

Tax Benefits for Graduate Education: Incentives for Whom?

Steven Bednar* and Dora Gicheva[†]

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Abstract

Numerous studies have examined the enrollment responses of traditional undergraduate students to the introduction of government-provided tuition subsidies, but far less attention has been devoted to the elasticity of demand for graduate education. This paper examines how the tax code and government education policies affect graduate enrollment and persistence rates as well as the ways in which students fund their graduate education. Our empirical methodology is based on exogenous variations in the availability of an income tax exemption for employer-provided tuition assistance for graduate courses. We find that graduate attendance among full-time workers age 24-30 is higher when the tax exemption is available, mostly due to higher persistence in public universities and enrollment in vocational courses. We further explore the degree to which the tax benefit affects how students in different types of programs finance their degrees. We present some evidence that universities may change tuition or grant amounts to capture part of the incidence.

Keywords: Educational Finance, Tax Code, Graduate Education, Employer-Provided Tuition Subsidies

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*Department of Economics, Elon University, 2075 Campus Box, Elon, NC 27244, USA. E-mail: sbednar@elon.edu.

[†]Department of Economics, University of North Carolina at Greensboro, PO Box 26170, Greensboro, NC 27402, USA. E-mail: d_gichev@uncg.edu.

1 Introduction

There are several reasons why it is important to understand the degree to which different groups of students respond to government-provided financial incentives for education, in particular ones available through the tax code. In the 2009-10 academic year alone, close to \$15 billion of student aid was in the form of federal education tax credits and deductions; about 10 percent of this amount was used by graduate students (College Board 2011). In addition, in 2010, the government lost an estimated \$690 million in revenue due to tax exemptions for employer-provided educational assistance (Office of Management and Budget 2010). Understanding how such benefits are likely to affect the recipients who are targeted, as well as those who may not be, can help in the cost-benefit analysis of government spending on education. Responses to changes in the tax treatment of employer-provided tuition assistance can also provide a better understanding of firm-provided general training. Additionally, there is still a lot to be learned about the price elasticity of demand for graduate education.

This paper examines how the tax code and government education policies affect graduate enrollment and persistence rates as well as the ways in which students fund their graduate education. That is, the tax code may provide an incentive for someone to enroll in graduate school who would not without tax incentives, and it could change how someone pays for graduate school conditional on the fact that they would attend without any tax benefits. Over the past two decades, the United States government has enacted several federal policies with the goal of increasing graduate education enrollment. One important policy has been the allowance of an income tax exemption for employer-provided tuition assistance up to \$5,250. This tax exemption can affect enrollment decisions if the student ultimately receives the benefit which amounts to a tuition subsidy. Firms can alter the availability of tuition assistance and universities can change tuition or grant amounts to capture the incidence. The tax exemption has been in place for undergraduate courses during the whole period we study (1989-2009), but employer

assistance for graduate education was not exempt prior to 1991 and between 1996 and 2002. This allows us to test for responses to the tax policy in a difference-in-difference framework.

While numerous studies have examined the enrollment responses of traditional undergraduate students to the introduction of government-provided tuition subsidies¹ or to exogenous variations in the grant aid policy within specific institutions², far less attention has been devoted to graduate students and “nontraditional” undergraduate students.³ There is more room for increase in enrollment among older students because their attendance rates are considerably lower than the attendance rates of recent high school graduates. The incentives that older students face are likely to be very different from the driving forces behind the postsecondary enrollment of more typical college students. For example, in our data two-thirds of undergraduate students between the ages of 18 and 22 are listed as dependents while only 0.02 percent of individuals aged 24 to 30 are dependents. Older students are more likely to pay for the education themselves, rather than rely on parental transfers, so it is important to focus on personal, rather than parental income. In addition, individuals in the older age group have to balance work, family, and potentially school, both financially and in terms of time. For the reasons mentioned above, one’s own employment status, among other factors, should have a strong impact on schooling decisions. In our study, employment status is given even

¹Programs whose effects on enrollment have been studied recently include the Georgia Hope Scholarship (Dynarski 2000, Cornwell, Mustard and Sridhar 2006), the CalGrant program in California (Kane 2003), the Washington, D.C. Tuition Assistance Grant Program (Abraham and Clark 2006, Kane 2007) and, most notably, the Tax Relief Act of 1997 (Long 2004, Chenevert 2010, Turner 2011). Nielsen, Sørensen and Taber (2010) study the college enrollment effects of an increase of the generosity of student aid in Denmark. Dynarski (2003) is among the few studies who focus on the enrollment effects of the elimination of a program (the Social Security Student Benefit Program in 1982). See the overview in Dynarski (2002) for a list of other papers that use the quasi-experimental approach to estimate the elasticity of demand for college education.

²See van der Klaauw (2002) and Linsenmeier, Rosen and Rouse (2006) for example.

³Two exceptions are Seftor and Turner (2002), who examine how changes in the Pell Grant Program impact the college enrollment rates of individuals in their twenties and thirties, and LaLumia (2011), who studies the impact of the Tax Relief Act of 1997 on older college students. Long (2004) shows estimates of her college enrollment specifications for a sample of older CPS respondents (age 25-40) but similarly to her results for traditional college students, finds no enrollment effect of the Tax Relief Act.

more importance, as our identifying variation is linked to employer-provided education subsidies.

There are fewer studies that examine the role of financial aid for college persistence beyond the first year and completion, rather than first-year enrollment. Several of the papers that focus on the effects of education benefits for veterans find a positive effect of veteran benefits on the number of years of completed schooling or the fraction of college graduates in the affected population (Angrist 1993, Bound and Turner 2002, Stanley 2003). Similarly, Dynarski (2003) shows some evidence that Social Security education benefits may have a positive impact on college persistence in addition to college enrollment. Kane (2007) finds that the D.C. tuition assistance program affected both the probability of applying to and the probability of attending college, along with the type of college attended (public or private). Gicheva, Ionescu and Simpson (2012) show that the availability of education financing can have different implications for the extensive and intensive margins of postsecondary education. Turner (2004) also points out that it is important to distinguish between college enrollment and completion when analyzing the impacts of aid policies. In the analysis here of graduate attendance rates, we consider both individuals who were enrolled in school a year before their interview date and those who were not, so we measure overall attainment, including enrollment and persistence. We further use available data on the year of study to look at enrollment and persistence separately.

We use the exogenous changes in the tax exemption of employer-provided graduate tuition assistance to examine any accompanying changes in graduate education investments. The nature of the policy change allows us to use two different control groups: college graduates who are unemployed or out of the labor force and current and potential undergraduate students. Neither of these two groups should have been affected by the tax code changes we consider. Furthermore, we believe that the incentive was not large enough to induce individuals without an undergraduate degree to complete college in

order to have access to the graduate tuition assistance exemption, or to lower workers' reservation wages. The relatively small monetary value of the benefit is also likely to trigger more noticeable changes in attendance rates at less costly programs, for which a subsidy of around \$1,000 is more likely to make a difference and sway individuals on the margin. The quasi-experimental approach that we adopt avoids many of the problems of a cross-sectional study in which schooling outcomes are expressed as a function of individual characteristics, aid eligibility and the available tax incentives because the latter two are likely to be correlated with unobservables that affect schooling.

Using the 1989-2009 October supplements of the Current Population Survey, we find that graduate attendance among full-time workers age 24-30 is higher when this tax exemption is available, mostly due to higher persistence in public universities. The probability of enrollment in part-time private programs and vocational non-degree courses also increases. We do not see these relationships in the case of undergraduate enrollment. We then examine the proportion of students in the National Postsecondary Student Aid Study who use educational assistance from their employer. We find that use of employer aid for individuals enrolled in full-time graduate programs, both public and private, increases relative to similarly aged students enrolled in undergraduate programs when the tax exemption is available. We also find an increase in average tuition paid when the tax exemption is in place for all graduate students relative to similarly aged students in undergraduate classes when the subsidy is in place. It is unclear, however, if this is a supply effect (universities increasing tuition) or a demand response (students enrolling in more expensive universities).

