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Income-Tested College Financial Aid and Labor Disincentives

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ABSTRACT

Working has become commonplace among college students; however, this activity can have unexpected financial consequences. Federal formulas implicitly tax the amount of financial aid students are eligible to receive by as much as 50 cents for each marginal dollar of income. This tax creates an incentive for college students to reduce income, though abstruse formulas and the timing of financial aid receipt are likely to limit responses. Using data from a national sample of financially independent college students in the United States, I do not find that students bunch below earnings protection thresholds in a manner that would indicate attempts to avoid reductions in financial aid in total or grants specifically. Moreover, I do not find evidence that implicit income taxes predict lower earnings in a manner that suggests that students meaningfully reduce earnings in response to the tax. Therefore, while economically efficient, the reduction in aid has the potential to burden low-income students who need to both work and receive financial aid in order to afford college expenses.

JEL Codes: H52, I22, J22

Keywords: College financial aid; Working students; Educational finance

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Vast public outlays are directed to encourage enrollment and ease financial burdens among college students in the United States. An example is the means-tested federal Pell Grant program that disburses over $30 billion annually and for which the yearly number of recipients has more than doubled in the past 20 years (Baum and Payea 2013). Even with these large public investments, many students face challenges affording college because of a growing gap between costs and available financial resources (Advisory Committee on Student Financial Assistance [ACSFA] 2006). This unmet financial need is one reason working has become commonplace among college students. Over 75 percent of undergraduate students work while in college, with recent student cohorts more likely to not only work, but work more hours than in the past (Perna 2010; Scott-Clayton 2012). These trends reflect both increasing rates of work among traditional full-time young college students and the growing college attendance of "nontraditional" students (Hess 2011; Perna 2010).

Working while in college can have unexpected adverse consequences to students' financial aid receipt.[1] Need-based federal financial aid formulas are based on the premise that students should direct a substantial portion of their income toward educational expenses. As a result, higher earnings result in reduced calculated need for financial assistance, and therefore possibly less aid received—as much as 50 cents less aid for each marginal dollar of income. This implicit income tax in the financial aid system has the potential to distort students' working behavior as it provides an incentive for students to reduce earnings immediately before or while in college. Even with the incentive to avoid the implicit income tax, however, there are a number of reasons to believe that responses will be limited, including a lack of knowledge students likely

[1] Research indicates that working while in school can improve labor market outcomes (Light 2001; Molitor and Leigh 2004). With regard to academic performance, researchers find null to small negative effects of increased working on grade point averages, but that increasing working leads to lower credit accrual for some types of students (Darolia 2014; Ehrenberg and Sherman 1987; Stinebrickner and Stinebrickner 2003).

have about complex need formulas, the timing of financial aid application and receipt, and the inability of many students to adjust their earnings because of financial obligations. A lack of response would indicate that the tax is economically efficient; however, it may be particularly burdensome to students who need to both work and receive financial aid in order to afford college and meet other financial obligations (Baum 2010).

In this paper, I analyze the working disincentives created by the tax on income that is embedded in the federal financial aid formula. The focus in this paper is on students who are considered financially independent in financial aid programs. Though relatively understudied, nearly half of all undergraduate students (about 9 million students annually) are identified as financially independent.[2] These students are not expected to receive financial support from parents and have relatively fewer resources on average, making them dependent mainly on their own earnings and financial aid pay for college. These financial constraints make this group particularly relevant to study in the context of implicit financial aid income taxes. Furthermore, financially independent students lie at the center of prominent public policy initiatives to increase college achievement in the United States. Growing the college completion rates among nontraditional working students is critical to recent federal higher education goals, but the financial aid system is not well-structured to serve this population (ACSFA 2012; Kane 1997).[3]

There have been relatively few studies of the earnings disincentives in the financial aid system, as extant research has focused on implicit taxes on asset accumulation behavior (e.g., Feldstein 1995; Kane 1998; M. Long 2004). However, income is the largest component of

[2] In addition, all graduate students (nearly 3 million students annually) are considered financially independent. Author's calculations based on the 2012 Digest of Education Statistics (U.S. Department of Education 2013) and the nationally representative National Postsecondary Aid Study (see http://nces.ed.gov/datalab/postsecondary/index.aspx).

[3] For example, President Obama has set goals in his administration to produce 5 million new community college graduates and to have the highest proportion of college graduates in the world by 2020 (White House n.d. http://www.whitehouse.gov/issues/education/higher-education).

expected personal contribution to college expenses in federal aid formulas for most students (Monks 2004).[4] The relative importance of income to pay for college expenses is especially acute for financially independent students, since they have relatively low asset levels (financially dependent students' relatively high asset levels are typically a reflection of the assets held by their parents). Furthermore, assets are not counted in federal aid formulas for many students, such as those who have an income below a certain threshold ($50,000 in recent years) and qualify for means-tested federal social programs. Therefore, most low-income and many moderate-income students are only affected by the income tax, but do not need to be concerned about the asset assessment.

Using data from a nationally representative sample of undergraduate students in the United States, I do not find evidence that financially independent students strategically attempt to avoid the tax by manipulating their earnings near thresholds where taxes start to be assessed. Additionally, I do not find that implicit income taxes predict lower earnings in a manner that suggests that students meaningfully reduce earnings in response to the tax. If anything, I find descriptive evidence that students with modest incomes work more as implicit earnings taxes increase, suggesting that the tax may be particularly burdensome for this group if they are increasing work in order to make up for the loss of aid. I discuss implicit income taxes in the financial aid system, and expected response to them, in the subsequent section. This is followed by discussion of financially independent students, the data, and methodology. In the Results section, I present results from tests of bunching near income protection thresholds and estimates of the relationship between earnings response and implicit marginal tax rates (MTR). I conclude with implications for policy.

[4] This is particularly true over the past 20 years, since home equity, a major component of many households' asset bases, was removed from consideration in financial aid formulas as part of amendments to the Higher Education Act in 1992.

IMPLICIT TAXES IN THE FEDERAL FINANCIAL AID SYSTEM

Financial Aid Formulas

Federal aid is the sizable source of public aid used by students to pay for college, with about $170 billion disbursed to students in recent years (Baum and Payea 2013).[5] The average receipt and the number of recipients for the major broadly available federal financial aid programs are listed in Table 1. Pell Grants and loan programs are the largest categories, both in the average aid per recipient and the number of recipients. Federal college financial aid formulas calculate the amount of financial aid provided to the student by comparing the cost of educational attendance (including direct costs such as tuition, fees, and books, as well as indirect costs such as housing, food, and personal expenses) with the amount the government expects students and their families to contribute, formally called the expected family contribution (EFC).

