

Born Under a Lucky Star: Financial Aid, Credit Constraints, and College Completion

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Abstract

Financial aid has been shown to affect student decisions to enroll in college but less is known about the effect of financial aid on enrolled students. This study examines how financial aid affects students who have already decided to enroll in college. Specifically, this study investigates the effects of additional financial aid on graduation, credits attempted, persistence, and grade point average. I leverage a discrete change in the amount of federal financial aid available to financially independent students to document the effect of additional financial aid on student outcomes. I combine the discrete change in financial aid with administrative records from Texas' public colleges and universities in a regression discontinuity framework. I find that additional financial aid accelerates graduation for university seniors. This occurs because students attempt more credits but do not reduce their grade point average and is consistent with binding credit constraints. Community college students are also considered, though they experience smaller changes in financial aid as a result of financial independence and do not experience changes in student outcomes.

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1 Introduction

Attending college can have large impacts on students' earnings as well as many other dimensions of students' lives (Oreopoulos and Salvanes, 2011; Zimmerman, 2014; Hoekstra, 2009). Moreover, students who *complete* college have substantially higher wages than those who do not (Oreopoulos and Petronijevic, 2013). Understanding factors affecting college completion has received additional attention as policymakers have realized the gains from college completion and recognized the large number of students who begin college but do not complete a degree. Financial aid may play a key role in helping students graduate from college and this paper explores how students who have already enrolled in college are affected by additional financial resources. Specifically, this study examines the effect of additional financial aid on graduation, credits attempted, grade point average (GPA), and persistence.

The price of college has been shown to affect student enrollment in numerous studies.¹ However, fewer studies have focused on how financial aid for students already enrolled in college affects student outcomes.² College enrollment rates have grown since 1970 but college completion rates have stagnated (Turner, 2004). In fact, less than 60% of students who begin a bachelor's degree will finish in six years and approximately 20% of students who begin a two year program will finish within three years (National Center for Education Statistics, 2013). Among college enrollees, low income students' graduation rates often lag behind their higher income peers, which suggests that financial considerations may play a role.³ This paper documents that additional financial aid accelerates graduation for university seniors and presents evidence that is consistent with seniors experiencing binding credit constraints.

To examine the effect of financial aid on enrolled students I focus on changes in students' classification as financially dependent to examine the effect of financial aid for already-enrolled students. Financial independence from parents can induce large changes in federal financial aid such as Pell Grants and federal subsidized loans. This paper documents the changes in financial aid that occur with financial independence and links changes in financial aid to changes in student outcomes. Financial independence will be shown to have heterogeneous impacts on student finan-

¹See (Deming and Dynarski, 2009) for a summary

²These studies will be discussed in detail in Section 2.

³This is the case in Virginia which keeps detailed records on parent income and college completion (State Council of Higher Education for Virginia, 2015).

cial aid packages depending on family income and whether the student is attending a university or community college.⁴ I leverage Texas administrative data from 2002-03 to 2013-14 to examine these effects. Ultimately, I find that increases in financial aid for university seniors increases credits attempted and accelerates graduation. I find that financial independence has a smaller effect on financial aid packages at community colleges and has no effect on credits attempted, persistence, or graduation.

The change in financial aid studied in this paper occurs for older students who are sometimes called “nontraditional” students. However, this label may be misleading as over 60 percent of bachelor’s degrees granted in Texas from 2002-2014 were to students who were 24 or older at the time of graduation. The fraction of students 24 years old or older receiving a degree or certificate from a community college is even higher. Older students constitute a large fraction of the college-going population as evidenced by the nationally representative 2012 National Postsecondary Aid Survey where 51.3% of all undergraduate students were classified as financially independent and 43.8% were 24 years or older ([U.S. Department of Education, 2009](#)). Not only are older students a large part of the college going population, they are an increasing share. In 1970, students 25 and older constituted 27.7% of all undergraduate enrollment and by 2010 they accounted for 42.6% ([National Center for Education Statistics, 2013](#)). Since 1990, over 40% of students enrolled as undergraduates were 25 years old or older. Despite their growing prominence, the response of older students to financial aid has rarely been studied.⁵ This study sheds new insight into this large group of older students and how the federal financial aid system affects them.

Older students are also particularly relevant when considering college graduation. This study will consider university seniors who turn 24 during the school year. These students have accumulated substantial college credit but many do not graduate in a timely manner. In fact, only 44 percent graduate in the year they turn 24. Some never graduate with 17.3 percent having not received a bachelor’s degree within 4 years. These students are at the margin of graduation and additional financial aid may enable them to accelerate receiving a degree or help them complete a degree when they otherwise would not.

The primary focus in this study will be on federal financial aid. Federal financial aid is sub-

⁴Community college and four year students differ along many dimensions, including age and price responsiveness ([Denning, 2015](#))

⁵[Seftor and Turner \(2002\)](#) is a notable exception that will be discussed in section 2.

stantial, with over \$171 billion disbursed in 2012-13 of which \$33 billion was allocated to Pell Grants (CollegeBoard, 2014). Despite the large investment, very little is known about the effect of additional federal aid on already-enrolled students. Financially independent students feature prominently among federal aid recipients and made up nearly 60% of Pell Grant recipients in 2010-11. (Department of Education, 2013). Very little is known about the consequences of classifying students as financially independent and one of the contributions of the present study is that it sheds light on the consequences of this prominent phenomenon.

The current paper contributes to the existing literature on the effect of financial aid for students enrolled in college in several ways. First, this paper considers the effects of need-based financial aid on enrolled students' graduation, persistence, credits attempted, and GPA at both community colleges and universities.⁶ Separating the effect of financial aid on enrollment from its effects on post enrollment outcomes is critical for a full picture of financial aid policy. Second, a primary focus on this paper will be on graduation outcomes. Lengthening time to college graduation is costly for students (in foregone wages), schools, and state and federal governments. Third, this paper explores the effects of financial aid on older students who represent a large and growing fraction of students in higher education. Older students also are very relevant for understanding factors affecting college graduation as they have often accumulated substantial credit. Fourth, the change in financial aid largely affects Pell Grant amounts and federal loans, two of the most prominent forms of financial aid in the United States. Lastly, this paper examines financial independence which is particularly relevant because nearly 60% of Pell Grant recipients are financially independent.

The rest of the paper will proceed as follows. Section 2 will discuss the conceptual framework and related literature. Section 3 will discuss the institutional details of financial independence. Section 4 will introduce the data used and Section 5 will discuss how the effect of financial aid on already-enrolled students is identified. Section 6 will present the results of estimation and Section 7 will conclude.

⁶Considering community colleges and universities separately is important because community college students are a large fraction of the higher education sector and differ from universities in meaningful ways and notably in their price responsiveness (Denning, 2015)

2 Conceptual Framework

A robust literature has shown that reducing the price of college increases college enrollment.⁷ The general finding is that a \$1,000 reduction in the cost of college increases enrollment by 2-4 percentage points. However, one of the less-considered potential benefits of reducing the price of college is that it can affect inframarginal students who would have enrolled in the absence of a reduced price but now are paying less to go to college. Reducing the price of college may affect student's number of credits attempted, the probability of reenrollment, grade point average, and ultimately graduation. This study will explicitly examine whether increased financial aid affects inframarginal students and their college decisions. Understanding the effect of financial aid on inframarginal students is critical for understanding the entire effect of financial aid policy and can shed light on the causes for the large number of students who do not complete their degree.

Additional financial aid may affect student outcomes such as course-taking, or degree completion, but often the direction of the effect is ambiguous. If credit constraints are binding, financial aid could act as a substitute for working during college and as such, students might devote more time to their studies potentially increasing credits attempted, GPA, or even timely graduation. Financial aid may also decrease credit hours taken in a semester or increase time spent in college if a student values the time spent in college (Jacob et al., 2013). These changes may, in turn, affect time to graduation or even graduation rates. There is some evidence that higher expected prices of an additional year of college can decrease time to graduation (Garibaldi et al., 2012) suggesting that students may value additional years in college.⁸ Ultimately, the theoretical impact of additional financial aid for enrolled students is ambiguous and requires empirical work to determine a sign on the effect.