The rest of the paper is organized as follows. Section 2 provides more information about the tax treatment of employer-provided tuition assistance; section 3 examines how the tax exemption affects enrollment decisions and utilizes the CPS data; section 4 uses the NPSAS data set to address how enrolled individuals finance their education and whether employers or universities respond to the tax exemption, and section 5 concludes.

2 Tax Treatment of Employer Tuition Assistance

According to a provision in the IRS tax code known as Section 127, employer contributions towards tuition are treated like other fringe benefits. They are reported on employees' W-2 forms but are tax exempt up to \$5,250,⁴ as long as the employer has a qualified educational assistance program. The course work does not need to be related to the job or lead to a degree for the tax benefit to apply, but education involving sports, games and hobbies is not eligible, unless directly related to the job. Expenditures that are included in the exemption are tuition, fees, books, supplies, and equipment, but not meals, room and board, and transportation. In March 2007, 49 percent of workers had access to work-related educational assistance through their firm, and non-work related assistance was available to 15 percent of employees. These numbers are higher for management and professional workers, full-time and unionized employees, as well as those who earn higher wages and work in larger establishments. There are also small geographic differences in the incidence of education assistance programs (U.S. Bureau of Labor Statistics 2007). Employers can deduct the full cost of educational assistance from their annual income if the firm has a tuition reimbursement plan.

Section 127 has been extended several times, but the only amendments made since 1986 have been the inclusion or exclusion of graduate education; the coverage limit has remained unchanged.⁵ In 1990, Section 127 was amended and the \$5,250 exemption was applied to graduate education undertaken after January 1, 1991. A 1996 amendment excluded graduate education from Section 127 after June 30 of that year, but graduate courses were included again starting in January of 2002. We are not aware of any specific reason for which any of the changes were made that may be related to individual investment decisions. For more information on Section 127, see Levine and Lyke (2002)

⁴Amounts greater than \$5,250 can be exempt only if they qualify as a working condition fringe benefit, meaning that the amount could have been deducted as an employee business expense (i.e. Section 132 benefit).

⁵Levine (2008) lists in detail all Section 127 extensions and their provisions.

and Levine (2008).

The tuition assistance deduction was the main tax incentive for higher education until the Tax Relief Act (TRA) of 1997 was passed. A discussion of the provisions of the TRA and other tax benefits and education financing sources for graduate students is available in Appendix A. The timing and changes of the tax benefits for which graduate students are eligible are summarized in Figure 1. Our estimation strategy allows for flexible functional forms that account for the effects these additional policies may have on education investment decisions while identifying the impact of the tax exemption for employer provided tuition assistance from the exogenous variation in its availability.

3 Attendance Incentives

3.1 Current Population Survey Empirical Specifications

We use the 1989-2009 October supplements of the Current Population Survey to examine changes in attendance rates associated with Section 127. Given the availability of two separate control groups (unemployed college graduates and potential undergraduate students), we adopt a triple difference style approach in order to examine how changes in the tax treatment of employer-provided tuition assistance affect attendance rates in the CPS. A difference-in-difference approach has been used in Dynarski (2000) to evaluate the impact of Georgia's HOPE Scholarship on college attendance, and by Dynarski (2003) to examine the 1982 elimination of the Social Security Benefits Program for students with a deceased parent. Kane (2003) and Long (2004) use a similar approach to evaluate how the CalGrant program and the Hope and Lifetime Learning Credits, respectively, affected college enrollment.

Using the available employment information in the CPS data, we estimate a model

of the form

$$\begin{aligned}
\text{Attend}_{it} = & f\{X_{it}\beta + (\text{Income}_{it})\delta + \gamma_1\text{Sec127}_t + \gamma_2\text{Grad}_{it} + \gamma_3\text{Empl FT}_{it} + \gamma_4\text{Empl PT}_{it} \\
& + \eta_1(\text{Sec127}_t \times \text{Empl FT}_{it}) + \eta_2(\text{Sec127}_t \times \text{Empl PT}_{it}) \\
& + \eta_3(\text{Grad}_{it} \times \text{Empl FT}_{it}) + \eta_4(\text{Grad}_{it} \times \text{Empl PT}_{it}) + \eta_5(\text{Grad}_{it} \times \text{Sec127}_t) \\
& + \lambda_1(\text{Grad}_{it} \times \text{Sec127}_t \times \text{Empl FT}_{it}) + \lambda_2(\text{Grad}_{it} \times \text{Sec127}_t \times \text{Empl PT}_{it}) + \varepsilon_{it}\},
\end{aligned} \tag{1}$$

where X_i contains demographic information, a quadratic in time, indicators for enrollment in the previous year and for $t \geq 1993$,⁶ as well as the one-year lag of the state unemployment rate. The income vector consists of indicators for low and middle income (the high income category is excluded), and the interactions of each of our three binary income variables with an indicator for $t \geq 1998$, which should account for some of the changes in enrollment that are due to the TRA of 1997.⁷ Our “treatment” group is comprised of employed college graduates, who would be affected by the changes in the Section 127 treatment of graduate tuition assistance if they decide to use employer-provided grant aid. In this case the estimated coefficients of interest λ_1 and λ_2 measure the intention to treat.

We estimate equation (1) for high school graduates between the ages of 24 and 30. The triple difference model does not allow other coefficients to vary by education status. In addition, low undergraduate attendance rates at private institutions for the age groups of interest may make college students a less than ideal control group. For these reasons,

⁶In 1992, Congress reauthorized the Higher Education Act of 1965, expanding substantially the limits and eligibility for federal student loans beginning in 1993. Our estimation strategy allows for enrollment trends to change upon the HEA reauthorization, but the estimated coefficients are small and not statistically significant.

⁷While we do not show the results here, we also estimated the models with a set of two interactions for each income variable, one for $1998 \leq t < 2003$ and another for $t \geq 2003$ in order to account for changes in the Lifetime Learning Credit maximum and the introduction of tuition deductions as another tax benefit. This introduced more noise in the estimates but did not change the main findings.

we also estimate several sets of difference-in-difference models:

$$\begin{aligned} \text{Attend}_{it} = & f\{X_{it}\beta + (\text{Income}_{it})\delta + \gamma_1\text{Sec127}_t + \gamma_3\text{Empl FT}_{it} + \gamma_4\text{Empl PT}_{it} \\ & + \lambda_1(\text{Sec127}_t \times \text{Empl FT}_{it}) + \lambda_2(\text{Sec127}_t \times \text{Empl PT}_{it}) + \varepsilon_{it}\}. \end{aligned} \quad (2)$$

Equation (2) is estimated for two separate groups: college graduates between the ages of 24 and 30 and high school graduates between the ages of 24 and 30. The latter group is limited to respondents who do not have a Bachelor’s degree. The coefficients of interest are λ_1 and λ_2 . We can look across specifications to compare the Section 127 enrollment effects of potential graduate students, who should be affected by the changes, and potential undergraduate students, who should not be affected. We expect the models in (1) and (2) to yield similar results because they are based on the same estimation strategy.

We also use the more detailed answers to the question of what year of school a respondent is attending to investigate in more detail the Section 127 effects on graduate enrollment and persistence. The tax exemption lowers the cost of education for each year when in school. For programs in which individuals are less price sensitive once enrolled, we would expect to see larger effects on first-year attendance rates than on upper-year attendance. We construct separate dependent variables when the answer is “1st year of graduate school” (“1st year of college”) and “2nd year or higher of graduate school” (“2nd year of college” through “4th year of college”). The first variable is designed to measure changes in enrollment, while the second variable should focus on persistence. Programs are again differentiated by their intensity and public or private status. These models also follow the structure in (2).

We estimate equations (1) and (2) by probit separately for each enrollment variable (part-time public, part-time private, full-time public, full-time private and vocational courses).⁸ The coefficients that we report are average marginal effects, which we estimate

⁸We also estimated a multinomial logit model of the joint decision of full-time or part-time public and private attendance with a base outcome of no schooling; the results were virtually identical. The

using the person-specific weights in the CPS. The standard errors are clustered on the state-year level.

3.2 CPS Data

The CPS allows us to use fairly large samples, which are representative of the U.S. population. We focus our attention on the October surveys because they contain school enrollment information for the current and previous years.