EFC for a financially independent student is calculated as the sum of students' expected contribution from prior year income and assets.[6] EFC for independent students without dependents is calculated as

$$EFC = [(I - P_I)\Omega_I + A]/S \quad (1)$$

Contribution from income is calculated as the total income of the student (net of taxes), I, less a protected income allowance level, P_I.[7] The income allowance varies by marital status, number of dependents, spousal college attendance pattern, and student and spouse income. The assessment on income contribution is Ω_I. Though not relevant for most students, asset contribution, A, is a function of available assets, an asset protection amount, and an asset

[5] States also heavily subsidize higher education costs at public institutions, but students do not need to apply for the majority of this aid that is reflected in subsidized tuition prices.

[6] The full EFC calculation guide is available from the Department of Education: http://ifap.ed.gov/ifap/byAwardYear.jsp?type=efcformulaguide. Income is based on adjusted gross income from the prior year tax filing, plus untaxed income and benefits.

[7] Federal taxes in the financial aid formulas are deducted based on what was paid, while state and Social Security taxes are assessed based on percentages in the formula.

assessment. The sum of the income and asset contributions is divided by the number of household members in college, *S*, to yield EFC. EFC is considered zero if calculated EFC is less than zero.[8]

The purpose of most federal financial aid programs is to support students with financial need, which is calculated as the gap between college costs and EFC. All else equal, those with more income and assets have less calculated need in the financial aid formula. At higher levels of income, EFC increases, and consequently out of pocket expenses correspondingly grow. Funds to cover out of pocket expenses include savings, contributions from family members, private loans, and income.

Assuming all financial need is met by financial aid, the following schedule describes students' out of pocket expenses, *OPE*, which depend on EFC and cost of attendance, *C*:

$$OPE = \begin{cases} 0, & EFC = 0 \\ [(I - P_I)\Omega_I + A]/S, & 0 < EFC < C \\ C, & EFC \geq C \end{cases} \tag{2}$$

The income allowance protects a limited amount of students' incomes without a loss to financial aid. This is because EFC will be zero when income is less than the income allowance and with few counted assets. In this way, students with very low incomes have an income MTR equal to zero. In the 2011–2012 EFC calculation, the after-tax income allowance ranged from $8,550 to $16,670 for independent students without dependents and from $29,600 to $36,800 for independent students with two children. High-income students also face a zero marginal income tax rate if their income is sufficiently high that their EFC exceeds costs of attendance. In this

[8] Independent students with dependents other than a spouse can qualify for an "automatic zero" EFC if they satisfy both of the following conditions: 1) a member of the student's household received benefits from the federal SSI Program, Food Stamp Program, Free and Reduced Price Lunch Program, TANF Program, or WIC; or the student and student's spouse (if married) each filed or was eligible to file a IRS Form 1040A or 1040EZ, or was not required to file income tax returns; or the student or student's spouse (if married) is a dislocated worker; and (2) The student's and spouse's (if married) income is below a certain threshold ($31,000 or less in the 2011–2012 school year). Independent students without dependents other than a spouse are not eligible for automatic zero EFC.

case, students are expected to finance all of their education from private sources (i.e., they receive no federal need-based aid), and therefore earnings increases do not reduce aid receipt.

It follows that as income increases, out of pocket expenses grow by a rate of Ω_I/S, representing the MTR, when there is a positive EFC that does not exceed cost of attendance and zero otherwise:

$$(3) \qquad \frac{\partial OPE}{\partial I} = \begin{cases} 0, & EFC = 0 \\ \Omega_I/S, & 0 < EFC < C \\ C, & EFC \geq C \end{cases}$$

The calculation differs for independent students with dependents, as the implicit tax is assessed based on the total amount of net income and assets. Holding all else equal, however, out of pocket expenses similarly increase by the assessment as earnings increase. Further detail is included in Appendix A.

Panel (a) in Figure 1 provides a schedule of the relationship between EFC and income earned for four exemplar independent student households using the 2011–2012 EFC formula. The horizontal lines are the average total price of attendance for public two-year, public four-year, private nonprofit four-year, and for-profit colleges in the 2011–2012 school year (U.S. Department of Education 2014). All students have EFCs equal to zero for some amount of income allowance, and when EFC exceeds educational costs, students will not receive need-based federal aid. Panel (b) in Figure 1 more directly illustrates the relationship between federal financial aid receipt and income for the same four students based on the average cost of college at a public two-year institution. If all need is fully met, then financial aid receipt is equal to the cost of education when income is less than the income allowance (this is when EFC is equal to

zero), then decreases linearly at a rate of Ω_I/S for the two students without dependents.[9] The income assessment rate for independent students without dependents has been 50 percent in recent years, which yields an MTR of 50 percent for the single student and 25 percent for the married student with a spouse in college in this range. Federal aid receipt declines at a rate of Ω_j/S, for the students with dependents, based on adjusted available income tier j as explained in Appendix A. At higher levels of income when EFC exceeds the cost of education, financial aid receipt is equal to zero.

Figure 2 displays the corresponding marginal and average tax rates faced by these students as scheduled in the EFC formula. MTRs are calculated as the percentage change in marginal aid for each dollar earnings increase ($\partial AID/\partial I$). Panel (a) demonstrates that single students without dependents face a relatively high MTR when compared to married students who have a spouse in college in a specified income range, while the MTRs of students with dependents follow a tiered schedule. Panel (b) displays average tax rates for all students, which are calculated as the proportion of total forgone aid at each income level,$(Aid_{I=X} - Aid_{I=0})/I$.

Expected Response to MTRs

Earnings can reduce financial aid receipt for students with $I \in (P_I, C)$ for students with few assets; therefore, following expectations from a simple labor supply substitution effect, the implicit income tax creates a disincentive to work for students with EFCs in this range. Further discussion and a graphical depiction are provided in Appendix B. Students with incomes outside of this range may also respond to implicit taxes. It is possible that some students will reduce their work effort in response to the general concern that they could lose some financial aid even if

[9] Aid packages can be composed of grants, loans, and work-study with varying levels of subsidy and benefits. As a result, students may not value all components of their aid packages similarly. I elaborate on this point in the next section.

they are not sure of the magnitude of their own MTR. As well, strategic students with incomes just below the protection level (i.e., when with EFC just below 0 for a student with few assets) might reduce their incomes in order to avoid the income assessment. I test for evidence of this behavior in subsequent sections.