Prior work on the effect of need-based aid on success in college has largely found that increased financial aid increases persistence, though the effects vary quite a bit by institutional setting. Three of the papers most similar to the current study focus on students who received additional financial aid after already being enrolled in college. Goldrick-Rab et al. (2011) use a randomized controlled

⁷See (Deming and Dynarski, 2009) for a discussion of this literature.

⁸Garibaldi et al. (2012) examines Bocconi University in Italy which is notably a very different setting than public universities in the United States or specifically Texas. Moreover, the policies are different with Garibaldi et al. (2012) examining anticipated discontinuities in tuition and the present study examining changes in financial aid that are likely to be unanticipated. The differences in these settings may lead to different graduation responses to college price.

trial to examine the effect of need-based aid for freshman in Wisconsin and find that increased financial aid increased persistence at schools with low persistence rates, but no effect was found at schools with higher persistence rates. [Barrow et al. \(2014\)](#) examines financial aid that was randomly assigned at two Louisiana community colleges and find that financial aid at community colleges that contains incentives had large effects on community college credit accumulation and GPA. Additionally, [Marx and Turner \(2015\)](#) look at students in the City University of New York and use discontinuities in the Pell Grant formula. Their primary focus is on the borrowing behavior of students but they also find that additional Pell Grant dollars increase credits attempted. One takeaway from these studies is that the context in which the need-based aid is delivered can have significant impacts on the effects on student behavior. Additionally, the programs studied in [Goldrick-Rab et al. \(2011\)](#) and [Barrow et al. \(2014\)](#) included notification of new financial aid programs and potentially additional counseling whereas [Marx and Turner \(2015\)](#) and the present study examine changes in financial aid distributed largely within the context of the existing financial aid system. The present study is the first of which I am aware to explicitly study graduation outcomes, though [Goldrick-Rab et al. \(2011\)](#); [Barrow et al. \(2014\)](#) will be able to look at these outcomes as time passes.

Other studies have focused on the longer term effects of need-based aid. [Castleman and Long \(2013\)](#) examine a need-based grant in Florida and show that it induced immediate enrollment in addition to increasing student persistence and bachelor's degree receipt. [Bettinger \(2015\)](#) examines the expansion of need based aid in Ohio and finds that additional aid reduced the chances of college drop out in students' first year. However, in both of these studies it is difficult to interpret the effects for inframarginal students as the grants affected initial student enrollment.

One contribution of this study is to focus on older student and builds off of the work in [Seftor and Turner \(2002\)](#). [Seftor and Turner \(2002\)](#) examine the effect of financial independence on student enrollment and finds that financial independence increases student enrollment. The present study builds on this work by studying financial independence and focuses on outcomes beyond enrollment. I am also to precisely measure both the change in aid and student outcomes as a result of detailed administrative data. [Seftor and Turner \(2002\)](#) use a differences-in-differences framework to examine the impact of the change the age at which students were classified as independent. They find that decreased access to federal financial aid significantly decreased college

enrollment of older students using CPS data. Their findings suggest that federal financial aid policy determining independence can have large effects. One potential shortcoming of their paper is that the result may be driven by different trends in enrollment for the groups they expect to be affected. Additionally, they use one change in policy which may lead to a biased estimate, particularly if other changes occur contemporaneously. (Conley and Taber, 2011).⁹ The current paper also examines federal financial independence but uses a different source of variation and detailed administrative data to consider longer term outcomes.

3 Background

The United States Federal Government has several financial programs that are designed to help students pay for college. A host of factors determine students' eligibility for these programs including income, assets, and family structure. A primary consideration is whether students' income and assets are considered separately from their parents—that is, if they are financially independent. This distinction between dependent and independent students does not need to reflect actual financial dependence but rather deals with statutes governing the amount of financial aid disbursed. This section will discuss two programs where financial independence changes the amount of aid disbursed. The first set of programs is administered by the United States Department of Education which I will refer to as “federal financial aid.” The second is a part of the United States Tax Code and I will refer to it as “tax aid.”

3.1 Federal Financial Aid

Federal financial aid consists of federal grants, student loans, and work study. The largest federal grant program is the Pell Grant which is targeted toward low-income students. In the 2013 fiscal year the Pell Grant cost over \$33 billion and provided aid to over 9 million students. Various federal student loans are also available to students and low-income students may take out loans at subsidized interest rates. In order to be eligible for need-based financial aid students must file a Free Application for Federal Student Aid (FAFSA).

⁹Seftor and Turner (2002) also examine the effect on students ages 21 to 23 where the present study focuses on students ages 23 and 24.

The FAFSA uses information about student income and assets as well as family income and assets and demographic information (such as the number of siblings in college) and a complex formula to compute an Expected Family Contribution (EFC). This EFC determines eligibility for need-based federal programs with lower values leading to eligibility for more grants and subsidized loans. In general, the federal financial aid awards are calculated yearly and use information for the prior year.¹⁰

Students must include parent information on their FAFSA as long as they are considered financially dependent. Undergraduate students may be classified as financially independent for several reasons including being over 24 years old as of January 1st of the school year, being married, having dependent children, or a few other reasons.¹¹ When students are independent, parental financial information is not considered and student aid eligibility increases as a result. All else equal, independent students qualify for larger amounts of financial aid (both grants and subsidized loans) than dependent students.

Independent status is determined once per year. Students who are 24 or older as of January 1st will be independent for the entire school year. Students who are 23 years and 364 days old and younger that meet the other conditions for dependent status will be declared dependent for the entire year. This discontinuity creates a situation where students are very similar in age (and other characteristics) but are treated very differently in terms of their eligibility for federal financial aid. This is the institutional oddity that will be leveraged to examine the effect of additional financial aid arising from financial independence.

3.2 Tax Aid

The United States Tax Code gives special treatment to dependent children. Children can be claimed as dependents as long as they are younger than 19 at the end of the year. If a child is a full-time student they may be claimed as a dependent if they are younger than 24 at the end of the year and meet certain conditions. Those conditions are that the child must be a full time student for at least 5 months in a year, they must live with their parents for at least 6 months of the year, and must receive more than half of their financial support from their parents. If these

¹⁰If a life event occurs that would change a student's EFC, students can amend their FAFSA to reflect the new information and possibly change their eligibility for Pell Grants.

¹¹See <http://studentaid.ed.gov/fafsa/filling-out/dependency> for all conditions that determine independent status.

conditions are met parents may claim their student children as dependents and receive exemptions and tax credits that reduce taxable income. Additionally, dependent students may qualify the taxpayer for tax credits like the American Opportunity Credit, the Lifetime Learning Credit, and the Earned Income Tax Credit. During the time period studied in this paper, the Hope Tax Credit and Tuition Deduction could also be used.

Tax aid changes at the same January 1st threshold for some students. Ultimately this paper will be able to identify the reduced form effect of changes in tax aid and financial aid resulting from financial independence. However, I argue that the changes in federal financial aid are likely to dominate changes in Tax aid for several reasons. The first is that tax aid is disbursed for the prior financial tax year no earlier than February. This is after extensive and intensive margin enrollment decisions are made for both semesters which likely limits the extent to which tax aid can influence student outcomes. Also, [Bulman and Hoxby \(2015\)](#) use administrative tax data and convincingly show that tax aid does not change whether students enroll or what types of institutions they enroll in which suggests that the effect of tax aid on other student outcome may also be small. Further, student's tax liability is likely to decrease as a result of the change whereas family tax liability is likely to decrease making the effect on student finances ambiguous.¹² The last is that the change in financial independence is likely to affect a minority of students as discussed in the Appendix. For this reason the results of this study will largely be interpreted as the effects of financial aid rather than tax aid.

4 Data

The data for this project come from the Texas Higher Education Coordinating Board and contain the universe of students who were enrolled in public colleges and universities in the state of Texas from 2002-03 to 2013-14. The data contain demographic information about the students including race, gender, and birth date. They also contain records on student enrollment and credits attempted. Importantly, all financial aid disbursed by the university is also contained in the data. Additionally, many of the fields from the FAFSA are available including including dependency status and Expected Family Contribution (EFC). I adjust all financial aid to be in constant 2013

¹²A more complete discussion of this can be found in the appendix.

dollars for comparability.