We restrict the estimation to the CPS reference person and his or her spouse. It is not clear how relevant the family income variable reported in the CPS is with regard to the schooling decisions of other household members. For example, an adult child of the reference person may be financially independent but living in the same household. Since the CPS definition of reference person is “the person (or one of the persons) in whose name the housing unit is owned or rented,” limiting the sample in this way should also guarantee that most of the individuals we study are independent from their parents. The age group we focus on is 24-30 year-olds. We exclude people younger than 24 because we are interested in the incentives created by tax benefits for financially independent individuals, and the IRS allows full-time students younger than 24 to be claimed as dependents. In addition, the age restriction is appropriate given that our study is directed at graduate education.⁹

Graduate enrollment measures are based on reported grade or year attended: “1st year of graduate school,” “2nd year or higher of graduate school,” and “1st year of college” through “4th year of college.”¹⁰ We also use the information on whether students are attending a public or private institution. Full-time or part-time enrollment status is self-reported, so the definition may vary across respondents. The descriptive statistics

last outcome, vocational training, is not mutually exclusive with the rest because respondents can be enrolled in a degree program and take vocational courses at the same time.

⁹Some preliminary robustness checks (available on request) suggest that varying the age cutoff does not change the results substantially.

¹⁰There is no option to report higher years of college.

in Table 1 show that 6.4 percent of college graduates are attending a part-time graduate program when interviewed, with public programs twice as popular as private ones. The attendance rate is similar for public institution undergraduate attendance among high school graduates with no Bachelor’s degree (column 2 of Table 1), but private enrollment is under 1 percent for this group. In addition to part-time and full-time programs, we also consider whether an individual reports taking “business, vocational, technical, secretarial, trade or correspondence courses.” The vocational studies variable is relevant since Section 127 covers course work that may not lead to a degree. Non-degree vocational course work usually constitutes a smaller financial and time commitment than a degree program that may take several years, so we expect such education to be more sensitive to the Section 127 benefit availability. About 3 percent of respondents report being enrolled such classes at the interview date.

Family income is reported as a categorical variable in the CPS data, which introduces much noise in our measure of income and makes it hard to determine respondents’ eligibility for many of the tax benefits. Thus, we do not draw any conclusions about the enrollment effects of income-contingent benefits, such as the Lifetime Learning Credit (LLC), but nonetheless use income as a control. Since the income categories do not change over time (with the exception of an additional category at the top of the distribution starting with the 2003 survey), it is also not possible to systematically account for inflation. The income measure that we use consists of three categories: low income (less than \$10,000 for single respondents and less than \$20,000 if married), medium income (\$10,000-\$49,999 if single; \$20,000-\$74,999 if married) and high income (all others). The low income category aims to include individuals whose income is too low to be taxable, which would make the tax benefits inapplicable. The high income category is constructed to include respondents whose income is above the eligibility cutoff for many of the benefits. Among high school graduates between the ages of 24 and 30 with no college degree, only 9 percent have high family income, and 18 percent have low income.

The main findings are robust to variations in the cutoffs for the income categories. We further interact the three income categories with an indicator for $t \geq 1998$, aiming to capture any income-contingent effects of the TRA on enrollment.

To indicate Section 127 availability and eligibility we first construct a variable that equals 1 in years 1991-1995 and 2002-2009. These are all years for which Section 127 benefits could be applied to graduate classes taken during the month of October. Because the nominal amount of the tax exemption did not change over time, we adjust the value of the benefit for inflation, indexing it to the 2009 Consumer Price Index for all items and all urban consumers.¹¹ Next, we interact the resulting variable with part-time and full-time employment status, since individuals who are unemployed or out of the labor force cannot take advantage of this benefit. We use the CPS labor force and part-time/full-time definitions.¹² College graduates are more likely to be employed full-time than respondents in the less educated sample; the difference is 10 percentage points. Respondents without a Bachelor's degree are slightly more likely to be employed part-time, but also more likely to be unemployed or out of the labor force.

Finally, we control for the one year lag of the state-level annual unemployment rate for all workers from the Local Area Unemployment Statistics series provided by the BLS. There is evidence that unemployment may have an effect on postsecondary educational enrollment and the return to postsecondary degrees (Betts and McFarland 1995, Bedard and Herman 2008, Kahn 2010, Johnson 2011), although the CPS results do not indicate such a relationship among the main age group of interest.

Table 10 in Appendix B shows the average characteristics of students in the sample by employment and attendance intensity. The typical part-time graduate student is 27 years old and more likely to be married than full-time students, works full-time and attends a public institution. Part-time graduate and undergraduate students who

¹¹We also estimated the models with a Section 127 variable that was not adjusted for inflation. The results did not change in terms of significance.

¹²Workers who are employed but currently absent from work are treated as employed, and full-time status corresponds to 35 hours per week or more.

are employed part-time or not working are predominantly female. Full-time graduate students are slightly younger and distributed more evenly among the three employment statuses.

3.3 CPS Results

3.3.1 Attendance Rates at Public and Private Institutions

Table 2 shows equation (1) estimation results for the sample of 24-30 year olds. The dependent variables are part-time attendance in public (column 1) and private (column 2) universities, full-time public (column 3) and private (column 4) attendance and vocational courses (column 5).

We find that the impact of Section 127 is strongest for full-time public and vocational graduate education. The availability of Section 127 benefits, adjusted for inflation, increases full-time graduate attendance at public institutions by about 1 percentage point relative to the control groups; the coefficients are somewhat larger for vocational courses. The corresponding coefficients on the interaction between Section 127 and graduate education are negative and significant at the 10 percent level, indicating the fewer respondents who are unemployed or out of the labor force attend such programs when tax-free employer assistance is available. Given that employment status is not truly exogenous, the negative estimate for η_5 and positive estimates for λ_1 and λ_2 may also indicate that more graduate students choose to remain employed while attending school and possibly use employer-provided tuition assistance, as opposed to leaving work for the duration of their studies, although this seems unlikely given the limited value of the benefit. The effect on part-time public graduate programs is also relatively large (0.8 percentage points for part-time workers and significant at the 10 percent level). Full-time public attendance rates being more responsive than full-time attendance rates at private institutions supports the conjecture that a relatively small benefit such as Section 127 would not have strong incentive effects on the margin for individuals considering

high-cost education.

The estimates for η_1 and η_2 suggest that fewer part-time employees attend full-time undergraduate programs and fewer full-time workers take undergraduate vocational courses when Section 127 is available for graduate studies compared to other years covered by the sample period. On the other hand, we see a switch toward undergraduate attendance by respondents who are not working (measured by the uninteracted coefficient on Section 127). The magnitudes of all these estimates are again smaller in absolute value than the estimated coefficients for 24-30 year old graduate students. It is possible that we see some degree of crowding out of employer-provided resources, if they become more valuable to relatively young college graduates who desire to continue their education.

The post-1997 income interactions in Table 2 are significant for the low-income group, where the sign of this coefficient is negative in column 3 (full-time public) and positive in column 5 (vocational). The medium income interaction is also positive and significant in column 5, but all other coefficients are noisy. One interpretation of these estimates is that the introduction of the Lifetime Learning Credit had little effect on students age 24-30, but it could also be the case that the Section 127 and employment status interactions are picking up part of the effects, since our income variable is measured with a lot of error, and employment status tends to be highly correlated with income. The results for the previous year's state unemployment rate (not shown in the table) are statistically and economically indistinguishable from zero.

We next split the sample based on whether respondents completed a Bachelor's degree and show estimates for equation (2) in Table 3. The estimates in Panel A (college graduates age 24-30) and B (high school graduates age 24-30) mirror the triple difference results from Table 2, which is not surprising given that the estimation approaches are similar. The interaction between Section 127 and full-time employment is positive and significant for the graduate part-time private, full-time public and vocational attendance

specifications and positive but not significant in the other two models. The interaction with part-time employment is largest and only significant for part-time private graduate programs. In the undergraduate sample in Panel B the interactions between Section 127 and employment status are either close to zero or negative and significant.

