12 years after high school completion | -0.409*** | (0.0133) | -0.399*** | (0.0169) |
| 13 years after high school completion | -0.407*** | (0.0133) | -0.399*** | (0.0169) |
| Panel C: Ever enrolled in a two-year college by… | | | | |
| 1 year after high school completion | -0.454*** | (0.0119) | -0.417*** | (0.0146) |
| 2 years after high school completion | -0.408*** | (0.0130) | -0.362*** | (0.0160) |
| 3 years after high school completion | -0.389*** | (0.0134) | -0.339*** | (0.0165) |
| 4 years after high school completion | -0.375*** | (0.0136) | -0.320*** | (0.0168) |
| 5 years after high school completion | -0.357*** | (0.0137) | -0.295*** | (0.0172) |
| 6 years after high school completion | -0.334*** | (0.0140) | -0.272*** | (0.0174) |
| 7 years after high school completion | -0.321*** | (0.0141) | -0.262*** | (0.0175) |
| 8 years after high school completion | -0.304*** | (0.0142) | -0.244*** | (0.0177) |
| 9 years after high school completion | -0.292*** | (0.0142) | -0.231*** | (0.0177) |
| 10 years after high school completion | -0.284*** | (0.0143) | -0.222*** | (0.0178) |
| 11 years after high school completion | -0.277*** | (0.0143) | -0.212*** | (0.0178) |
| 12 years after high school completion | -0.268*** | (0.0143) | -0.203*** | (0.0178) |
| 13 years after high school completion | -0.267*** | (0.0143) | -0.203*** | (0.0178) |

*$p$ < .1. **$p$ < .05. ***$p$ < .01

**Table A7**
**Effects of Delay on Degree Completion by Year, Restricted to "Thick Support" Sample**

| | OLS | | PSM | |
|---|---|---|---|---|
| Outcomes | Coefficient | *SE* | Coefficient | *SE* |
| Panel A: Ever received a college degree by… | | | | |
| 2 years after high school completion | -0.0230*** | (0.00400) | -0.0195*** | (0.00473) |
| 3 years after high school completion | -0.0836*** | (0.00677) | -0.0704*** | (0.00770) |
| 4 years after high school completion | -0.195*** | (0.00988) | -0.195*** | (0.0116) |
| 5 years after high school completion | -0.274*** | (0.0116) | -0.286*** | (0.0142) |
| 6 years after high school completion | -0.315*** | (0.0122) | -0.320*** | (0.0152) |
| 7 years after high school completion | -0.332*** | (0.0128) | -0.331*** | (0.0161) |
| 8 years after high school completion | -0.334*** | (0.0131) | -0.333*** | (0.0166) |
| 9 years after high school completion | -0.340*** | (0.0133) | -0.336*** | (0.0169) |
| 10 years after high school completion | -0.336*** | (0.0135) | -0.326*** | (0.0171) |
| 11 years after high school completion | -0.329*** | (0.0136) | -0.318*** | (0.0173) |
| 12 years after high school completion | -0.320*** | (0.0138) | -0.307*** | (0.0174) |
| 13 years after high school completion | -0.318*** | (0.0138) | -0.300*** | (0.0174) |
| Panel B: Ever received a bachelor's degree by… | | | | |
| 4 years after high school completion | -0.0959*** | (0.00671) | -0.113*** | (0.00763) |
| 5 years after high school completion | -0.171*** | (0.00869) | -0.202*** | (0.0104) |
| 6 years after high school completion | -0.214*** | (0.00957) | -0.239*** | (0.0115) |
| 7 years after high school completion | -0.240*** | (0.0102) | -0.264*** | (0.0125) |
| 8 years after high school completion | -0.259*** | (0.0107) | -0.280*** | (0.0131) |
| 9 years after high school completion | -0.266*** | (0.0110) | -0.286*** | (0.0134) |
| 10 years after high school completion | -0.269*** | (0.0112) | -0.289*** | (0.0138) |
| 11 years after high school completion | -0.271*** | (0.0114) | -0.292*** | (0.0142) |
| 12 years after high school completion | -0.271*** | (0.0116) | -0.290*** | (0.0144) |
| 13 years after high school completion | -0.272*** | (0.0118) | -0.291*** | (0.0146) |
| Panel C: Ever received an associate degree by… | | | | |
| 2 years after high school completion | -0.0217*** | (0.00396) | -0.0181*** | (0.00468) |
| 3 years after high school completion | -0.0730*** | (0.00642) | -0.0599*** | (0.00715) |
| 4 years after high school completion | -0.109*** | (0.00836) | -0.0909*** | (0.00975) |
| 5 years after high school completion | -0.126*** | (0.00972) | -0.105*** | (0.0118) |
| 6 years after high school completion | -0.140*** | (0.0105) | -0.114*** | (0.0130) |
| 7 years after high school completion | -0.140*** | (0.0113) | -0.108*** | (0.0141) |
| 8 years after high school completion | -0.139*** | (0.0118) | -0.108*** | (0.0148) |
| 9 years after high school completion | -0.143*** | (0.0122) | -0.109*** | (0.0153) |
| 10 years after high school completion | -0.141*** | (0.0126) | -0.106*** | (0.0158) |
| 11 years after high school completion | -0.137*** | (0.0129) | -0.102*** | (0.0162) |
| 12 years after high school completion | -0.130*** | (0.0132) | -0.0926*** | (0.0165) |
| 13 years after high school completion | -0.129*** | (0.0134) | -0.0843*** | (0.0167) |