The composition of financial aid packages may also affect if, and at what levels of income, a student responds to MTRs. Federal aid can come in many forms; Pell Grants are the largest grant program and grants are most valuable to students since they do not need to be repaid. Financial aid offices typically first assign Pell Grants to students. If student need exceeds the maximum Pell award (the maximum Pell Grant award was $5,550 in the 2011-2012 school year), then institutions will add federal loans and work-study to the aid package.[10] Loans and work-study, however, likely do not have the same value as grants to the student. Researchers have previously valued loans at 50–60 cents for each dollar of grant aid (Dick and Edlin 1997; Feldstein 1995; M. Long 2004). Baum (2010) suggests that work-study has a relatively limited value to students since the student is expending a similar level of effort as in a non-work-study job and that the benefits are mostly accrued by the college.[11]

As a result, students with need that exceeds the maximum grant award and who discount the value loans and work-study may be more likely to respond to MTRs that reduce specifically grant aid. For students with few assets, grant aid can be reduced when earnings are less than the income protection level plus the maximum grant amount, G, and below college costs, $I \in (P_I +$

[10] Aid packages vary by student and by institution. Federal loan programs can have annual and/or aggregate limits. For example, a third-year undergraduate student in the 2011–2012 school year could get a maximum of $5,500 in subsidized Stafford loans, $7,000 in unsubsidized Stafford loans, and $5,500 in Perkins loans for that school year. The generosity of some federal programs such as work-study, the Supplemental Educational Opportunity Grant, and Perkins loans depends on school-level fund availability. Some states and institutions also have state- and institution-level aid programs that can be used to bridge any remaining gap between federal aid and student financial need, some which have eligibility standards based on academic performance.

[11] Extant research indicates potential benefits to working on campus rather than off campus (Ehrenberg and Sherman 1987), and other research suggests differential impacts based on work location (Pascarella et al. 1998).

G, C). Therefore, instead of responding to taxes on total aid, some strategic students might reduce their incomes to be just below the level at which earnings begin to reduce grant aid. A graphical depiction is provided in Appendix Figure B2.

Even with the incentive to avoid the implicit income tax, there are a number of reasons to believe that student responses will be limited. Some students with low incomes and few assets will have little flexibility to alter their earnings in response to the tax because of difficulty affording educational costs as well as meeting family or other obligations. In this case, a dominant income effect may lead these students to increase their work intensity. The constraints are particularly relevant for students who are financially independent, since they are less likely to expect assistance from parents.

Moreover, the abstruse nature of financial aid formulas and the timing of information about aid receipt likely hinder students' understanding of the financial aid system. Students may be unable or unwilling to change their working behavior if they are unaware of implicit taxes, unfamiliar with financial aid formulas, or unsure of their expected aid receipt. Descriptive evidence suggests that students commonly lack understanding about how much college costs and how much financial aid they obtain (Akers and Chingos 2014). Ethnographic work by Ziskin et al. (2014) reveals that misunderstandings and uncertainty are common among working students, especially low-income students. Part of this may be because the financial aid process and formulas are oft-criticized for being confusing and opaque (Dynarski and Scott-Clayton 2006). In order to obtain federal aid, students must provide detailed information about family income, assets, and expenditures through the complicated Free Application for Federal Student Aid (FAFSA) form.[12] Bettinger et al. (2012) provide compelling experimental evidence that the

[12] The FAFSA currently asks 116 questions making it nearly the length of federal income tax filing form (Dynarski and Wiederspan 2012).

complicated application process and students' lack of knowledge deter some potential students from simply applying for aid; therefore, it is reasonable to believe that many students will also not accurately compute tax rates associated with their work behavior.

The timing of the aid process further impedes students' ability to respond to implicit earnings taxes on aid. Consider students newly enrolling in college in the fall of 2011. These students could fill out the FAFSA from January to June of 2011 (students are typically encouraged to fill out FAFSA as early as possible in January and some states and colleges have deadlines for scholarships). EFC is determined by inputs from the prior year's (2010) tax returns. Colleges are responsible for determining the amount of aid offered to each student, and financial aid offers will vary at different colleges for the same student since cost of attendance and available aid vary by institution. Students will typically find out to which colleges they have been accepted in the spring of 2011, and receive financial aid award letters from these colleges in late spring or summer of 2011. Therefore, unless they knew the colleges to which they will be admitted, independently sought out relevant formulas, calculated their EFC, and accurately estimated the amount of expected financial aid receipt, students would typically not find out about the implication of their 2010 working decisions until the late spring of 2011, at the earliest. A returning student may be more likely to have knowledge of the implications of working on aid receipt, since they are more likely to have experience with the financial aid system in a prior year. For this reason, I analyze heterogeneity between new and returning student responses in the empirical analysis.

Another contributing factor to the lack of response to implicit taxes in the financial aid system is that other social programs or incentives in the tax system may have more pronounced effects. For example, some students may be more likely to adjust earnings in response to the

Earned Income Tax Credit with which they may be more familiar, rather than the financial aid income tax. Researchers have also analyzed education credits in the federal tax system that students can claim retroactively when filing their federal tax returns. Results from these studies generally find little effect of these credits on students' enrollment decisions; rather, they predominantly subsidize costs for inframarginal students who would have otherwise enrolled (Bulman and Hoxby 2014; B. Long 2004; Turner 2012).

Prior studies on responses to implicit college financial aid taxes have focused on the effect of the asset tax in college financial aid programs on family savings behavior. Edlin (1993) and Feldstein (1995) find substantial savings disincentives from college financial aid taxes, with the latter author finding that married parents who are paying for child's college reduce savings by as much as 50 percent in response to the asset-tested rules in financial aid formulas. Later work by Monks (2004) and Reyes (2008), also examining the savings responses of the parents of dependent students, conclude that earlier estimates overstate the response of families, while Long (2004) does not find evidence of a strong family response to implicit asset taxes. In addition to scrutinizing some of the assumptions of earlier analyses, the newer studies also analyzed a period during which home equity was no longer considered in financial aid formulas because of amendments to the Higher Education Act in 1992. The lack of response supports the graphical analysis in Kane (1998), which demonstrates that there is little evidence of adjustments to families' savings behavior just below asset protection amounts. Dick and Edlin (1997) provide one of the few studies of implicit financial aid income taxes, where they estimate the level of realized MTRs. These authors use a sample of financially dependent students from the 1980s and do not examine potential responses to taxes.

FINANCIALLY INDEPENDENT STUDENTS

The focal group in the analysis is financially independent undergraduate students, an understudied but prominent group. Of the approximately 18 million undergraduate students in the United States annually, the number that is financially independent is about equal to the number that is financially dependent on parents or guardians (U.S. Department of Education 2013). Part of this is a function of the increasing average age of undergraduate college students over the past 40 years (U.S. Department of Education 2013), as the EFC calculation automatically classifies students over 24 years old as financially independent. Other factors that determine financially independent status in financial aid formulas include being married, serving or having served in the military, having a dependent or supporting a child, or having reached the age of majority in their state of residence (often age 18) while no longer being under the legal control of parents or guardians. EFC formulas automatically classify graduate students as financially independent.