3.3.2 Effects of Section 127 on Enrollment and Persistence

The results in Table 4 address the issue of enrollment and persistence. As discussed in section 3.1, the dependent variable in these models indicates the year of attendance in addition to the type and intensity of the program. Panel A of Table 4 shows results for part-time graduate attendance, and Panel B focuses on full-time graduate attendance. We see that inflation-adjusted Section 127 availability increases the relative persistence of full-time employees in part-time public programs by 0.8 percentage points, at the expense of decreasing the probability of second or higher year attendance of individuals who are unemployed or out of the labor force. As discussed previously, this may reflect a trend of more students staying with their employers until completion of the graduate program. Both full-time and part-time employment are positively related to enrollment in private part-time programs when the tuition deduction can be applied to graduate studies; the estimated coefficients equal 0.0072 and 0.0091, respectively, and are significant at the 5 percent level. Parallel to the findings from columns 3 and 4 of Tables 2 and 3, the biggest change in full-time attendance for workers occurs in the case of public institutions. We also see that the effect is strongest in column 2 of Table 4, the persistence specification. Full-time and to a smaller degree part-time employment are associated with an increase in second and higher year attendance rates when the tax deduction can be used for graduate studies.

Panels C and D repeat the estimation for undergraduate education. All of the part-time program coefficients are close to zero and statistically insignificant. Two of the full-time public program coefficients on Section 127 interacted with employment status

are negative and significant at the 5 or 10 percent level. This indicates once again that making Section 127 available to graduate students did not increase undergraduate attendance.

Overall, the CPS results presented in this section show that the graduate attendance response to the tax deduction for employer-provided tuition assistance is small but positive for working college graduates. It is not surprising that the effect we find is small given the limited incentive value of the benefit. The attendance rates of workers with a high school diploma but no college degree are unaffected or fall slightly, which may suggest that employers may redistribute part of the resources devoted to tuition assistance as a result of increased demand for graduate subsidies.

4 Effects on Financing

4.1 NPSAS Empirical Specification

We use the National Postsecondary Student Aid Study (NPSAS) data to uncover whether the way students finance their education changes when employer tuition assistance is tax favored. More graduate students should report receiving any employer tuition assistance if there is an enrollment response to the exemption. The policy could also change the mix of students even if overall enrollment remains the same or decreases. When estimating the effect of the tax exemption on the probability of using employer provided tuition assistance and the amount of assistance we can no longer use the unemployed as a control group because by definition they cannot receive any tuition assistance whether there is an exemption or not. We do not drop non-workers because the employment decision is not exogenous and some non-workers may take a leave of absence from work to attend school full-time, then return to work. The baseline model that we estimate

using the NPSAS data is a difference-in-difference specification given by

$$\text{Employer Aid}_{it} = f\{X_{it}\beta + \gamma_1\text{Sec127}_t + \gamma_2\text{Grad}_{it} + \lambda(\text{Grad}_{it} \times \text{Sec127}_t) + \varepsilon_{it}\}, \quad (3)$$

where Employer Aid is an indicator for receiving any aid or the amount of aid in 2009 dollars, depending on the regression; the vector X includes race, a quadratic in age, marital status, income, the one-year lag of the state unemployment rate and a quadratic in time. Individuals who attend undergraduate classes after age 23 are certainly different from those who pursue a graduate degree. However, all respondents in the sample are currently enrolled in school and we use the actual aid that they receive from their employers as a dependent variable. Using individuals taking undergraduate courses as a control allows us to eliminate bias arising from employers changing their education assistance generosity that may be correlated with the timing of the tax exemption for graduate education. The coefficient of interest, λ , in this case is a measure of the treatment effect on the treated.

We estimate the model in equation (3) using different versions of the dependent variable. First, we estimate a probit model in which the outcome of interest is an indicator for any employer-provided tuition assistance received during the academic year when the interview took place. An increase in the proportion of graduate students who use employer-provided tuition reimbursement during periods when Section 127 applies to this type of aid could indicate one of two things. It is possible that graduate enrollment increases and marginal individuals who would not have undertaken the education without the deduction enroll when the cost drops by the tax deduction amount. We cannot distinguish this scenario from the case in which enrollment remains the same but students shift towards using more employer-provided aid either because its value increases or because more firms start offering this benefit. Thus, it is important to consider both the CPS and NPSAS results.

We also estimate equation (3) by tobit with a dependent variable that measures the

amount (in 2009 dollars) of employer aid that each respondent used. The direction in which the amount of employer-provided aid might vary with changes in the Section 127 provisions depends on the incidence of the tax credit. The incidence will fall on firms if they change the amount of tuition assistance offered in response to the change in the tax code. For example, suppose a firm provides \$5,000 in tuition assistance of which the student must pay \$1,000 in taxes (assuming a 20 percent average tax rate) if the tuition assistance is not exempt. When the assistance becomes exempt, the employer could decrease the assistance offered to \$4,000 and the student could pay \$1,000 to cover the difference. The student is thus no better or worse off, but the firm has reduced its labor costs. Researchers have also pointed out that educational institutions may increase tuition costs or lower the amount of aid they offer in response to the introduction or expansion of education tax benefits (e.g. Hoxby 1998, Long 2004, Turner 2012b). We therefore estimate equation (3) by tobit with a dependent variable that measures the amount (in 2009 dollars) of tuition paid. An increase in tuition for graduate students relative to undergraduates when the tax exemption is in place can reflect institutions increasing tuition or it could be that students enroll in more expensive programs when the tax exemption is in place. We are unable to distinguish between these two cases but it will be relevant to examine whether there is a change in the amount of tuition paid. Finally, we estimate a model with the amount of institutional grants as the dependent variable because this is another way that universities can capture the economic incidence of the tax exemption. As in the CPS results we report weighted average marginal effects with standard errors clustered on the state-year level.

4.2 National Postsecondary Student Aid Study Data

We use the 1989-1990, 1992-1993, 1995-1996, 1999-2000, 2003-2004 and 2007-2008 waves of the NPSAS to analyze how graduate students finance their education.¹³ NPSAS sur-

¹³The tax exemption was not available for respondents in the 1989-1990 and 1999-2000 samples.

veys individuals who are enrolled in the current school year about their finances and supplements these data with individual-level institutional records.¹⁴ Both undergraduate and graduate students are interviewed. The survey includes detailed and accurate accounts of the dollar amounts of different types of grants received, including employer tuition assistance and institutional grants, loans, and the amount of tuition paid to the institution. Information on whether a student is enrolled part-time or full-time, the type of degree, whether the school is public or private, and the number of hours worked outside of the university allows us to examine the impact of the tax exemption on different types of students.

Income is taken from the Free Application for Federal Student Aid (FAFSA) if the student filled one out. If not, then the student selects an interval that their income falls into and this information is used to impute an income value. Thus, the income variable is more reliable than in the CPS data but is still subject to some measurement error. We restrict our sample to students who are not claimed as dependents on their parents' tax returns as students more likely to have parental support in financing their education likely face different constraints and incentives than financially independent students. We chose not to include 23 year olds because many of them are claimed as dependents whereas only 0.02% of the individuals aged 24-40 are dependents.

Trends in student financing follow those reported by the College Board (2011). Employer tuition assistance has stayed close to 20% of total funding for graduate students as a whole, but grants have made up a smaller proportion of funding over time, being replaced by loans, especially from the Stafford program. In 2008, loans made up roughly 54% of total funding. Work-study and grants from the State and Federal government make up a negligible amount of aid for graduate students. Graduate students receive some grants from their institutions, making up anywhere from 6-17% of total funding

¹⁴NPSAS is not longitudinal and it is not clear how many years the student has been enrolled in the program at the time of the interview, which makes it impossible to provide estimates of the tax exemption effect on persistence.

in a given year. Since the amount of grants being awarded has fallen over time relative to tuition, the tuition assistance tax exemption could have a significant effect on maintaining or increasing graduate enrollment.

Comparing demographic characteristics of the NPSAS data in Table 5 to those in the CPS in Table 1, we find that students are slightly younger than the average population and less likely to be white but more predominantly Asian. In both data sets, half of the 24-30 year-old group of college graduates enrolled in graduate school are in part-time programs. Graduate students are less likely to be married than the general population. Graduate students are more likely to receive aid from their employers than undergraduate students. More students are enrolled in public programs than private programs, and the proportion in each is close to those reported from the CPS data in Table 10.