*$p$ < .1. **$p$ < .05. ***$p$ < .01

**Table A8**

**Effects of Delay on Labor Market Outcomes by Year, Restricted to "Thick Support" Sample**

| | OLS | | PSM | |
|---|---|---|---|---|
| Outcomes | Coefficient | *SE* | Coefficient | *SE* |
| Panel A: Annual Income (adjusted 2010 dollars) | | | | |
| 1st year after high school completion | 2,309*** | (277.1) | 2,601*** | (345.8) |
| 2nd year after high school completion | 2,462*** | (344.9) | 2,900*** | (424.0) |
| 3rd year after high school completion | 1,443*** | (416.3) | 2,232*** | (499.6) |
| 4th year after high school completion | -9.650 | (458.6) | 825.1 | (553.0) |
| 5th year after high school completion | -1,507*** | (504.1) | -789.4 | (623.1) |
| 6th year after high school completion | -3,131*** | (544.0) | -3,183*** | (677.6) |
| 7th year after high school completion | -4,933*** | (580.1) | -4,965*** | (724.0) |
| 8th year after high school completion | -6,116*** | (638.7) | -6,003*** | (798.3) |
| 9th year after high school completion | -6,266*** | (678.4) | -6,051*** | (836.9) |
| 10th year after high school completion | -7,285*** | (729.0) | -7,676*** | (886.8) |
| 11th year after high school completion | -7,864*** | (783.7) | -8,853*** | (953.4) |
| 12th year after high school completion | -8,224*** | (835.2) | -9,272*** | (1,011) |
| 13th year after high school completion | -8,596*** | (917.3) | -9,639*** | (1,113) |
| Panel B: Total work hours | | | | |
| 1st year after high school completion | 223.4*** | (22.50) | 218.9*** | (28.44) |
| 2nd year after high school completion | 223.5*** | (26.46) | 226.2*** | (33.13) |
| 3rd year after high school completion | 131.7*** | (28.34) | 137.6*** | (34.16) |
| 4th year after high school completion | 112.9*** | (29.62) | 160.8*** | (36.18) |
| 5th year after high school completion | -26.94 | (29.78) | 4.979 | (36.62) |
| 6th year after high school completion | -112.1*** | (29.70) | -99.31*** | (36.97) |
| 7th year after high school completion | -212.7*** | (30.58) | -177.7*** | (38.11) |
| 8th year after high school completion | -259.1*** | (30.77) | -235.7*** | (38.04) |
| 9th year after high school completion | -259.0*** | (30.76) | -269.3*** | (38.31) |
| 10th year after high school completion | -257.7*** | (31.92) | -242.0*** | (39.45) |
| 11th year after high school completion | -250.6*** | (32.30) | -261.1*** | (39.80) |
| 12th year after high school completion | -229.9*** | (33.30) | -281.4*** | (40.11) |
| 13th year after high school completion | -237.0*** | (33.91) | -275.8*** | (42.06) |
| Panel C: Full-time work status (> 35 hours/week for 50 weeks) | | | | |
| 1st year after high school completion | 0.0605*** | (0.00906) | 0.0669*** | (0.0115) |
| 2nd year after high school completion | 0.0823*** | (0.0114) | 0.0923*** | (0.0148) |
| 3rd year after high school completion | 0.0622*** | (0.0126) | 0.0604*** | (0.0162) |
| 4th year after high school completion | 0.0710*** | (0.0132) | 0.0814*** | (0.0169) |
| 5th year after high school completion | 0.0412*** | (0.0136) | 0.0530*** | (0.0172) |
| 6th year after high school completion | -0.0216 | (0.0140) | -0.0178 | (0.0177) |
| 7th year after high school completion | -0.0742*** | (0.0144) | -0.0521*** | (0.0181) |
| 8th year after high school completion | -0.0805*** | (0.0144) | -0.0679*** | (0.0181) |
| 9th year after high school completion | -0.105*** | (0.0145) | -0.0981*** | (0.0181) |
| 10th year after high school completion | -0.0897*** | (0.0145) | -0.0744*** | (0.0182) |
| 11th year after high school completion | -0.0943*** | (0.0146) | -0.0843*** | (0.0182) |
| 12th year after high school completion | -0.0803*** | (0.0142) | -0.0927*** | (0.0178) |
| 13th year after high school completion | -0.0726*** | (0.0135) | -0.0822*** | (0.0169) |