Financially independent students are less likely to receive financial support from parents and are therefore expected to be more personally responsible for financing their higher education (there is no formal requirement that they do not receive transfers from parents or family). Since they personally control their incomes, they conceivably have more power to adjust earnings if needed. On the other hand, since they are less likely to be able to enjoy contributions from parents, they may not have flexibility to decrease income given educational and noneducational financial responsibilities.

Many financial aid programs are not designed to serve financially independent and nontraditional students. Kane (1997) describes how rules and formulas that evaluate financial need are based on a model where students may make some summer income but predominantly

depend on parental resources. This leads to a problematic treatment of income in federal financial formulas for many independent students. Consider, for example, students who go to college at night while working full time during the day or students who return to college to change careers after being a full-time worker. These students' incomes can be taxed at the same rate as dependent students whose primary support is expected from parents.

Table 2 includes a comparison of financially dependent and independent undergraduate students from the National Postsecondary Student Aid Study (NPSAS) data available from the National Center of Education Statistics (the data are described in more detail in the following section). Almost all differences among students in the two groups are statistically significant. Independent students are 11 years older on average, with a much larger variation in age. About a third of independent students are married and over half have dependents; dependent students by definition are not married and do not have dependents. Independent students are more likely to be black and less likely to be white, and also more likely to attend public two-year and for-profit institutions. This corresponds to being less likely to attend nonprofit 4-year institutions.

Independent students are also less likely to attend school full time, which may be because of the larger work burden. They are only slightly more likely to work as dependent students but work almost 10 hours more on average. Even though independent students work more hours, they come from households with substantially lower income levels. Average total income in independent households is $24,379, as compared to about $70,285 in dependent student households; this reflects dependent students' relatively high parental incomes. Average independent students' EFC is about a quarter of the level of financially dependent students. About 80 percent of dependent students expect to receive financial help from parents for college expenses (this question is not asked of independent students).

Taken together, these metrics demonstrate the challenge faced by many financially independent students. They have relatively low incomes, yet over half have dependents for which they must care. They are less able to rely on financial support from family than their dependent peers. They are more likely to be enrolled in subbaccalaureate programs and attend part time. Since they have relatively low EFCs, they are likely to be more dependent on financial aid. These challenges underscore the importance of understanding independent students' college financing decisions and tradeoffs, particularly in the context of student financial aid.

DATA AND METHODS

Data

Student level data come from the 2007–2008 and 2011–2012 academic year waves of NPSAS. NPSAS is a repeated cross-section of nationally representative student-level records, including information on financial aid received, working and borrowing behavior, demographics, and enrollment patterns. These data are especially useful for this study since they include detailed data regarding components of federal financial aid formulas. All sample members are undergraduate students; therefore, all results are conditional on an individual enrolling in college and I cannot observe extensive margin effects of financial aid income taxes (i.e., whether a student decides to enroll or drop out because of the tax). I restrict the sample to only students who applied for financial aid. Unweighted sample size is 74,340 student records. Here, and throughout the paper, all observation counts are rounded to the nearest 10 per the data use agreement.

Table 3 lists summary statistics for the sample. As previously described, the analysis sample similarly contains a disproportionate number of two-year, for-profit, and black students.

Nearly a third of students are married, with just over one dependent and one household member in college, on average. Prior year earnings in the data are based on total household earnings from official FAFSA filings (e.g., 2010 year data for students in the 2011–2012 academic year sample). Students have average annual household prior year incomes of $24,379. Current year income data are self-reported and do not include earnings from summer employment or from the student's spouse. Average current year academic term earnings are $11,058. Average student EFCs are $2,942. Asset contribution to expected costs (which is calculated as the total EFC less income contribution) is $1,188 on average, though about 70 percent of students have no asset contribution expected to defray college costs. Average total cost of attendance is $15,047, while average total aid equals $8,107. Therefore, aid does not fill the full gap between average EFC and cost of attendance. Aid is predominantly comprised of grants and loan aid, with average loan aid receipt about 50 percent higher than average grant aid. Average work-study receipt is only $110.

The relationship between earnings and aid is graphically represented in Figure 3. The markers are the average aid receipt in $1,000 income categories with a locally smoothed line among these points. The dotted grey lines are the 95 percent confidence interval. In panel (a), we can observe a slightly negative relationship between total aid and income, with the variation in average aid becoming more dispersed at higher levels of income. A downward sloping trend is more evident when examining grant aid in panel (b), with a clearer negative relationship between grants received and income. An opposite relationship is observed in panel (c), where loans increase as income increases, though there is wider variation at higher income levels. This indicates that even with increasing levels of income, many students are still borrowing at high levels.

Finally, while Figure 2 depicts marginal tax rates based on illustrative student examples, I plot the average MTRs students actually face in financial aid formulas in Figure 4. Recall that a student's MTR depends on marital status, number of dependents, student and spouse college attendance pattern, student and spouse income, and measures of other financial resources. These program characteristics mean that there can be substantial variation in MTRs at the same income level, as reflected in Figure 4. Because of the income and asset protections, average MTRs are near zero with relatively less variation for students with very low incomes, and rise to about 20 percent once incomes exceed $10,000. MTRs stay generally around this level until incomes surpass $40,000. After this point, average MTRs rise to about 25–30 percent with a wider standard error band through the remainder of the income range, mostly driven by lower sample size at higher income levels.

Empirical Strategy

I first examine the potential responses to MTRs at the point where students become subject to the reductions in aid with increased earnings by testing for bunching around students' income protection level (point D on Appendix Figure B1) and also at the point where specifically grant aid is potentially reduced because of increased earnings (point G from Appendix Figure B2). Bunching around kink points has been a common focus for researchers, for example, in response to income tax rates (e.g., Chetty et al. 2011) and Social Security Benefits (e.g., Friedburg 2000). Kane (1998) presents histograms in his study of financial aid formula asset accumulation incentives to indicate lack of evidence of this behavior. If students are strategically responding to income thresholds, we would expect to see a mass of students with incomes just below the income protection level, indicating that students are adjusting their working behavior in an effort to avoid the income assessment.