The data are matched across the various files and years to create the variables of interest. All variables created deal with a academic year which starts in the fall of one year and extends through the end of summer of the next. The sample consists of students who were enrolled in college in the year they turn 24. However, students may respond to additional financial aid in the year they turn 24 by changing enrollment. This is checked in Section 5 and found not be a concern.

Table 1 contains summary statistics for university seniors and community college students. University students receive a substantial amount of financial aid with the average student receiving over \$1,800 in grant money and taking out \$3,912 in loans. Graduation is common for these students with 44 percent of seniors who turn 24 graduating in that year and 70 percent graduating by the end of the following year. Also, 30 percent of students received a Pell Grant in the previous year and students attempted an average of 22 credits hours within the current year. Students at two-year schools are more likely to be racial minorities and receive less financial aid. Two-year students earn a two-year degree or certificate by the next school year 15 percent of the time.

5 Identification

As previously discussed, students who are 23 years old on January 1st are counted as dependent for the entire previous year if they meet other conditions. However, students who are 24 on January 1st are dependent for the prior year. This rule means that students who are nearly identical in age (and other characteristics) receive different amounts of financial aid for an entire year. I leverage the discrete nature of the change in classification to examine the effect of additional financial aid arising from being declared independent on student outcomes using a regression discontinuity framework.

The sample will consist of students who are attending a public college or university in Texas in the year that they turn 24. For universities, the sample is restricted seniors because graduation is a key outcome considered and students with less credits are not at risk of graduation. However, this restriction keeps the majority of university students turning 24 during the school year as 71.5% are classified as seniors. The outcomes considered include re-enrollment, graduation in X years, credits attempted, and financial aid.

The estimating equation is:

$$Y_{it} = f(\widehat{age}_{it}) + \theta \cdot 1(Ind > 0) + X_{it} + \mu_t + \epsilon_{it}, \text{ for } |\widehat{age}_i| < j \quad (1)$$

Where i indexes students and t indexes school year. Y_{its} is a student outcome like enrollment, credits attempted, or graduation, $f(\widehat{age}_{it})$ is a flexible function of a student's age as of January 1st, $1(Ind > 0)$ is an indicator for being 24 as of January 1st, θ is the parameter of interest and is the effect of the additional financial aid arising from students being declared financially independent in the next year. X_{it} contains control variables like race and gender and μ_t are year fixed effects. Finally, ϵ_{it} is an idiosyncratic error term. This equation is estimated on a subset of the data to compare students who are similar ages and in the preferred, local linear specification j is chosen using the procedure outlined in [Imbens and Kalyanaraman \(2012\)](#) though tests for sensitivity to bandwidth will be presented. This equation will be estimated separately for students at community colleges and university seniors. I will also examine heterogeneity by other student characteristics including prior year Pell receipt as a proxy for income.

Assumptions for Identification

Using a regression discontinuity requires assuming that the running variable, in this case birth date, cannot be manipulated to gain access to treatment. Obviously a student's true birth date is not manipulable by the student before or after birth. Students do have incentives to misreport their birth date to gain additional dollars but the reported birth date is verified by comparison with Social Security Administration records. In this sense, birth date is an ideal running variable because it is not determined by the student and is not misreported.

However, there is evidence that birth dates are manipulated in response to tax incentives ([Schulkind and Shapiro, 2014](#); [LaLumia et al., 2015](#)). These studies found that there is a small amount of manipulation in response to tax incentives that is less than half the amount of re-timing of births that is typically seen on a weekend. A \$1,000 change in taxes leads to about 1% of births being re-timed.¹³ This may be a concern for identification if children of parents who re-time their births in response to tax incentives produce children who systematically respond differently to

¹³[Schulkind and Shapiro \(2014\)](#) find that the manipulation is due to increased cesarean rates before January 1.

financial independence 24 years later. It is not obvious how these students would differ systematically but it is a possibility.

To explore the amount of re-timing of births that occurs Figure 1 plots the number of students with each birthday among students turning 24 in a given school year for community college students and university seniors. The panels on the left include all students. Panels on the right remove students who were born within three days of January 1st and the distribution is much more smooth through the cutoff. There is some re-timing of births evident but the distribution appears to be smooth after removing the 3 days surrounding January 1st.¹⁴ To avoid any issues associated with potential re-timing of births the preferred specification will be a regression discontinuity “donut” estimator (Almond and Doyle, 2011) where the 3 days on either side of January 1st are omitted. The results are quantitatively and qualitatively very similar if those 3 days are included and those results are available upon request.

Another test of the assumption for a regression discontinuity estimator is that students on one side of the cutoff are similar to students on the other side in observable and unobservable ways.¹⁵ I test for observable differences by looking for discontinuities in predetermined characteristics like race, gender, grant aid received in the previous year, loans received in the previous year and EFC and fulltime status for students who had filed a FAFSA in the previous year. Results from these checks for balance of the covariates are found in 2. In these regressions there are 18 discontinuities considered and one is statistically significant at the 5% level and one is significant at the 10% level. This is about what would be expected when testing 18 covariates. Overall, these discontinuities suggest students on either side of the age discontinuity are similar in observable characteristics.

Given that students are unable to manipulate their date of birth and that observed covariates do not vary discretely by eligibility status, the testable assumptions of the regression discontinuity estimator are met and the results can be interpreted as the causal impact of financial independence on student outcomes.

If the sample of students who are enrolled in college changes in anticipation of changes in

¹⁴There does appear to be a decrease in births associated with Christmas though that is unlikely to be problematic for the identification strategy.

¹⁵There may be unobserved variables that also differ on each side of the age cutoff. One example that may be relevant is insurance coverage. In the state of Texas during this time frame employers were required to cover dependent children on health for health insurance until age 25 so insurance status is not likely to vary discretely at this threshold (Dillender, 2014). Starting in 2011, the Affordable Care Act mandated that all children under the age of 26 be eligible for inclusion on their parent’s plans which would not affect the identification strategy of this paper.

financial aid, conditioning the sample on enrollment in the year a student turns 24 would be problematic. To check for this I examine the re-enrollment probabilities of students who turned 23 in a given school year.¹⁶ For both university and community college students the estimated change in reenrollment probability for students who will receive additional financial aid is essentially zero and precisely estimated. For universities students the estimated discontinuity was .002 with a standard error of .004 and for community college students the estimated discontinuity is .0005 with a standard error of .004. The lack of a response may be because this rule governing independent status is not widely known. Given that there is no measured effect on reenrollment, I continue to condition the sample on enrollment in the year a student turns 24.

6 Results

6.1 Two Year Students

Financial independence increases the amount of financial aid that two year students receive. This is seen in Figure 2 where students who were 24 on January 1st received more grant aid and took out more federal loans. The discontinuities are relatively small and are estimated in Table 3 to be an \$187 increase in grants and a \$181 increase in loans. Student outcomes, which can be seen in Figures 2 and 3 do not appear to have changed substantially with no measured discontinuity in probability of re-enrollment, graduation in the current year, graduation in the next year, or GPA. There seems to be some evidence that credit hours modestly increased although this is only marginally statistically significant and is small in magnitude at .09 credit hours or 1/30th of a typical 3 hour class. If all of the effect on credits attempted arose from grants (rather than grants and loans) then a \$1,000 increase in grants would lead to an increase in credits attempted of .5 which is similar to estimates from Marx and Turner (2015).

One reason that student outcomes may not have changed is that the amount of financial aid students received as a result of independence is quite low. Another reason is that the change in financial aid is concentrated among students who are relatively wealthier. This is seen in Table 5 which interacts the running variable and discontinuity with an indicator for not having received

¹⁶First time college students represent .6 percent of students enrolled who were born in a 100 day window around January 1st. For this reason, re-enrollment is the likely margin for additional financial aid to affect enrollment.

a Pell Grant in the previous year. Thus, the main effect is for students who previously received a Pell Grant. There is no change in total grants for previous Pell recipients and an increase in Loans of \$241. Students who had not received a Pell Grant previously saw grants increase by \$322 and no change in loans. This pattern is consistent with what would be expected given the rules of the policy. Students who had previously received a Pell Grant had parents with lower incomes on average. So when parent incomes are excluded from the calculation of financial aid, students who had previously received a Pell Grant are less likely to see increases in grant aid.