*Note*. NLSY97 follow-up surveys were not conducted annually after 2011. We imputed the labor market outcomes for 2012 and 2014 by averaging the outcomes from the years immediately before and after.

*$p$ < .1. **$p$ < .05. ***$p$ < .01

**Table A9**
**Sensitivity to Unobservable Selection, $\delta$ for $\beta = 0$**

| | Panel A: College enrollment | | |
|---|---|---|---|
| | Ever enrolled in college by… | Ever enrolled in a four-year college by… | Ever enrolled in a two-year college by… |
| 1 year after high school completion | 1.33 | 10.34 | 2.20 |
| 2 years after high school completion | 1.66 | 7.69 | 1.73 |
| 3 years after high school completion | 1.83 | 6.52 | 1.63 |
| 4 years after high school completion | 1.89 | 5.45 | 1.59 |
| 5 years after high school completion | 2.05 | 4.95 | 1.56 |
| 6 years after high school completion | 2.23 | 5.01 | 1.48 |
| 7 years after high school completion | 2.25 | 4.94 | 1.48 |
| 8 years after high school completion | 2.33 | 4.78 | 1.45 |
| 9 years after high school completion | 2.43 | 4.73 | 1.49 |
| 10 years after high school completion | 2.50 | 4.67 | 1.50 |
| 11 years after high school completion | 2.51 | 4.53 | 1.46 |
| 12 years after high school completion | 2.59 | 4.56 | 1.47 |
| 13 years after high school completion | 2.65 | 4.70 | 1.47 |
| | Panel B: College completion | | |
| | Ever received a college degree by… | Ever received a bachelor's degree by… | Ever received an associate degree by… |
| 2 years after high school completion | -3.32 | | -3.24 |
| 3 years after high school completion | 5.25 | | 3.85 |
| 4 years after high school completion | 4.46 | 12.37 | 2.44 |
| 5 years after high school completion | 3.07 | 8.93 | 0.87 |
| 6 years after high school completion | 3.43 | 9.24 | 0.97 |
| 7 years after high school completion | 3.71 | 7.29 | 0.95 |
| 8 years after high school completion | 3.87 | 6.19 | 0.95 |
| 9 years after high school completion | 3.24 | 5.04 | 0.86 |
| 10 years after high school completion | 3.13 | 4.69 | 0.94 |
| 11 years after high school completion | 3.44 | 4.71 | 0.87 |
| 12 years after high school completion | 3.42 | 4.80 | 0.83 |
| 13 years after high school completion | 3.59 | 4.54 | 0.93 |
| | Panel C: Employment outcomes | | |
| | Annual Income (adjusted 2010 dollars) | Total work hours | Full-time work status (> 35 hours/week for 50 weeks) |
| 1 year after high school completion | 1.85 | 1.39 | 0.54 |
| 2 years after high school completion | 2.79 | 1.09 | 1.31 |
| 3 years after high school completion | 0.59 | 0.78 | 0.91 |
| 4 years after high school completion | -0.65 | 0.37 | 0.58 |
| 5 years after high school completion | -3.25 | -0.39 | 0.69 |
| 6 years after high school completion | -6.21 | -4.01 | -0.45 |
| 7 years after high school completion | -8.02 | 2.30 | -14.88 |
| 8 years after high school completion | -6.20 | 5.85 | 1.45 |
| 9 years after high school completion | -6.10 | -18.77 | 1.08 |
| 10 years after high school completion | -24.62 | 18.06 | 2.14 |
| 11 years after high school completion | -31.81 | -19.39 | 1.66 |
| 12 years after high school completion | -7.38 | -2.84 | 0.95 |
| 13 years after high school completion | -4.23 | -2.11 | 1.23 |