I next more formally test for level and slope discontinuities around the income allowance cutoff. First, I use the McCrary (2008) level discontinuity test that is commonly used to assess whether individuals manipulate their behavior in response to thresholds in means-tested benefit programs. The test involves first categorizing data into bins, then separately estimating local regressions on either side of the cutoff, with the number of observations in income bins as the outcome and the distance from the cutoff as covariates. The densities above the cutoff are compared to densities below the cutoff, $\hat{\theta} = ln\hat{f}^{+} - ln\hat{f}^{-}$, where $\hat{f}^{+}$is the estimated density above the cutoff and $\hat{f}^{-}$ is the estimated density below. A positive value indicates that there is a higher density on the right of the income protection, while a negative value indicates that there is a higher density to the left of the income protection.

I also test for slope discontinuities at the threshold based on Card et al. (2012) by estimating

(4) $$Y_b = \alpha + \pi_1 U_b + \pi_2(\tilde{I}_b \times U_b) + \pi_3 f(\tilde{I}_b) + \epsilon_b$$

where *Y* is the number of students in bin *b*, *U* is an indicator for having an income less than the threshold, $\tilde{I}$ is the distance from the income bin to the threshold ($\tilde{I}$ = income – income allowance), and $f(\tilde{I})$ is a quadratic function of the distance from each bin to the threshold. Here, I test for $\pi_2 = 0$ to ascertain whether the slope changes at the income allowance cutoff.

The previously described tests examine earnings around a specific point; however, I am also interested in the more general relationship between students' earnings and MTRs. To analyze this relationship, consider first the following equation to estimate income for each student *i* as a function of the financial aid marginal tax rate on income, *MTR*, and a set of covariates in *X*.

(5) $$I_i = \alpha + \delta MTR_i + X_i\beta + u_i$$

From this regression, δ is an estimate of the conditional relationship between a unit change in MTR and student earnings. However, there are likely omitted factors, such as students' work ethic or unobserved financial resources that could affect both the MTR and income such that $E[u_i] \neq 0$ yielding biased estimates of δ.[13]

Therefore, I add a control for the student's prior year income to model[14]

(6) $$I_{it} = \alpha + \delta MTR_{i,t-1} + \gamma I_{i,t-1} + X_i\beta + u_{it}$$

The rationale for including prior year income is twofold. First, to the extent it is related to confounding omitted factors, it mitigates bias by partially controlling for these student-level unobserved characteristics. Second, given the complexity and timing of financial aid as previously discussed, if students respond to implicit taxes, we would expect to see them adjust their current year income in response to the MTRs to which they were already exposed, from the prior year. Therefore, I estimate current year income for each student function of MTR faced in financial aid formulas based on prior year income. Since all students who worked in the prior year do not also work in the current year, I estimate Equation (6) using a Tobit specification with a lower limit equal to zero.[15]

From estimates of Equation (6), we can interpret δ as the dollar change in student earnings associated with a unit change in MTR, while accounting for prior year income and controls in *X*. I include in the *X*-vector controls for factors that can affect aid receipt in financial

[13] The direction and magnitude of this bias is hard to predict because of the varied factors that affect MTRs (recall that these can depend on students' financial resources, but also family structure, spouse school/work characteristics, and location), and the complex interrelationships between financial and family background, working decisions, and factors that determine implicit income taxes. For example, work ethic is likely positively correlated to earnings but is ambiguously related to students' MTR, making it difficult to assess bias that could arise from this factor not being measured.

[14] Results from estimates of Equation (5) are available upon request. As described previously, current year earnings are self-reported and do not include summer or spousal earnings. Correlation coefficients between prior and current year earnings are 0.31 for first-year students and 0.41 for returning students, indicating a positive relationship, but also variation from prior to current year earnings.

[15] Estimates using ordinary least squares leads to qualitatively similarly conclusions and are displayed in Appendix C.

aid (number of dependents, marital status, number in the household in college, asset contribution, asset contribution squared, and year of survey); college cost and college cost squared; factors that could affect earnings (student age, age squared, race/ethnicity, indicators for whether the student is a first or second generation immigrant); school sector (public, private for-profit); school type (four-year or two-year college); and locale (small, mid, or large city, suburb, town, or rural area). I also include vectors of indicators for state and year to account for variation across states and over time, such as local economic conditions, college going rates, and educational systems.

Another concern with drawing conclusions from observed relationships between income and MTR is that parameter estimates could reflect nonlinearities in the aid formula, rather than a response to MTRs. This issue is especially relevant for students with very low incomes (less than $10,000 because of allowances in the financial aid formula as displayed in Figure 4). Within narrower income ranges, however, average MTRs are generally similar. Therefore, I present results from estimates of students based on various earnings categories. I base these categories on prior year income to avoid further censoring the dependent variable (which is current year earnings). This also allows me to examine potentially distinct relationships between MTR and earnings among students with relatively low, middle, and high incomes.

Finally, I also separately estimate results for all students and for first-year and returning students separately. Returning students' prior year incomes are from a period when the student was enrolled in college and therefore potentially better reflect learning associated with financial aid system experience. First-year students' prior year incomes, alternatively, are from a period prior to the student entering college. Therefore, for timing and knowledge reasons that limit their

knowledge of the system, first-year students are less likely to adjust work behavior in response to income MTRs in federal financial aid formulas.

Even though I include a robust set of observable controls and account for unobserved factors captured in prior year income, I am careful not to strongly interpret estimated relationships from Equation (6) as causal. The data do not contain a full accounting of all factors that could confound estimates. I consider results nonetheless informative since the interplay between working and implicit financial aid taxes has been rarely studied in extant literature and findings are useful in evaluating the theoretical predictions previously described.

RESULTS

I begin with a discussion of findings related to potential bunching around students' income protection levels. Students are subject to different levels of income protection depending on various student characteristics as previously described. I calculate the relevant income protection available to each student based on her marital status, whether her spouse works and goes to school, the number of dependents the student has, the amount of work income, taxes paid or expected to be paid, and other considerations in financial aid formulas. Figure 5 presents histograms of the number of students according to the distance from their relevant income allowance level using $100 bins plotted on the x-axis. Positive distances indicate that the student earned more than her income protection, while negative distances indicate that income protection exceeded earned income. Therefore, we are looking for potential bunching just to the left of zero. Visual inspection of all graph panels indicates that more students have incomes less than the income protection within the $5,000 bandwidth. However, there does not appear to be distinct bunching close to the threshold, nor right below the threshold where students can avoid the tax.

To examine potential bunching more formally, Table 4 displays results from the level and slope tests using $100 income bin sizes (results are robust to bin sizes twice as large, $200, and half as much, $50). Following Lee and Lemieux (2010), I display results from a variety of bandwidths. These tests confirm the visual inspection of the graphs and provide little evidence of bunching near the income protection, with all estimates of density and slope discontinuities not statistically significant.