Overall, the evidence for two-year college students suggests that financial independence has very little impact on financial aid packages. As a result, it also has very little impact on student outcomes.

6.2 Four Year Students

In contrast to two year colleges, seniors at four year schools see substantial changes in financial aid arising from financial independence. This is documented in Figure 4. Students who are financially independent (on the right of the figures) receive an additional \$918 of grant dollars, the bulk of which is increased Pell Grants (\$797). They also increase the amount of federal loans by \$857. Between grants and loans this represents a significant change to student finances totaling over \$1,775.

This large change in financial aid allows an examination of whether student outcomes are affected with large increases in financial aid. The effect on student outcomes are presented in Figures 4 and 5 and Table 4. Student credit hours attempted increase by .397. With increased classes attempted, GPA could potentially decrease if students do not change the time devoted to studying. However, in spite of this larger class load, student GPAs are unaffected with an estimated discontinuity of .00096 with a 95% confidence interval of to-.024 to .024. The additional financial aid increased student credits attempted but did not reduce performance in those credits.

As previously discussed, additional financial aid may increase or decrease the amount of credits attempted. If students face credit constraints then additional financial aid will increase credits attempted. If students value time in college, credits attempted may decrease or stay the same. These findings suggest that students are operating under credit constraints and that easing these

credit constraints allows them to focus more on schooling.

Because seniors are attempting more credits and GPA is unaffected, graduation has the potential to be affected. This is seen in Figure 5 and in Table 4. Students are more 1.76 percentage points more like to graduate in the year they turn 24 (in the tables this is Grad 4yr in 0y) if they received financial aid than if they didn't. This discontinuity is clearly visible in the figure and is statistically different from zero at the 1% level. There is an accompanying dip in the probability of enrolling in the next year which provides evidence that the results are not spurious. Students graduate and as a result, do not enroll in the next year.

Students are more likely to graduate in the year they turn 24. This could either be a result of re-timing graduation by encouraging students to graduate earlier than they otherwise would have or could arise from students graduating who otherwise would not. To investigate this graduation in either the year students turn 24 or the year afterward is considered (in the tables Grad 4yr in 1y). The estimated coefficient is .002 which suggests that additional financial aid re-timed graduations rather than induced graduation among students who not have otherwise graduated.

6.2.1 Heterogeneity

As in the case of two year students, I examine heterogeneity by a measure of parental income. In Table 6, separate discontinuities are estimated for students who had previously received a Pell Grant (main effect) as well as for students who had not. Several interesting patterns emerge. First, students who previously received a Pell Grant see an additional \$385 of grant aid and take out an additional \$1017 of loans as a result of financial independence. Students who had not previously received a Pell Grant see a much larger increase in Grant aid of \$1157 and take out \$782 in loans. Overall, financial independence is giving more grants to students from relatively wealthy backgrounds and enabling students from poorer backgrounds to take out additional loans.

For student outcomes, just-independent students who had previously received a Pell Grant attempt .35 more credit hours, experience no change in GPA and graduate in the year they turn 24 2.6 percentage points more often. There are no statistically significant difference between students who received a Pell Grant and students who did not for these outcomes. However, the point estimates suggest that, if anything, additional financial aid is less likely to affect the graduation

timing of wealthier students. This is again consistent with additional financial aid easing credit constraints and allowing students to focus on attending school.

6.3 Robustness

Two additional robustness checks are performed to make sure the results are not spurious. The first is to check the choice of bandwidth and is presented in Figure 6. This figure considers the main result of the paper which finds that students who are financially independent and receive additional financial aid are more likely to graduate in the year they receive the aid. Each of the dots represents an estimated discontinuity along with 95% confidence intervals for different bandwidth choices. The estimate is stable across bandwidths and is statistically different from zero starting with the bandwidth of .9. This confirms that the estimate is not sensitive to the choice of bandwidth which is in line with the visual discontinuity seen in Figure 5.

One concern is that students born before and after January 1st are unobservably different and have differential outcomes as a result of these differences rather than differences in financial aid. One way to test this is to perform a placebo test with students turning 22. I perform the same analysis as before but instead use students who are turning 22 in a school year. These students do not experience any differential change in financial aid if they are 22 by January 1st and so the students should have the same outcomes irrespective of if they are 22 by January 1st unless there is some unobserved underlying differences.¹⁷ This is exactly what is found in Table 7 where discontinuities are estimated and only one is significant at the 10% level.

7 Discussion and Conclusion

This paper presents evidence that credit constraints can matter in college. University seniors seem to be credit constrained and easing this constraint with financial independence speeds up graduation by one year. This additional financial aid has benefits for the student as well as potential benefits for the university they attend. Students who are declared financially independent are able to have an additional year of full-time work as a college graduate. The returns to college are large

¹⁷Students turning 22 are chosen because students who are 23 may be looking ahead to the next year and financial independence (or lack thereof) and adjusting their schooling decisions accordingly. There is no evidence of this occurring but I focus on 22 year out of caution

and an additional year in the labor force could represent substantial gains to students. Moreover, institutions reduce the time it takes for students to graduate which may reduce the cost per degree.

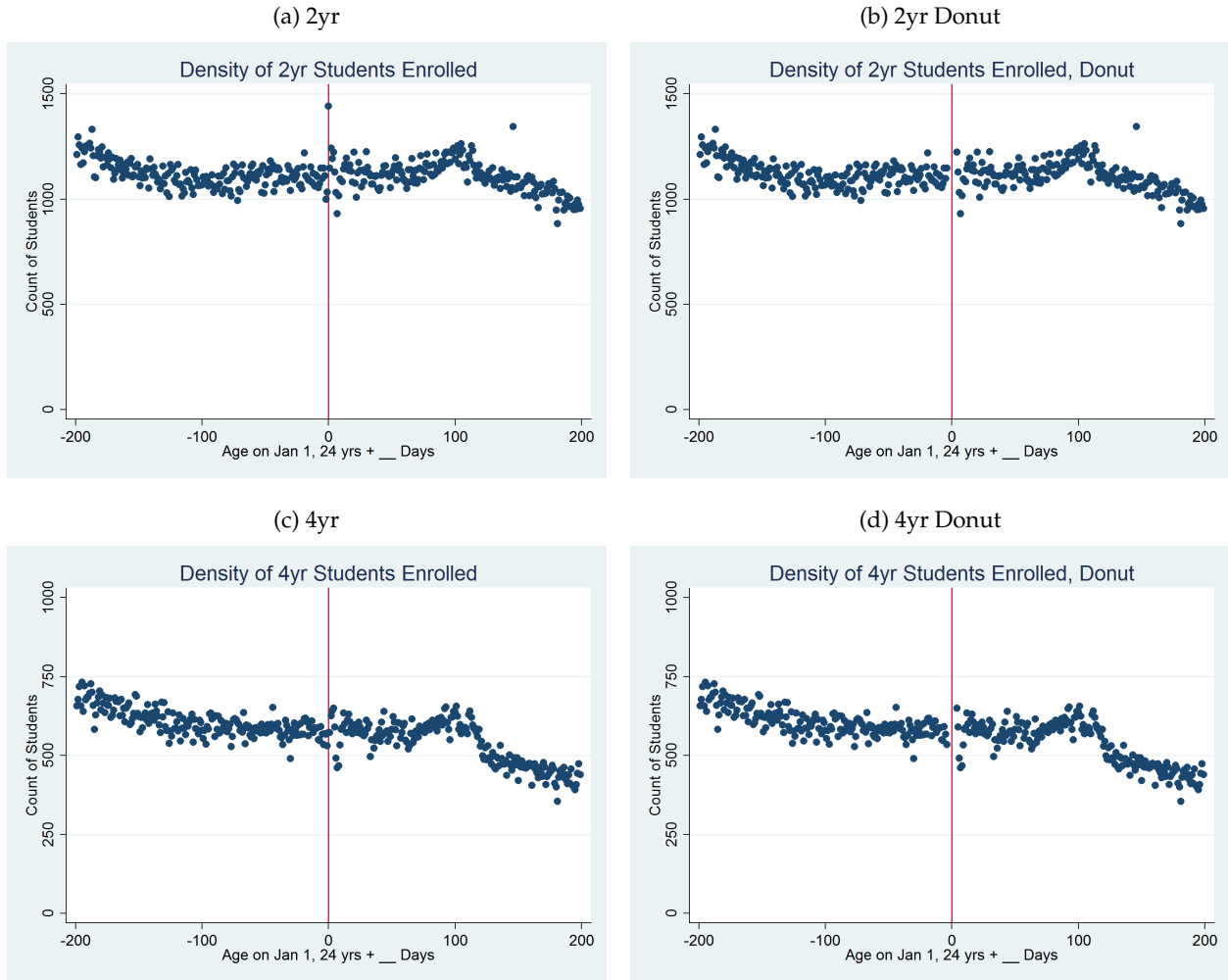
The results from this paper at a first glance stand at odds with [Garibaldi et al. \(2012\)](#) where higher future college costs reduce time to graduation. A key difference in these settings is that the cost in [Garibaldi et al. \(2012\)](#) is likely to be well-known by students as they have (likely) been paying that tuition the entire time. However, in the United States financial independence represents a discount over what students have previously been paying to attend college. Moreover, this oddity in the rules is likely not well known, as partially evidenced by the null effect on future enrollment of students turning 23, which would allow it to operate as an income shock. If so, additional income reduces time to graduation while additional expected costs also decrease time to graduation.