Table 11 in Appendix B shows the average characteristics of students in the sample by employment and attendance intensity. Graduate students receive about twice as much aid from employers on average compared to undergraduate students, while very few receive more than \$5,250, the maximum amount that can be utilized tax-free. The amount of income that these students report may seem surprisingly high, especially for those who report not working. While none of the students in this sample are dependents, they may have working spouses. Tuition is significantly higher for graduate programs than undergraduate degrees. We report our main results by degree type because of differential tuition as well as the variations across degree types in the probability of employers providing assistance.

4.3 NPSAS Results

4.3.1 Probability of Using Employer Tuition Assistance

We examine the probability that an individual uses employer tuition assistance as a source of finance for their graduate education in Table 6. The tax rules did not change for undergraduates, so we compare students enrolled in graduate programs to similarly

aged students enrolled in undergraduate programs. The samples compare respondents enrolled in part-time public graduate programs (column 1), part-time private graduate programs (column 2), full-time public graduate programs (column 3) or full-time private graduate programs (column 4) to respondents in any undergraduate program. That is, the control group is the same for each regression. We find that the tax incentive increases the probability of using any employer tuition assistance by two percentage points for students enrolled in full-time public programs. This result is consistent with the CPS data that found about a one percentage point change in enrollment. We also find a three percentage point increase in the probability of using employer tuition assistance for students enrolled in full-time private programs. Given that we did not find an enrollment response in the CPS data this indicates that the small subsidy is not enough to incentivize someone to enroll in a more expensive program, but it could persuade someone who intends to enroll to seek out employer assistance. The positive coefficients on the graduate student dummy variable indicates that employers are more likely to provide tuition assistance for graduate programs than undergraduate programs, as was seen in the summary statistics. The positive coefficient on income illustrates that firms that pay higher salaries are more likely to offer tuition assistance. The lagged state unemployment rate does not appear to play a role in whether a student utilizes employer tuition assistance. A negative coefficient would have indicated that firms offer fewer fringe benefits when the economy is slack.

4.3.2 Amount of Employer Tuition Assistance

The response in the amount of tuition assistance received is investigated in Table 7. Students in full-time public and full-time private programs report an increase of about \$900 and \$1,300 respectively when the tuition subsidy is in place. Since more individuals utilize the tuition assistance the average amount used goes up. The more interesting case is with part-time public programs that see an increase of about \$360 (although only

significant at the 10% level). This is consistent with the idea that firms do not capture the incidence of the subsidy but instead workers re-optimize how much education to obtain. It is possible that firms allow a maximum amount of tuition assistance but individuals are free to use less than this amount and that they do so on average when the tax exemption is not in place. Individuals must still pay tax on any amount of employer tuition assistance beyond \$5,250, so even though some individuals use more tuition assistance it is likely that the total tax bill still goes down.

4.3.3 Tuition

In addition to the incentive for individuals to acquire additional education when the tax exemption is in place, universities may increase tuition to capture the incidence of the subsidy. Alternatively, students can afford a more expensive education so they may enroll in a university with a higher tuition. Table 8 displays the results for the tuition response to the tax exemption. Relative to undergraduate students, all graduate programs see an increase in tuition when the tax exemption is in place, even those in which students do not report an increase in the use of or the amount of employer assistance. Interestingly, while income is a significant predictor of tuition, the coefficient is incredibly small and actually negative. The tax exemption is equivalent to giving an individual more income to spend on their education, so this provides some evidence that it is universities that are changing their behavior, not individuals.

4.3.4 Amount of Institution Grants

Instead of altering tuition, universities can change the amount of institutional grants they provide in response to the tax benefit. Turner (2012a) shows that institutions capture seventeen percent of all Pell Grant aid, for example. We investigate this phenomenon by estimating equation (3) using tobit with the amount of institutional aid in 2009 dollars

as the dependent variable.¹⁵ Students in part-time public programs see a slight increase in institutional grants, but the effect is only significant at the ten percent level. While the coefficient in the other degree type regressions is not significant, it is not always positive either. It appears that institutions are not altering their grant generosity in response to the availability of the tax exemption in general.¹⁶

5 Conclusion

In this paper we examine how changes in the tax code affect enrollment in and financing of graduate education. We focus on the six-year lapse in exemptions for employer-provided graduate tuition assistance. Using the October supplements of the CPS, we find that full-time graduate enrollment among 24-30 year-old employed college graduates increases by about one percentage point in years when the tuition reimbursement tax exemption is available. Even though the treatment samples are different, this result is comparable to the findings of previous studies that use exogenous changes in education financing policies to study the effects of aid on college attendance (e.g. Dynarski 2000, Cornwell et al. 2006, Kane 2003, Seftor and Turner 2002). Our results are also in line with other studies that find an effect of financial aid policies on the outcomes of recent college graduates (e.g. Rothstein and Rouse 2011, Field 2009). The estimated effects are small enough to lead us to believe that partial equilibrium analysis is sufficient in this case and we do not need to conduct general equilibrium analysis that takes into account changes in skill prices (Heckman, Lochner and Taber 1998, Hendel, Shapiro and Willen 2005).

In terms of financing graduate education, we find that the students who report an

¹⁵Table available upon request.

¹⁶The lack of significant results could be due to the estimation technique and it is possible that a regression discontinuity or regression kink strategy as in Turner (2012a) may uncover more exact changes in institutional grant responses. Turner (2012a) finds that a student who receives the minimum Pell Grant award sees a jump in institutional aid. However, as Pell Grant aid increases, institutional aid decreases, leading to the capture. We leave estimating additional models of institutional grant awards to future work.

increase in attendance (full-time public) also report a greater propensity to use employer tuition assistance. Students in part-time public programs also indicate a greater likelihood in utilizing employer tuition assistance, which suggests that the effect is not limited to the enrollment decision.

Although the literature up to date has mostly focused on the elasticity of demand for college education, mostly among recent high school graduates, it is important when doing program evaluation to keep in mind that financial aid policies may have a different effect on graduate students. This paper provides a look at one such policy that is targeted at employed college graduates whose firms offer educational assistance. Our treatment group is not fully representative of all potential graduate students, but the fact that we find a response to changes in the cost of graduate education suggests that other educational assistance programs are also likely to have a nontrivial impact on graduate enrollment. It is also necessary to examine in more detail how firms respond to changes in Section 127 in terms of the tuition assistance offered for both graduate and undergraduate courses, and whether educational institutions increase the effective cost to students when federal aid policies for graduate students are more generous. We find that students tend to report receiving larger amounts of tuition assistance but also paying more in tuition during tax exempt years. However, we are unable to tell whether this comes from employers being more generous or more employees making use of existing programs. The data are also not sufficient to answer whether universities are increasing tuition or if individuals choose to attend more expensive programs. We offer an initial insight but leave untangling these effects for future work.

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Figure 1: Timeline of Tax Benefits for Graduate Education

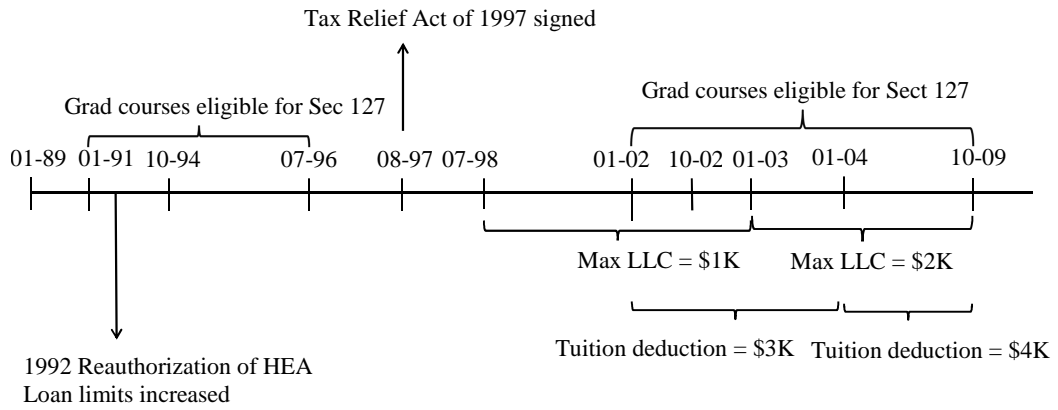


Table 1: CPS Summary Statistics

	College graduates	HS, No Bachelor's
Program attended:		
Part-time public	0.044	0.044
Part-time private	0.020	0.007
Full-time public	0.044	0.043
Full-time private	0.028	0.008
Vocational courses	0.033	0.032
Employed part-time	0.085	0.102
Employed full-time	0.799	0.698
Age	27.4 (1.9)	27.2 (2.0)
White	0.841	0.818
Asian	0.077	0.022
Female	0.549	0.541
Married, spouse present	0.602	0.649
Was enrolled in school last year	0.191	0.107
Low income	0.063	0.184
Medium income	0.634	0.725
High income	0.303	0.091
N	49,141	103,462

Summary statistics using CPS individual weights. The samples consist of individuals age 24-30, $1989 \leq t \leq 2009$.