In Table 5, I similarly test for bunching around thresholds where specifically grant aid is reduced because of increased earnings. This value is equal to students' income protection threshold plus the maximum Pell Grant ($4,310 in 2007–2008 and $5,500 in 2011–2012), as long as this total is less than cost of attendance. Here again, all estimates of density and slope discontinuities are not statistically significant. Taken together, these tests do not provide evidence that suggests that students are systematically manipulating their earnings near thresholds at which implicit income taxes affect financial aid receipt. This could be because they are either unfamiliar with the consequences of earnings in the financial aid formulas or they cannot reduce their work efforts near these thresholds because of budget constraints.

Turning next to results from estimates of the relationship between MTR and earnings, I present results based on Equation (6) in Table 6. For brevity, I display only parameter estimates for the primary variables of interest, and full output for selected subgroups is available in Appendix C. I present separate estimates from income ranges, based on prior year income, in $10,000 increments up until $50,000, and group together students with incomes of $50,000 to $100,000 because of the relatively small sample size within this range. Average current year earnings for students in each range are provided for context. MTRs are in percentage points, such that a 1 percentage point MTR increase is associated with average earnings decreases of about

$17 for students with incomes in the >$0–$10,000 range overall in the first row and first column of the table. This is about 0.3 percent lower average earnings for students in this income range. Separate estimates by first-year and returning students indicate that this overall effect is largely driven by returning students, where the magnitude of the effect rises to 0.5 percent off the average current year earnings for students in that group. Results from this lowest income category indicate a negative relationship between MTRs and earnings, as would be predicted by a labor-leisure model substitution effect. However, as mentioned previously, there is less variation in MTRs among students in this category, and many face a zero MTR because of income and asset allowances in financial aid formulas, which somewhat complicates interpretation.

Turning to results in the next higher income category in the second column, I observe that a 1 percentage point increase in MTR based on prior year income predicts about a $16 increase in current year earnings overall (about 0.2 percent of the average earnings in the category). This coefficient increases to almost $32 among first-year students (a magnitude of about 0.4 percent), while the point estimate for returning students is small (about $5) and statistically insignificant. Findings from the next income category in column 3 are similar, with magnitudes of coefficients staying relatively small, at about 0.2 percent of average earnings, and with the coefficients in the model including returning students only on the margin of statistical significance.

Results from these two income ranges (students with incomes in the $10,000–$30,000 range) are consistent with a dominant income effect, where resource-constrained students cannot afford to reduce earnings in response to the tax so they increase work efforts to offset the loss of aid. The stronger effect for first-year students relative to returning students suggests that students may be learning about the financial aid system as they gain experience with it. Results are

statistically significant in the relatively higher-income ranges, though I can rule out responses of greater than 0.3 percent, 0.07 percent, and 0.04 percent of average earnings with 95 percent confidence in the $30,000–$40,000, $40,000–$50,000, and $50,000–$100,000 income groups, respectively.

While I reiterate caution with strongly drawing causal inference from the results, on the whole, the observed relationship between current year earnings and MTRs does not suggest large-scale responses to implicit taxes. Among higher-income students, I do not find evidence that increases in implicit income taxes predict earnings changes at meaningful levels. Results provide descriptive evidence that is consistent with the expectation that students with modest incomes and less familiarity with aid formulas may have to work more in order to make up for the loss of financial aid. Moreover, magnitudes are arguably minor, as in most cases a unit change in MTR is related to well less than half a percent change in earnings.

DISCUSSION

Financially independent college students are a relatively understudied group in the United States, even though they comprise about half of the undergraduate population. The prevalence of these students is expected to grow, as policy initiatives that focus on increasing national college completion rates need to engage older, nontraditional, and working students. These students face unique challenges to attending college—they have relatively low incomes and are less able to rely on financial support than their dependent peers, yet over half care for dependents. With relatively fewer financial resources, they are likely to be more dependent on financial aid but face a system that was designed with other types of students in mind.

The implicit income taxes in the college financial aid system are an example of one of the challenges faced by working students. Because they can reduce the amount of aid working students receive, they have the potential to influence decisions about whether to and how much to work while in or immediately before school. Research suggests that working while in school can have labor market benefits, as it can augment work experience and aid in the development of soft skills (such as time management, communication, and problem solving) that contribute to academic and professional success (Light 2001; Molitor and Leigh 2004). One of the major concerns about working while in school, however, is that time spent working can crowd out time spent on academic, social, leisure, or extracurricular activities that positively affect students' academic performance, social integration, and well-being. Existing research generally indicates null or small adverse consequences to grades for marginal increases in work hours, and also that credit completion declines with increasing work (Darolia 2014; Ehrenberg and Sherman 1987; Kalenkoski and Pabilonia 2010; Scott-Clayton 2011; Stinebrickner and Stinebrickner 2003).

Using data from a large national survey of college students, I do not find evidence that students are bunching below relevant earnings thresholds in an effort to avoid the tax on aid in total or on grants specifically. One interpretation for the lack of bunching is that the amount of income protection offered students is too low for many to reasonably adjust their work behavior and still be able to afford educational expenses. Examination of the more general relationship between implicit taxes and students' earnings leads to a similar conclusion that students are not meaningfully reducing work in response to implicit income taxes. If anything, results suggest that students with relatively modest income levels might even increase work effort in order to compensate for the lack of aid, though estimates are generally not large in magnitude.

Informational deficiencies are likely an important contributor to students' lack of response to the income tax in college aid formulas, and these deficiencies are compounded by the complex nature of aid formulas and the timing of aid application and receipt. This corresponds with research documenting students' lack of understanding about financial aid (e.g., Akers and Chingos 2014; Ziskin et al. 2014) and would suggest that students are not making fully informed financial decisions related to college. Students could be borrowing more in order to cover financial shortfalls, and high levels of borrowing have been shown to affect some postcollege decisions (Field 2009; Rothstein and Rouse 2011) and have also led to concern about potential impacts on the economy at large. Further research is needed, however, to understand how implicit earnings taxes affect other student behaviors.