In terms of policy, the insights of both studies could be combined where a hypothetical grant and potentially additional loans are offered to students who become seniors. However, the grant is only available for one year thus increasing the future price of college and the current income of students. Additionally, this is likely to be more effective for students with lower family income where credit constraints are most likely to bind.

This study provides several insights into the effect of financial aid on enrolled students. The first is that credit constraints can have academic impacts. This paper documents that the amount of financial resources available to students affects timely graduation. This insight may shed light on the causes of increasing time to degree and stagnating completion rates. In particular, the rising cost of college may be negatively affecting student graduation rates ([Turner, 2004](#)). Furthermore, policymakers should consider the effects of tuition policy on inframarginal students as it has the potential to affect important student outcomes. Taken together, the results of this paper suggest the returns to intelligent financial aid policy design may be large to both the student and government.

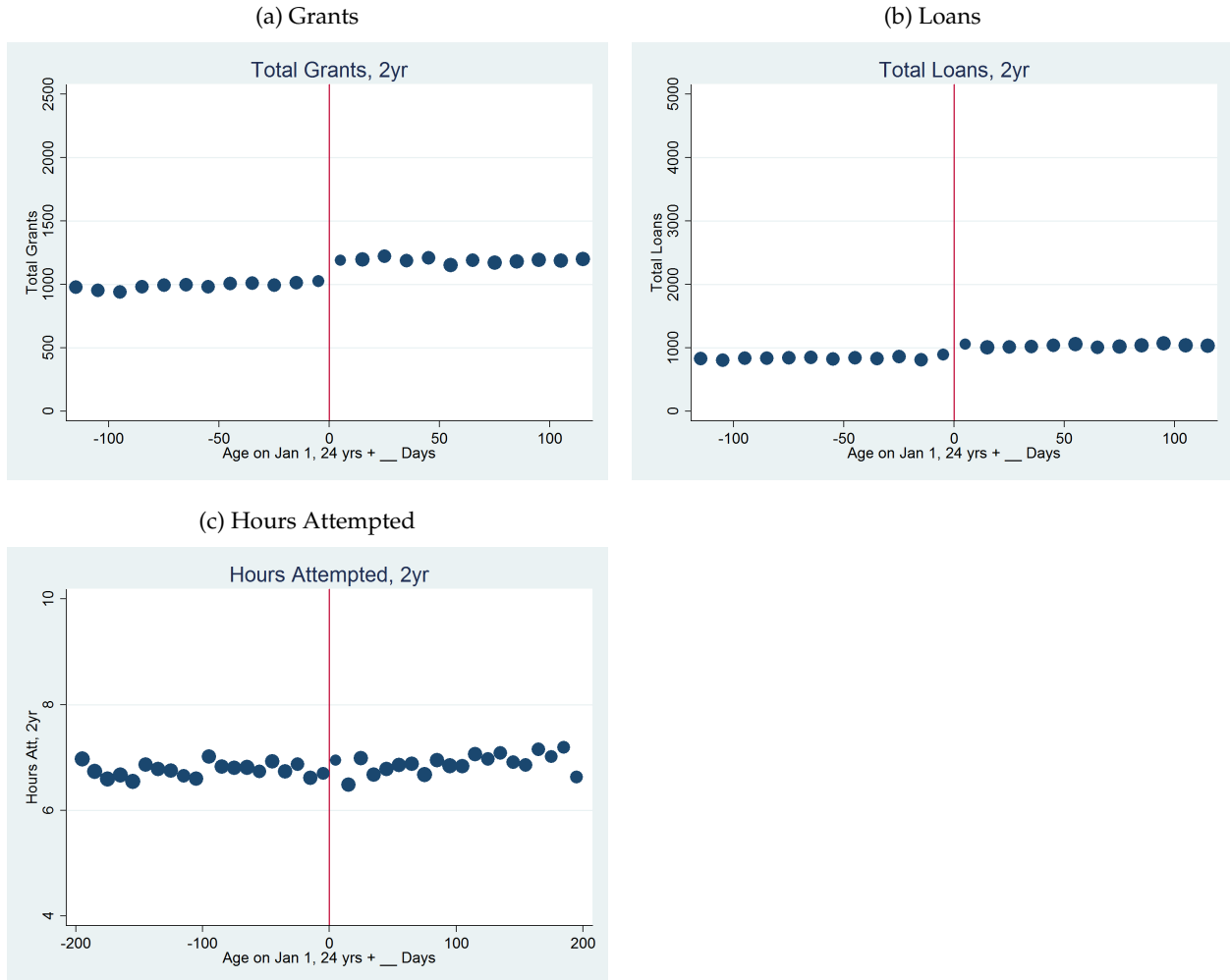
8 Figures and Tables

Figure 1: Density of Birth Dates



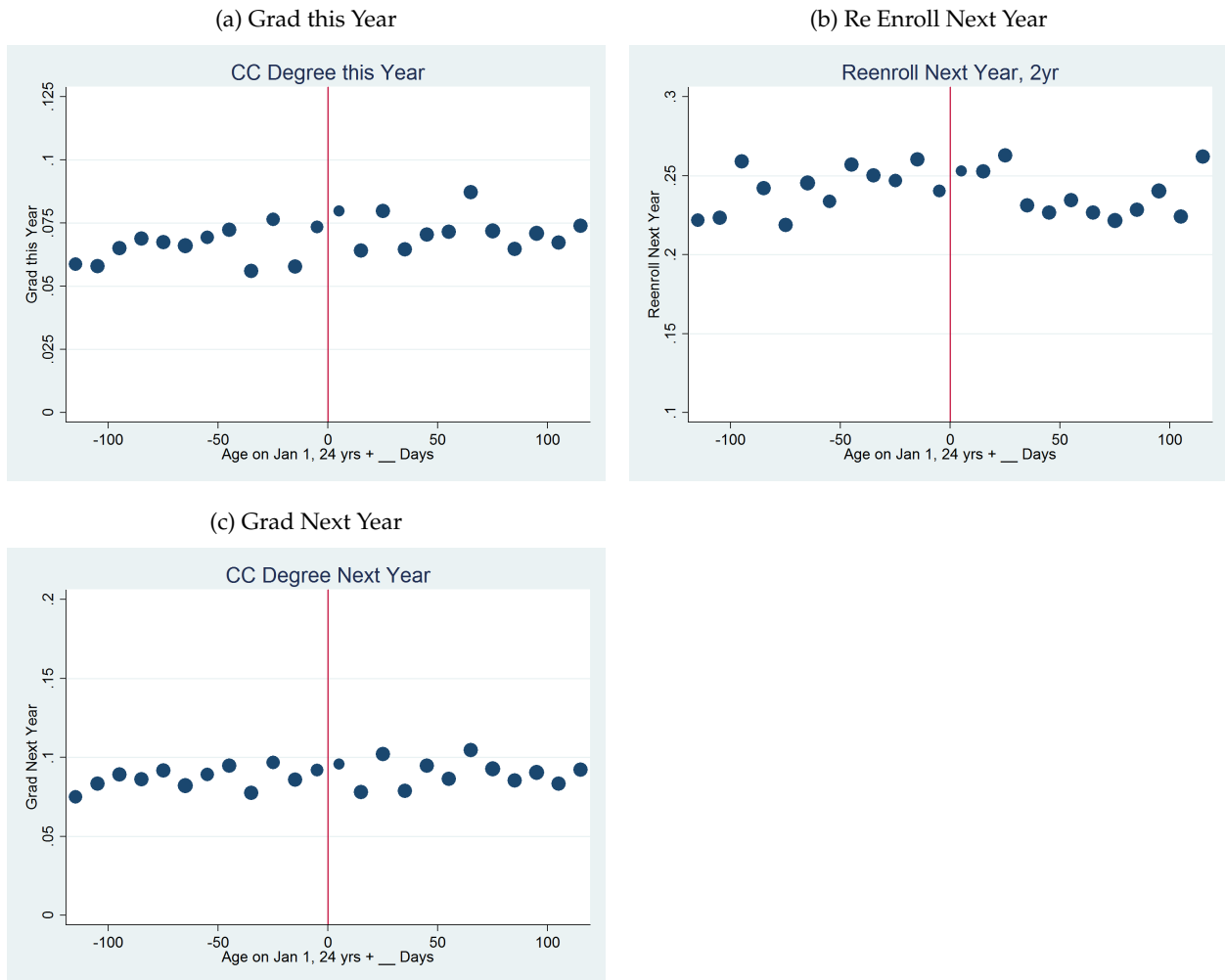
Panel A plots the number of students at two year colleges born on each day of the year. Panel B replicates this plot but removes students born within 3 days of January 1st. Panel C plots the number of students born on each day of the year for university seniors and panel D replicates that plot removing students born within 3 days of January 1st

Figure 2: 2 yr Colleges Student Outcomes, 1



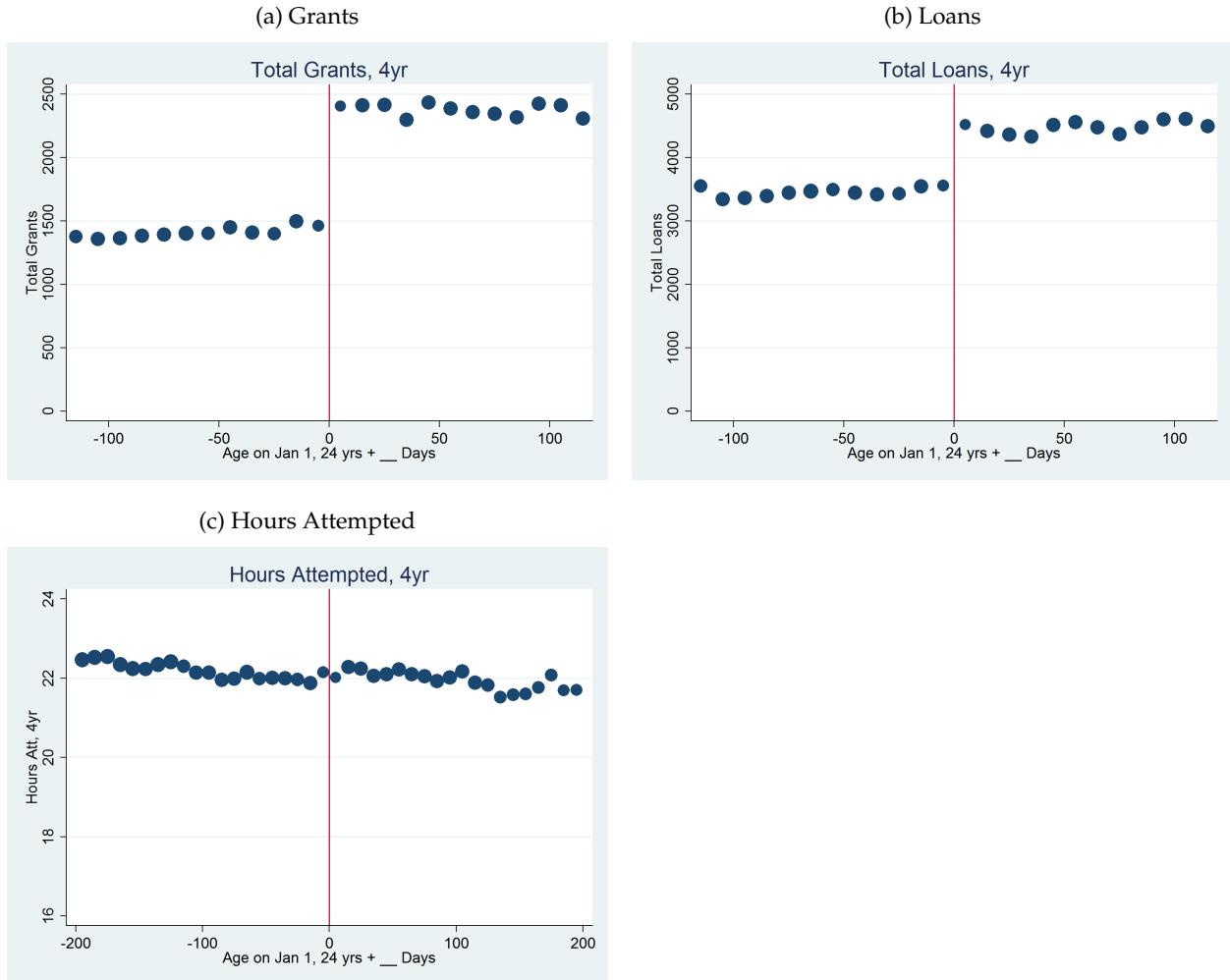
Panel A plots the average amount of grants received by students by their age as of January 1st. Panel B plots the amount of Loans taken out by the students by their age as of January 1st and Panel C plots the number of credit hours attempted by their age as of January 1st. Each dot represents the average for a group of 10 birth dates. The size of the dot is proportional to the number of students for which the average is computed.