Table 2: CPS Triple Difference Results - Public/Private Attendance

	PT Public	PT Private	FT Public	FT Private	Vocational
Grad X Sec 127 X Emp. FT	0.0080 (0.0063)	0.0038 (0.0028)	0.0097*** (0.0037)	0.0013 (0.0022)	0.0166*** (0.0041)
Grad X Sec 127 X Emp. PT	-0.0028 (0.0080)	0.0076* (0.0039)	0.0090** (0.0043)	0.0024 (0.0026)	0.0129** (0.0062)
Section 127 available	0.0019 (0.0026)	0.0002 (0.0016)	0.0029** (0.0014)	0.0011 (0.0012)	0.0057*** (0.0020)
Grad	-0.0153*** (0.0058)	0.0040 (0.0027)	0.0032 (0.0029)	0.0246*** (0.0018)	0.0028 (0.0034)
Employed FT	0.0238*** (0.0029)	0.0069*** (0.0019)	-0.0569*** (0.0020)	-0.0156*** (0.0016)	-0.0026 (0.0024)
Employed PT	0.0167*** (0.0036)	0.0058** (0.0024)	0.0076*** (0.0021)	0.0015 (0.0018)	-0.0009 (0.0033)
Section 127 X Employed FT	-0.0020 (0.0028)	0.0001 (0.0017)	-0.0014 (0.0019)	0.0005 (0.0015)	-0.0056*** (0.0021)
Section 127 X Employed PT	0.0030 (0.0036)	-0.0029 (0.0025)	-0.0048** (0.0021)	-0.0031* (0.0018)	-0.0045 (0.0032)
Employed FT X Grad	0.0127** (0.0061)	0.0035 (0.0028)	-0.0157*** (0.0038)	-0.0202*** (0.0022)	-0.0045 (0.0038)
Employed PT X Grad	0.0063 (0.0078)	-0.0020 (0.0038)	-0.0004 (0.0042)	-0.0113*** (0.0026)	-0.0097 (0.0060)
Section 127 X Grad	-0.0091 (0.0060)	-0.0043 (0.0027)	-0.0052* (0.0029)	-0.0020 (0.0017)	-0.0129*** (0.0038)
Low income	-0.0172*** (0.0035)	-0.0120*** (0.0017)	0.0196*** (0.0038)	0.0072*** (0.0022)	-0.0034 (0.0028)
Medium income	0.0009 (0.0029)	-0.0066*** (0.0012)	0.0099*** (0.0038)	0.0026 (0.0021)	-0.0014 (0.0025)
Low income and $t \geq 1998$	0.0053 (0.0041)	0.0008 (0.0025)	-0.0064** (0.0028)	-0.0032 (0.0020)	0.0080** (0.0034)
Medium income and $t \geq 1998$	0.0016 (0.0026)	0.0022 (0.0014)	-0.0010 (0.0024)	-0.0000 (0.0017)	0.0045* (0.0025)
High income and $t \geq 1998$	0.0025 (0.0037)	-0.0009 (0.0018)	0.0000 (0.0046)	-0.0011 (0.0025)	0.0048 (0.0036)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Estimation results for equation (1). The dependent variable is an attendance indicator for the given program. The reported coefficients are weighted average marginal effects from probit models. The sample consists of high school graduates age 24-30, $1989 \leq t \leq 2009$. The controls include quadratics in age and t , race, gender, marital status, state dummies, the state's unemployment rate from the previous year and indicators for previous year enrollment and for $t \geq 1993$ (post-HEA reauthorization). The standard errors are clustered on the state-year level. $N = 152,603$.

Table 3: CPS Difference-in-Difference Results - Public/Private Attendance

	PT Public	PT Private	FT Public	FT Private	Vocational
A. Graduate (N = 49,141)					
Sec 127 and employed FT	0.0055 (0.0057)	0.0085** (0.0040)	0.0094*** (0.0029)	0.0032 (0.0026)	0.0106*** (0.0038)
Sec 127 and employed PT	-0.0011 (0.0072)	0.0102* (0.0054)	0.0031 (0.0034)	-0.0008 (0.0032)	0.0083 (0.0053)
Section 127 available	-0.0068 (0.0055)	-0.0085** (0.0038)	-0.0034 (0.0025)	-0.0033 (0.0021)	-0.0071** (0.0036)
B. Undergraduate (N = 103,462)					
Sec 127 and employed FT	-0.0017 (0.0027)	-0.0001 (0.0011)	-0.0009 (0.0019)	0.0005 (0.0010)	-0.0056*** (0.0021)
Sec 127 and employed PT	0.0021 (0.0035)	-0.0018 (0.0016)	-0.0051** (0.0021)	-0.0022* (0.0012)	-0.0044 (0.0032)
Section 127 available	0.0016 (0.0026)	0.0001 (0.0011)	0.0027* (0.0014)	0.0011 (0.0008)	0.0055*** (0.0021)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Estimation results for equation (2). The dependent variable is an attendance indicator for the given program. The reported coefficients are weighted average marginal effects from probit models. The sample consists of college graduates (Panel A) or high school graduates without a college degree (Panel B) age 24-30, $1989 \leq t \leq 2009$. The controls include income categories and their interactions with $t \geq 1998$, the state's unemployment rate from the previous year, quadratics in age and t , race, gender, marital status, state dummies and indicators for previous year enrollment and for $t \geq 1993$ (post-HEA reauthorization). The standard errors are clustered on the state-year level.

Table 4: CPS Difference-in-Difference Results - Enrollment and Persistence

	Public		Private	
	1st Year	2nd+ Year	1st Year	2nd+ Year
A. Graduate Part-Time Programs (N = 49,141)				
Section 127 and employed FT	-0.0003 (0.0037)	0.0080* (0.0045)	0.0072*** (0.0027)	0.0005 (0.0032)
Section 127 and employed PT	-0.0011 (0.0049)	0.0025 (0.0051)	0.0091** (0.0036)	0.0003 (0.0041)
Section 127 available	0.0014 (0.0036)	-0.0105** (0.0044)	-0.0067** (0.0026)	-0.0011 (0.0032)
Number obs. with $Y = 1$	965	1,189	453	567
B. Graduate Full-Time Programs (N = 49,141)				
Section 127 and employed FT	0.0038** (0.0019)	0.0063** (0.0026)	0.0029* (0.0016)	0.0002 (0.0022)
Section 127 and employed PT	-0.0014 (0.0021)	0.0044 (0.0030)	0.0019 (0.0019)	-0.0031 (0.0025)
Section 127 available	-0.0009 (0.0015)	-0.0027 (0.0022)	-0.0021* (0.0012)	-0.0007 (0.0017)
Number obs. with $Y = 1$	692	1,478	445	945
C. Undergraduate Part-Time Programs (N = 103,462)				
Section 127 and employed FT	-0.0009 (0.0013)	-0.0004 (0.0025)	0.0000 (0.0005)	0.0001 (0.0011)
Section 127 and employed PT	0.0013 (0.0017)	0.0013 (0.0033)	0.0006 (0.0008)	-0.0018 (0.0014)
Section 127 available	0.0014 (0.0012)	-0.0004 (0.0024)	0.0003 (0.0004)	-0.0002 (0.0011)
Number obs. with $Y = 1$	1,255	3,048	164	553
D. Undergraduate Full-Time Programs (N = 103,462)				
Section 127 and employed FT	-0.0016 (0.0010)	0.0010 (0.0017)	-0.0003 (0.0005)	0.0011 (0.0009)
Section 127 and employed PT	-0.0009 (0.0012)	-0.0041** (0.0018)	-0.0015** (0.0007)	-0.0006 (0.0011)
Section 127 available	0.0014* (0.0008)	0.0010 (0.0012)	0.0010** (0.0004)	-0.0001 (0.0007)
Number obs. with $Y = 1$	835	3,632	170	690

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Estimation results for equation (2). The reported coefficients are weighted average marginal effects from probit models. The sample consists of college graduates (Panel A and B) or high school graduates without a college degree (Panels C and D) age 24-30, $1989 \leq t \leq 2009$. The controls include income categories and their interactions with $t \geq 1998$, the state's unemployment rate from the previous year, quadratics in age and t , race, gender, marital status, state dummies and indicators for previous year enrollment and for $t \geq 1993$ (post-HEA reauthorization). The standard errors are clustered on the state-year level.