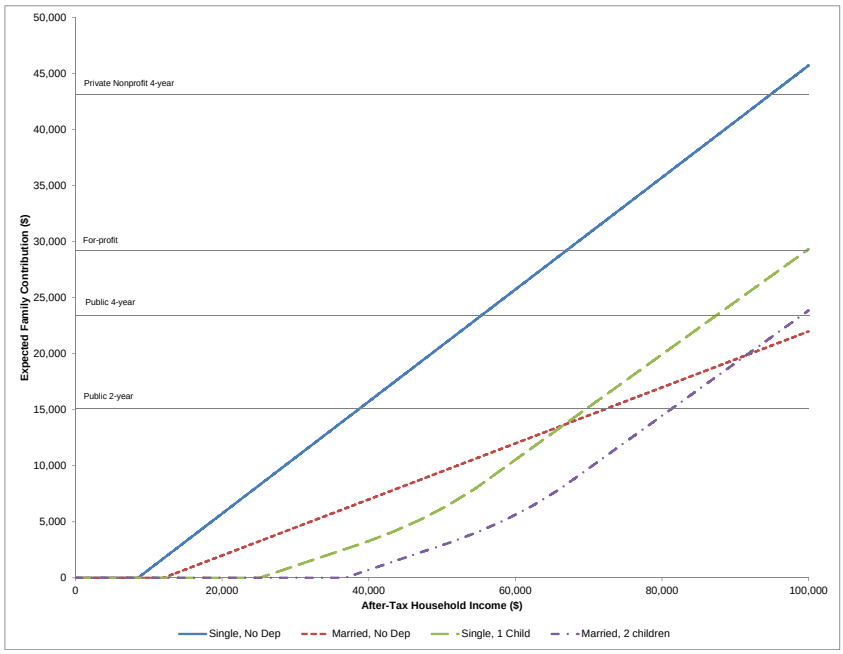
The lack of a response to taxes in the financial aid system indicates tax efficiency, yet the implicit taxes appear to burden resource-constrained students as they can lower financial aid receipt among the students who likely need it most. If policymakers seek to address concerns about these offsets, they should revisit the design of the financial aid programs with respect to financially independent and working students. For example, in current federal financial aid formulas, the implicit earnings tax rate for independent students can be as high as that faced by dependent students, even though the latter group is expected to receive financial support from parents and the former is not. Moreover, there is no corollary implicit income tax on the income of dependent students' parents in financial aid formulas. Therefore, policy could reduce implicit income taxes for independent students to recognize their unique challenges and obligations and to reduce the amount of aid that is offset by working while in school.

Furthermore, income protection limits could be increased in financial aid formulas to allow independent students to earn a greater amount of money before income begins to be taxed

(recall that independent students without dependents in the 2011–2012 school year can have their financial aid reduced after they start to make over $8,550 in after-tax income; similarly, an independent student with two children can have their financial aid reduced after $29,600 in after-tax income). Formulas could allow for an automatic zero EFC for financially independent students with no dependents who have particularly challenging financial barriers, and the flat tax rate faced by this group could be adjusted to increase progressively in a manner that is similar to students with dependents.

A trade-off of such policies would be the increased likelihood of higher expected public financial aid outlays, as well as increased prospects that public funds will be provided to students who do not have strong need, but whose resources are not well-captured in financial aid formulas. Policymakers should also take care to avoid further muddling a financial aid system that is already difficult to navigate. The cost of complexity could be reduced, however, if financial aid formulas were simplified to rely on a limited number of dimensions (e.g., Dynarski and Scott-Clayton 2006).

(a) Expected Family Contribution



(b) Federal Financial Aid Receipt

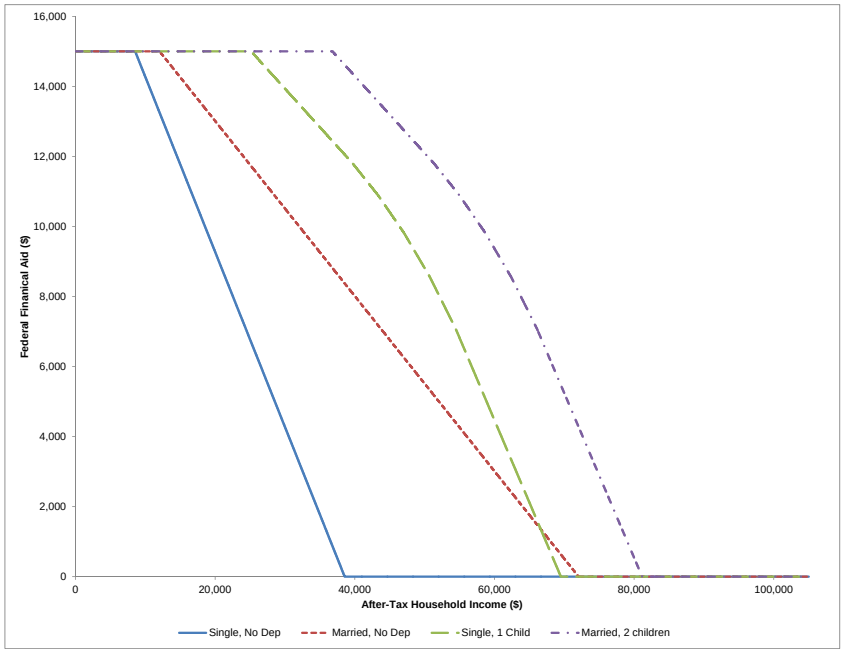
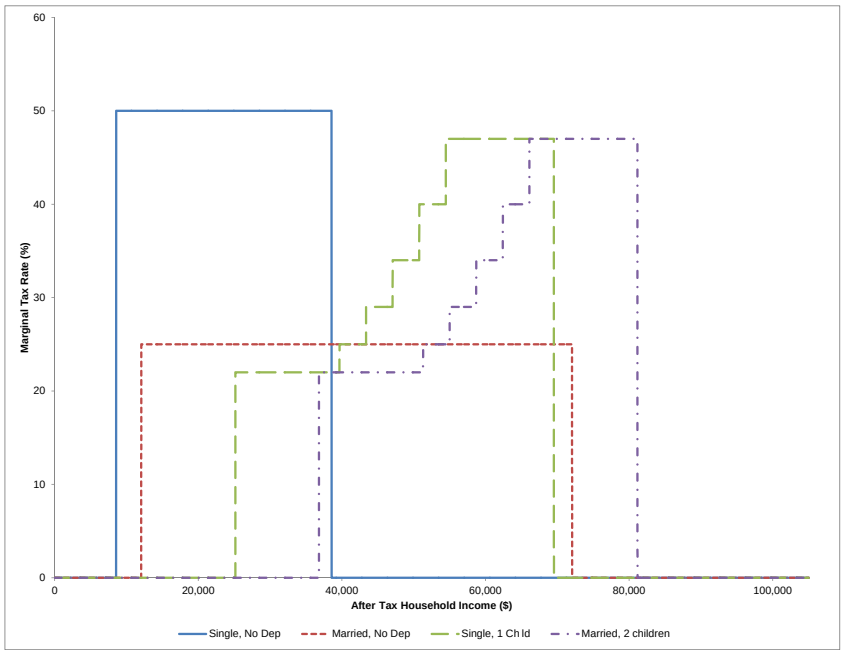


Figure 1: Example EFC & Federal Financial Aid Receipt

NOTE: Schedules are based on four exemplar students using the 2011–2012 EFC formula: a single student with no dependents, a single working parent with one child, a married couple that both work and attend college with no dependents, and a married student with a working spouse that has two children. Students are assumed to not qualify for the automatic zero EFC calculation and assets are assumed to be zero. All working members of the household are assumed to earn at least $10,000. Educational cost in panel (b) is assumed to be $15,000, the average cost of a public two-year college (U.S. Department of Education 2014). Panel (b) assumes that all need is fully met by federal aid, which can include grants, loans, and work-study.