Figure 3: 2 yr Colleges Student Outcomes, 2



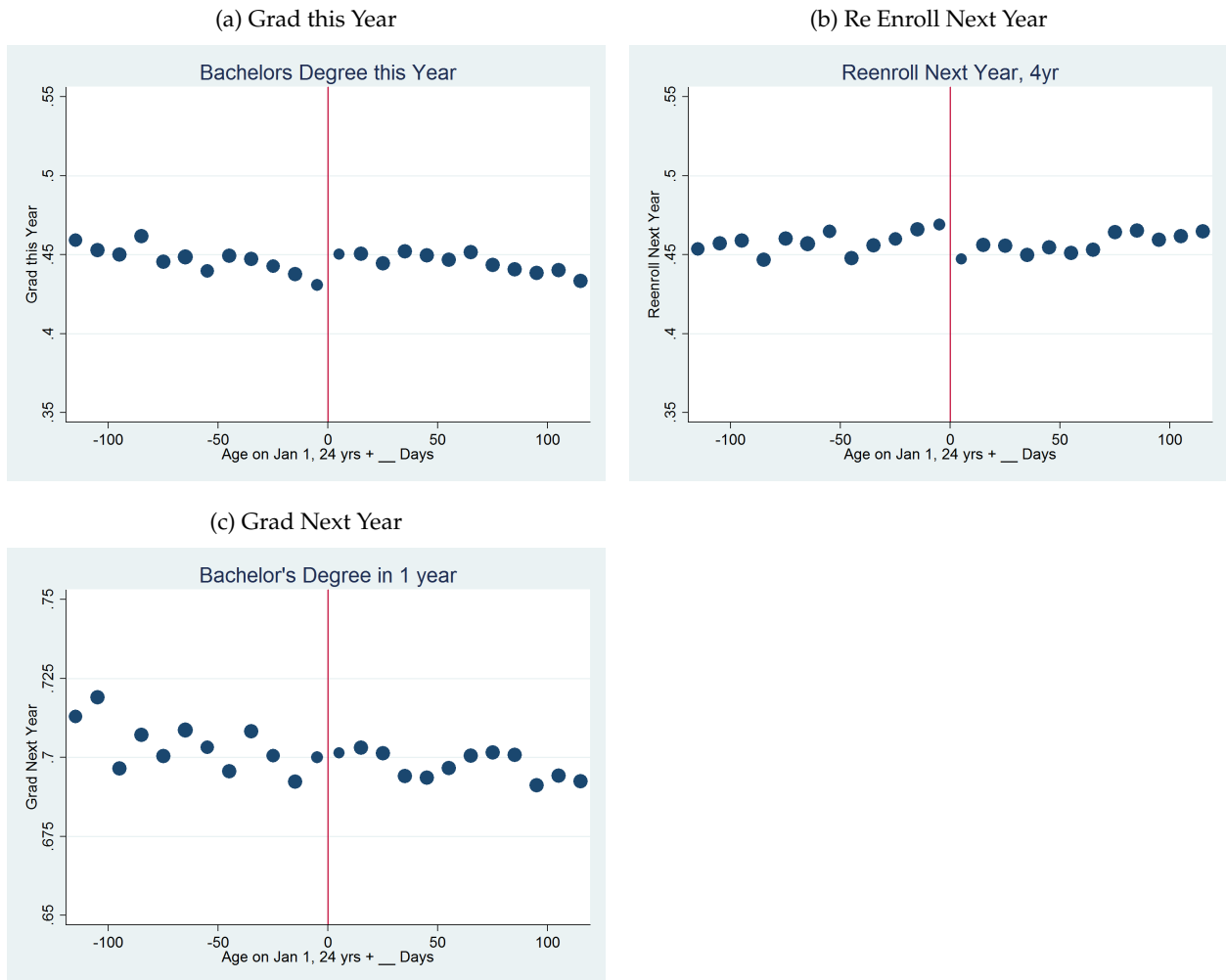
Panel A plots the probability of graduating with a two year degree or certificate in the year students turn 24 by their age as of January 1st. Panel B plots the probability of enrolling in a community college in the next year by birth date. Panel C plots the probability of graduation with a two year degree or certificate by the end of the year that a student would turn 25 . Each dot represents the average for a group of 10 birth dates. The size of the dot is proportional to the number of students for which the average is computed.

Figure 4: 4 yr Colleges Student Outcomes, 1



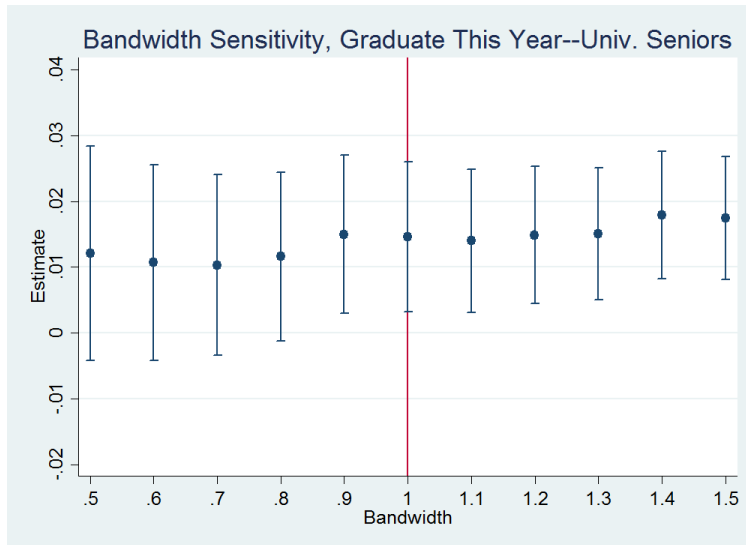
Panel A plots the average amount of grants received by students by their age as of January 1st. Panel B plots the amount of Loans taken out by the students by their age as of January 1st and Panel C plots the number of credit hours attempted by their age as of January 1st. Each dot represents the average for a group of 10 birth dates. The size of the dot is proportional to the number of students for which the average is computed.

Figure 5: 4 yr Colleges Student Outcomes, 2



Panel A plots the probability of graduating with a two year degree or certificate in the year students turn 24 by their age as of January 1st. Panel B plots the probability of enrolling in a community college in the next year by birth date. Panel C plots the probability of graduation with a two year degree or certificate by the end of the year that a student would turn 25 . Each dot represents the average for a group of 10 birth dates. The size of the dot is proportional to the number of students for which the average is computed.

Figure 6: Bandwidth Sensitivity, Graduate This Year



This plots the estimated discontinuity for graduating in the year students turn 24. Each dot represents an estimate with its accompanying 95% confidence interval. The horizontal axis represents different estimating bandwidths

Table 1: Summary Statistics

Variable	Univ. Seniors			Variable	2 yr. Students		
	Obs	Mean	Std. Dev.		Obs	Mean	Std. Dev.
Male	227851	0.49	0.50	Male	444158	0.44	0.50
White	227851	0.49	0.50	White	444158	0.43	0.49
Black	227851	0.10	0.30	Black	444158	0.12	0.33
Hispanic	227851	0.30	0.46	Hispanic	444158	0.36	0.48
Asian	227851	0.05	0.21	Asian	444158	0.03	0.18
Grant and Pell	227851	1815.07	2611.52	Grant and Pell	444158	1170.78	1963.77
Pell	227851	1431.27	2068.68	Pell	444158	1058.05	1778.16
Hours at 4yr	227851	22.09	10.36	Hours at 2yr	444158	13.18	8.72
Loans	227851	3912.93	4882.46	Loans	444158	1006.69	2731.99
Enroll Next Year	227851	0.46	0.50	Enroll 2yr Next Year	444158	0.51	0.50
Grad This Year	227851	0.44	0.50	Enroll 4yr Next Year	444158	0.15	0.36
Grad by Next Year	227851	0.70	0.46	Grad This Year	444158	0.08	0.27
Grad by 2 Years	227851	0.79	0.41	Grad Next Year	444158	0.15	0.36
Grad by 3 Years	227851	0.82	0.39	GPA	444158	2.14	1.38
Grad by 4 Years	227851	0.83	0.38				
GPA	227851	2.70	0.97				
Receive Pell Last Year	227851	0.30	0.46				

Summary statistics for the sample of students at Texas public universities and community college from 2003-2013 who are within 200 days of turning 24 during the school year.