Table 5: NPSAS Summary Statistics

	Graduate Students	Undergraduate Students
Part-time public	0.345	0.562
Part-time private	0.194	0.086
Full-time public	0.265	0.23
Full-time private	0.196	0.122
Employed part-time	0.279	0.314
Employed full-time	0.495	0.535
Age	26.56 (1.93)	26.47 (1.99)
White	0.757	0.655
Asian	0.082	0.05
Female	0.546	0.549
Married	0.323	0.318
Income	36900 (34518)	29580 (27303)
Use Employer Assistance	0.137	0.077
N	25290	56490

Summary statistics using NPSAS weights. The samples consist of individuals age 24-30 attending a graduate or undergraduate program. Standard deviations are in parenthesis. Sample sizes are rounded to nearest 10 as per NPSAS restricted use agreement.

Table 6: NPSAS Results - Probability of Using Employer Tuition Assistance

	PT Public	PT Private	FT Public	FT Private
Grad X Section 127	0.0059 (0.0060)	0.0013 (0.0074)	0.0213*** (0.0052)	0.0320*** (0.0098)
Grad	0.0432*** (0.0066)	0.0701*** (0.0070)	-0.0447*** (0.0059)	-0.0524*** (0.0102)
Section 127 available	-0.0037 (0.0047)	-0.0023 (0.0043)	-0.0042 (0.0042)	-0.0049 (0.0043)
Married	0.0045 (0.0029)	0.0036 (0.0028)	0.0060** (0.0026)	0.0051* (0.0028)
Female	-0.0139*** (0.0022)	-0.0138*** (0.0020)	-0.0088*** (0.0020)	-0.0105*** (0.0022)
Black	-0.0055 (0.0034)	-0.0038 (0.0034)	-0.0041 (0.0031)	-0.0039 (0.0031)
Asian	-0.0174*** (0.0059)	-0.0155** (0.0070)	-0.0111** (0.0050)	-0.0161*** (0.0059)
Family income (10,000s)	0.0116*** (0.0008)	0.0119*** (0.0008)	0.0101*** (0.0008)	0.0106*** (0.0008)
State UR last year	-0.0026 (0.0023)	-0.0028 (0.0022)	-0.0019 (0.0022)	-0.0013 (0.0022)
N	63270	60560	64890	62500

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Estimation results for equation (3). The dependent variable is an indicator for any employer-provided tuition assistance. The reported coefficients are weighted average marginal effects from probit models. The samples consist of individuals age 24-30 attending a graduate program of the type specified in the column heading or any undergraduate. The controls include quadratics in age and t and state dummies. The standard errors are clustered on the state-year level. Sample sizes are rounded to the nearest 10 as per NPSAS restricted use agreement.

Table 7: NPSAS Results - Amount of Employer Tuition Assistance (\$1,000s)

	PT Public	PT Private	FT Public	FT Private
Grad X Section 127	0.3607* (0.2037)	0.2064 (0.3395)	0.8784*** (0.2513)	1.3321*** (0.4752)
Grad	1.4333*** (0.2288)	3.2699*** (0.3543)	-1.2584*** (0.2740)	-1.3746*** (0.4564)
Section 127 available	-0.1169 (0.1580)	-0.0724 (0.1673)	-0.1383 (0.1857)	-0.1949 (0.1856)
Family income (10,000s)	0.3958*** (0.0287)	0.4685*** (0.0295)	0.4503*** (0.0335)	0.4728*** (0.0365)
State UR last year	-0.0751 (0.0762)	-0.1066 (0.0823)	-0.0983 (0.0940)	-0.0509 (0.0930)
N	63270	60560	64890	62500

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Estimation results for equation (3). The reported coefficients are weighted average marginal effects from tobit models. The dependent variable is the amount in 2009 dollars of reported employer-provided tuition assistance. The samples consist of individuals age 24-30 attending a graduate program of the type specified in the column heading or any undergraduate. The controls include quadratics in age and t , race, gender, marital status and state dummies. The standard errors are clustered on the state-year level. Sample sizes are rounded to the nearest 10 as per NPSAS restricted use agreement.

Table 8: NPSAS Results - Effect of Tax Exemption on Tuition (\$1,000s)

	PT Public	PT Private	FT Public	FT Private
Grad X Section 127	0.5825*** (0.1458)	1.4650*** (0.3589)	2.5751*** (0.2853)	5.1151*** (0.7929)
Grad	-1.0102*** (0.1081)	1.2513*** (0.2511)	1.7479*** (0.2167)	8.9080*** (0.7059)
Section 127 available	0.2678*** (0.0983)	0.2431** (0.1046)	0.1434 (0.1085)	0.0426 (0.1211)
Family income (10,000s)	-0.1830*** (0.0118)	-0.1692*** (0.0106)	-0.1963*** (0.0125)	-0.2033*** (0.0155)
State UR last year	0.0645 (0.0551)	0.0668 (0.0589)	0.1506** (0.0599)	0.1561** (0.0653)
N	63270	60560	64890	62500

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Estimation results for equation (3). The coefficients are weighted average marginal effects from tobit models. The dependent variable is the amount in 2009 dollars of total tuition and fees charged by the institution. The samples consist of individuals age 24-30 attending a graduate program of the type specified in the column heading or any undergraduate. The controls include quadratics in age and t , race, gender, marital status and state dummies. The standard errors are clustered on the state-year level. Sample sizes are rounded to the nearest 10 as per NPSAS restricted use agreement.

A Tax Benefits and Other Sources of Education Financing

The two most significant provisions of the TRA of 1997 are the Hope Credit and the Lifetime Learning Credit (LLC) (both introduced in 26 U.S.C. §25A(b)). The Hope Credit benefits only undergraduate students in the first two years of their postsecondary schooling. It covers the first \$1,000 of tuition and fee expenditures, as well as half of the next \$1,000. The maximum credit is thus \$1,500, and can be claimed for own schooling expenditures or for a taxpayer's spouse or children's education. The LLC is aimed at a different group of students. It covers tuition and fees for any postsecondary education, including graduate degrees and course work that is not part of a degree program. The maximum credit was \$1,000 when first introduced, but increased up to \$2,000 in 2003. Unlike the Hope Credit, the LLC covers 20% of the qualifying expenses. Both the LLC and the Hope Credit are subject to the same income eligibility requirements and neither is refundable meaning that the amount of the credit received is also capped at the amount of taxes owed. This makes very low income households ineligible for these credits if their income is below the taxable minimum.

Another important provision was introduced starting with the 2002 tax year, when students could deduct up to \$3,000 from their taxable income for postsecondary tuition and fees. In 2004 the limit was increased to \$4,000. The benefit is available to both graduate and undergraduate students, their spouses and dependents, but it may not be used concurrently with the Hope Credit or LLC. This deduction is again aimed at the middle class because households who do not owe income tax are not eligible (or are eligible for less than the full amount if the sum they owe is less than the maximum deduction), and there exist upper income limits that exclude households with income over \$80,000 (if single) or \$160,000 (if filing jointly).¹⁷ Other tax incentives for education

¹⁷These amounts were lower prior to 2004.

introduced with the TRA of 1997 include a student loan interest deduction, the Coverdell Education Savings Account and a tax exception for early IRA distributions used to cover schooling expenses. We do not include additional controls for these provisions in our empirical models because the timing of the incentives they create is unclear and the latter two are more likely to be used by parents for their children's college education. Furthermore, the controls we do include for the provisions of the TRA of 1997 should account at least partly for the aforementioned benefits.

Tax benefits constitute a small portion of the total aid received by graduate students, with the majority (69% in the 2009-10 academic year) coming from federal loans. Most loans are taken out under the Stafford Loan Program. Graduate students can accrue up to \$138,500 in debt from subsidized and unsubsidized Stafford loans. Perkins Loans are not available at all institutions and account for less than one percent of total federal loans for graduate students. Limits and eligibility for the federal loan program increased most substantially after the 1992 reauthorization of the Higher Education Act (HEA) of 1965, so to account for any effects of this change on enrollment in our empirical models we include an indicator for the post-1992 period.¹⁸ Students have been able to take out private loans since 1995 and starting in July 2006, graduate students are able to borrow through the PLUS program to cover additional tuition costs that are not covered by other forms of aid (College Board 2011). Graduate students are not eligible for Federal Pell Grants, Federal Supplemental Educational Opportunity Grants (FSEOG), Academic Competitiveness Grants (ACG), and SMART Grants, but can receive institutional and private awards, in addition to employer grants. An overview of the benefits described in this section is available in Table 9.

¹⁸We do not include this indicator in the financing models because we only have six years of data, one of which is pre-1992 and is one of two years when the Section 127 exemption is not in place.

Table 9: Education Benefits Overview

Benefit	Eligibility	Amount
Lifetime Learning Credit	Available for course work; can be claimed for net tuition and fees (less grant aid) for taxpayer, spouse, dependent; 20% credit against total tax liability for first \$A per household of qualified tuition and expenses	A = \$5K (1998-2002) or \$10K (2003-09) Phase-out income: \$40K/\$80K to \$50K/\$100K (1998-2001) \$50K/\$100K to \$60K/\$120K (2009)
Interest Deduction	Deduction up to \$A of adjusted gross income for interest payments on student loans; 1998-2001: Limited to first 60 months of interest payments	A = \$1,000 (1998), \$1,500 (1999), \$2,000 (2000), \$2,500 (2001-07) Phase-out income: \$40K/\$60K to \$55K/\$75K (1998-2001) \$55K/\$110K to \$70K/\$140K (2007)
Tuition and Fees Deduction	Deduction up to \$A for postsecondary tuition and fees	A=\$3K (2002-03) or \$4K (2004-09) Income limits: \$65K/\$130K (2002-03) \$80K/\$160K (2004-09)
Section 127	Tax-free status of employer-provided subsidy up to \$A for graduate courses	A = \$5,250 (1991-95, 2002-09) or 0 (1989-1990, 1996-2001)
Perkins Loan	Fixed-rate (5%) loan; annual limit of \$A and aggregate limit of \$B for graduate students	A = \$5K (1995-98) or \$6K (1999-2007) B = \$30K (1995-98) or \$40K (1999-2007)
Subsidized Stafford Loan	Variable interest rate; annual limit of \$A and aggregate limit of \$B for graduate students	A = \$7.5K (1987-93), \$8.5K (1994-2007) B = \$54.75K (1987-92), \$65.5K (1993-2007)
Unsubsidized Stafford Loan	Annual limit of \$A and aggregate limit of \$B for graduate students	A = \$4K (1986-94) or \$10K (1995-2007) B = \$73K (1994-2007)

Graduate students are not eligible for the HOPE credit, Federal Pell Grants, Federal Supplemental Educational Opportunity Grants (FSEOG), Academic Competitiveness Grants (ACG), and SMART Grants.

B Additional Descriptive Statistics

Table 10: CPS Summary Statistics by Employment/Attendance Status

Employment Attendance	Employed PT		Employed FT		Not Working	
	PT	FT	PT	FT	PT	FT
	Graduate Students					
Public institution	0.747	0.704	0.676	0.620	0.742	0.524
Private institution	0.253	0.296	0.324	0.380	0.258	0.476
Age	26.9	26.5	27.3	26.9	27.4	26.4
	(2.0)	(2.0)	(1.9)	(1.9)	(1.9)	(1.9)
White	0.859	0.777	0.872	0.765	0.643	0.721
Asian	0.065	0.151	0.043	0.084	0.240	0.198
Female	0.744	0.494	0.561	0.488	0.786	0.487
Married	0.580	0.434	0.595	0.464	0.672	0.385
Enrolled last year	0.706	0.816	0.597	0.785	0.566	0.742
Low income	0.172	0.296	0.027	0.088	0.192	0.385
Median income	0.683	0.633	0.661	0.731	0.588	0.514
High income	0.146	0.071	0.312	0.181	0.219	0.101
N	317	1,237	2,687	937	170	1,386
	Undergraduate Students					
Public institution	0.893	0.865	0.859	0.780	0.880	0.858
Private institution	0.107	0.135	0.141	0.220	0.120	0.142
Age	26.7	26.3	27.0	26.5	27.0	26.5
	(2.0)	(2.0)	(2.0)	(2.0)	(2.0)	(2.1)
White	0.810	0.828	0.819	0.739	0.746	0.720
Asian	0.039	0.035	0.025	0.024	0.069	0.068
Female	0.730	0.563	0.522	0.474	0.832	0.650
Married	0.544	0.455	0.551	0.468	0.642	0.486
Enrolled last year	0.606	0.782	0.609	0.700	0.497	0.682
Low income	0.226	0.360	0.068	0.135	0.303	0.385
Median income	0.698	0.582	0.795	0.747	0.626	0.560
High income	0.076	0.057	0.137	0.118	0.071	0.055
N	734	1,707	3,606	1,372	680	2,248

Summary statistics using CPS individual weights. The samples consist of individuals age 24-30, $1989 \leq t \leq 2009$.

Table 11: NPSAS Summary Statistics by Employment/Attendance Status

Employment Attendance	Employed PT		Employed FT		Not Working	
	PT	FT	PT	FT	PT	FT
Graduate Students						
Public institution	0.715	0.606	0.623	0.491	0.677	0.581
Private institution	0.285	0.394	0.377	0.509	0.323	0.419
Receives Employer Aid	0.070	0.043	0.307	0.147	0.055	0.039
Amount of Employer Aid	270	290	1100	690	220	270
Employer Aid (If > 0)	3780	6740	3600	4700	3950	6900
Tuition	4930	12730	3920	8040	6310	16460
Amount of Institution Aid	790	2900	290	1120	1960	4330
Age	26.54	26.13	26.95	26.73	26.70	26.06
White	0.765	0.752	0.800	0.733	0.724	0.700
Asian	0.073	0.089	0.045	0.059	0.116	0.138
Female	0.601	0.559	0.582	0.531	0.585	0.474
Married	0.328	0.230	0.439	0.310	0.339	0.243
Income	32910	24110	52220	40530	32430	24490
N	1970	4490	6330	2340	1000	4790
Undergraduate Students						
Public institution	0.878	0.721	0.860	0.572	0.858	0.650
Private institution	0.122	0.279	0.140	0.428	0.142	0.350
Receives Employer Aid	0.055	0.038	0.146	0.092	0.029	0.024
Amount of Employer Aid	96	105	215	257	61	70
Employer Aid (If > 0)	1730	360	1470	2790	2100	2880
Tuition	1960	5290	1400	5250	2110	5540
Amount of Institution Aid	110	480	50	270	140	380
Age	26.31	26.07	26.66	26.41	26.71	26.40
White	0.656	0.684	0.679	0.609	0.622	0.580
Asian	0.061	0.052	0.039	0.027	0.077	0.065
Female	0.588	0.531	0.519	0.492	0.672	0.625
Married	0.320	0.237	0.373	0.302	0.390	0.322
Income	27860	18900	37860	28300	29180	21090
N	7480	9860	14250	7580	3100	5760

Summary statistics using NPSAS weights. Sample sizes are rounded to the nearest 10.