Table 2: Discontinuities in Covariates

A. 2yr Colleges					
	Male	White	Black	Hispanic	Asian
Discontinuity	-0.000618	0.00522	0.00357	-0.00160	-0.00266
SE	(0.00453)	(0.00451)	(0.00301)	(0.00438)	(0.00165)
Observations	214052	214052	214052	214052	214052
	Prev Grant	Prev Loan	Prev EFC	Prev Fulltime	
Discontinuity	-28.59*	4.494	-1296.8	0.00279	
SE	(14.90)	(19.12)	(1967.6)	(0.00791)	
Observations	214052	214052	64906	64906	

B. Univ. Seniors					
	Male	White	Black	Hispanic	Asian
Discontinuity	-0.000509	-0.00114	0.000163	0.00944	-0.00546**
SE	(0.00633)	(0.00633)	(0.00387)	(0.00580)	(0.00264)
Observations	111788	111788	111788	111788	111788
	Prev Grant	Prev Loan	Prev EFC	Prev Fulltime	
Discontinuity	12.16	65.29	-1252.5	0.00447	
SE	(32.32)	(53.10)	(2206.6)	(0.00509)	
Observations	111788	111788	66292	66292	

This tests for discontinuities in covariates for students who are just declared independent. Panel A considers students at two year colleges and Panel B considers university seniors. * $p < .1$ ** $p < .05$ *** $p < .01$

Table 3: Student Outcomes, Community College Students

	Total Grants	Pell Amount	Total Loans		
Discontinuity	187.1***	167.7***	180.8***		
SE	(17.50)	(15.73)	(24.91)		
Observations	214052	214052	214052		
	Att. Hours	Re-Enroll 2yr	Grad CC in 0y	Grad CC in 1y	GPA
Discontinuity	0.0913*	0.00609	-0.000188	-0.000816	0.0134
SE	(0.0543)	(0.00456)	(0.00249)	(0.00323)	(0.0124)
Observations	435989	214052	214052	214052	214052

Each column has an estimate of the discontinuity a student outcome for students born before January 1st. The estimates arise from estimating Equation 1. The regressions also include controls for gender and race. Each discontinuity is estimated using a window of birth dates of 100 days from January 1st which corresponds to the IK bandwidth except in the case of Attempted Hours which uses a bandwidth of 200 days.

Table 4: Student Outcomes, University Seniors

	Total Grants	Pell Amount	Total Loans		
Discontinuity	918.3***	796.5***	856.5***		
	(31.48)	(24.59)	(59.96)		
Observations	111788	111788	111788		
	Att. Hours	GPA	Re-Enroll 4yr	Grad 4yr in 0y	Grad 4yr in 1y
Discontinuity	0.397***	0.000964	-0.0145**	0.0176***	0.00212
SE	(0.0896)	(0.0121)	(0.00629)	(0.00628)	(0.00579)
Observations	223773	111788	111788	111788	111788

Each column has an estimate of the discontinuity a student outcome for students born before January 1st. The estimates arise from estimating Equation 1. The regressions also include controls for gender and race. Each discontinuity is estimated using a window of birth dates of 100 days from January 1st which corresponds to the IK bandwidth except in the case of Attempted Hours which uses a bandwidth of 200 days.

Table 5: Heterogeneity by Previous Pell Receipt, 2 Year Students

	Total Grants	Pell Amount	Att. Hours CC	Total Loans
Discontinuity	-51.85 (34.55)	-54.96* (31.15)	0.0653 (0.142)	241.4*** (53.52)
Disc * No Prev pell	322.7*** (38.86)	299.9*** (35.03)	-0.0676 (0.160)	-64.70 (60.19)
Prev Pell	2215.8*** (27.62)	1983.0*** (24.90)	1.621*** (0.114)	1172.1*** (42.77)
Observations	214052	214052	214052	214052

	Re-Enroll 4yr	Grad CC in 0y	Grad CC in 1y	GPA
Discontinuity	-0.00198 (0.00712)	0.00620 (0.00542)	-0.00428 (0.00703)	-0.00982 (0.0271)
Disc * No Prev pell	-0.00245 (0.00801)	-0.00753 (0.00610)	0.00518 (0.00790)	0.0305 (0.0304)
Prev Pell	0.0767*** (0.00569)	0.0540*** (0.00434)	0.0815*** (0.00561)	0.132*** (0.0216)
Observations	214052	214052	214052	214052

This tests for differences in the student outcomes by whether they receive a Pell Grant in the previous year. Disc*No Prev Pell is an interaction between an indicator for being over 24 on January 1st and not receiving a Pell Grant in the Previous year. The running variable (Days from January 1st) is separately interacted with Previous Pell above and below the discontinuity. . * p<.1
 ** p<.05 *** p<.01

Table 6: Heterogeneity by Previous Pell Receipt

	Total Grants	Pell Amount	Total Loans	Att. Hours
Discontinuity	385.8*** (49.41)	306.8*** (38.42)	1017.4*** (105.6)	0.350** (0.162)
Disc*No Prev Pell	771.4*** (59.45)	709.5*** (46.23)	-235.7* (127.0)	0.0518 (0.194)
Prev. Pell	3151.4*** (42.53)	2539.0*** (33.07)	2140.3*** (90.86)	1.059*** (0.137)
Observations	111788	111788	111788	223773

	Re-Enroll 4yr	Grad 4yr in 0y	Grad 4yr in 1y	GPA
Discontinuity	-0.0236** (0.0113)	0.0264** (0.0113)	0.00894 (0.0104)	0.0220 (0.0218)
Disc*No Prev Pell	0.0132 (0.0136)	-0.0129 (0.0136)	-0.0101 (0.0125)	-0.0303 (0.0262)
Prev. Pell	-0.00256 (0.00974)	0.0200** (0.00971)	0.0393*** (0.00895)	0.0170 (0.0187)
Observations	111788	111788	111788	111788

This tests for differences in the student outcomes by whether they receive a Pell Grant in the previous year. Disc*No Prev Pell is an interaction between an indicator for being over 24 on January 1st and not receiving a Pell Grant in the Previous year. The running variable (Days from January 1st) is separately interacted with Previous Pell above and below the discontinuity. . * p<.1
 ** p<.05 *** p<.01

Table 7: Placebo Check–22 year olds

4 yr				
	Total Grants	Pell Amount	Att. Hours CC	Total Loans
Discontinuity	2.428 (24.07)	-0.513 (14.55)	-0.0398 (0.0859)	-53.09 (35.44)
Observations	237357	237357	163777	237357
	Re-Enroll 4yr	Grad 4yr in 0y	Grad 4yr in 1y	GPA
Discontinuity	0.00301 (0.00429)	-0.00687 (0.00423)	-0.00662* (0.00346)	-0.00837 (0.00592)
Observations	237357	237357	237357	235853
2 yr				
	Total Grants	Pell Amount	Att. Hours CC	Total Loans
Discontinuity	20.14 (13.59)	15.71 (11.36)	0.0492 (0.0696)	-8.967 (17.48)
Observations	342535	342535	342535	342535
	Re-Enroll 4yr	Grad 4yr in 0y	Grad 4yr in 1y	GPA
Discontinuity	0.00395 (0.00295)	0.000917 (0.00117)	0.00285 (0.00196)	0.0102 (0.00869)
Observations	342535	342535	342535	306453

This tests for differences in the student outcomes among students turning 22 as a placebo test. * p<.1 ** p<.05 *** p<.01

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A Changes resulting from Tax Aid

Dependent status for tax purposes changes for a minority of students. In particular students must live at home for at least 6 months and provide less than half of their own support. An upper bound on the number of students experiencing a change in dependency status for tax purposes can be gleaned from the 2007-2008 National Post Secondary Aid Survey (NPSAS). The NPSAS contains information about residence with parents for students while they are enrolled. Students at four year schools in Texas who are from 23.5 to 24.5 years old on January 1st live with their parents 15.0% of the time while two year students are more than twice as likely with 35.7% living with their parents while enrolled ([U.S. Department of Education, 2009](#)). This number is an upper bound on the number of students affected by the change in tax status because some of those who live at home may receive less than half of their support from their parents.

If a student is declared independent, all else equal, a the parent's tax liability will increase as they no longer can claim a dependent exemption or any of the education tax credits. If parents were eligible for the Earned Income Tax Credit (EITC), they are likely to see EITC benefits decreased as the number of eligible children will be reduced. The student will have their personal tax liability decrease as they will be able to use the education tax credits on their tax return instead of parents using the education tax credits. In general the family's total tax liability will weakly increase as credits and/or deductions are shifted from parents with relatively high marginal tax rates to students with relatively low marginal tax rates.¹⁸

Financial independence is associated with (weakly) reduced family tax aid but increased student tax aid. How this affects total resources toward college depends on how parents and older students split changes in wealth from marginal tax changes. I am not aware of any studies that examine how families split such tax changes and data on within-family transfers would be required to answer the question. Tax aid is never "disbursed" per se and households may differ in the timing of realizing tax benefits.

¹⁸For very high income families who are not eligible for education tax credits, the total tax burden may decrease as students will become eligible for tax credits.