(a) Marginal Tax Rates



(b) Average Tax Rates

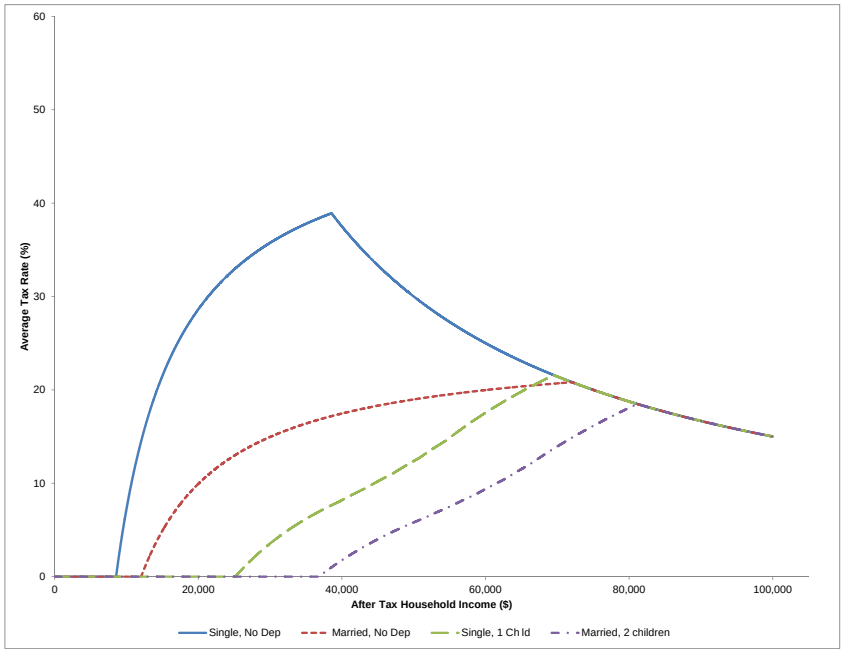
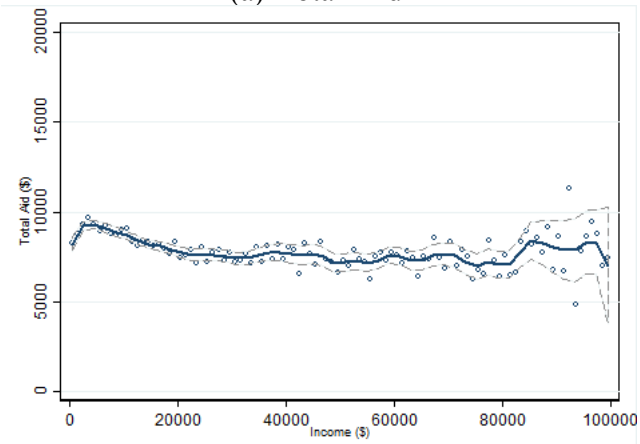


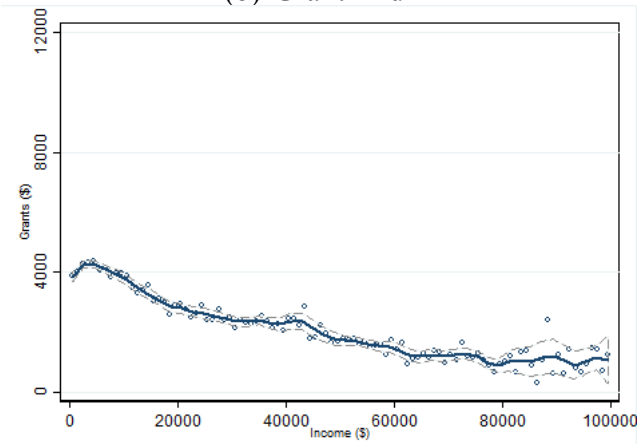
Figure 2: Example Marginal and Average Tax Rates

NOTE: Schedules are based on four exemplar students using the 2011–2012 EFC formula: a single student with no dependents, a single working parent with one child, a married couple that both work and attend college with no dependents, and a married student with a working spouse that has two children. Students are assumed to not qualify for the zero EFC calculation and assets are assumed to be zero. All working members of the household are assumed to earn at least $10,000. Educational cost in panel (b) is assumed to be $15,000, the average cost of a public two-year college (U.S. Department of Education 2014). Marginal tax rates are calculated as $\partial Aid/\partial Income$ and average tax rates are calculated as $(Aid_{Income=x} - Aid_{Income=0})/Income$.

(a) Total Aid



(b) Grant Aid



(c) Loan Aid

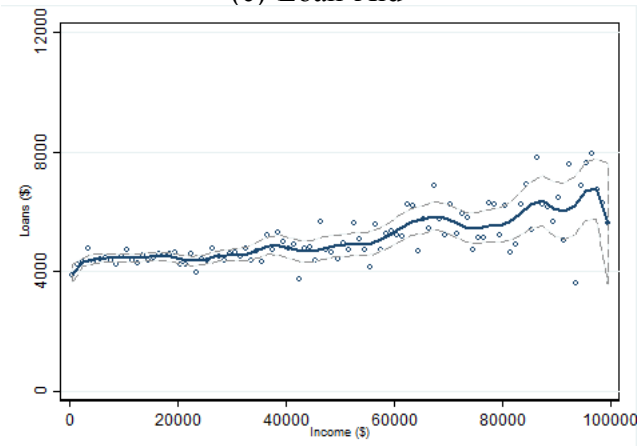


Figure 3: Income and Aid

NOTE: Sample is independent undergraduate students from NPSAS 2008 & NPSAS 2012. All dollars in 2012 dollars. Survey weights used. Markers are the average aid receipt in $1,000 income categories. The solid line is a local 2nd degree polynomial smoothed line with a triangular kernel. Dashed lines are the 95% confidence level.

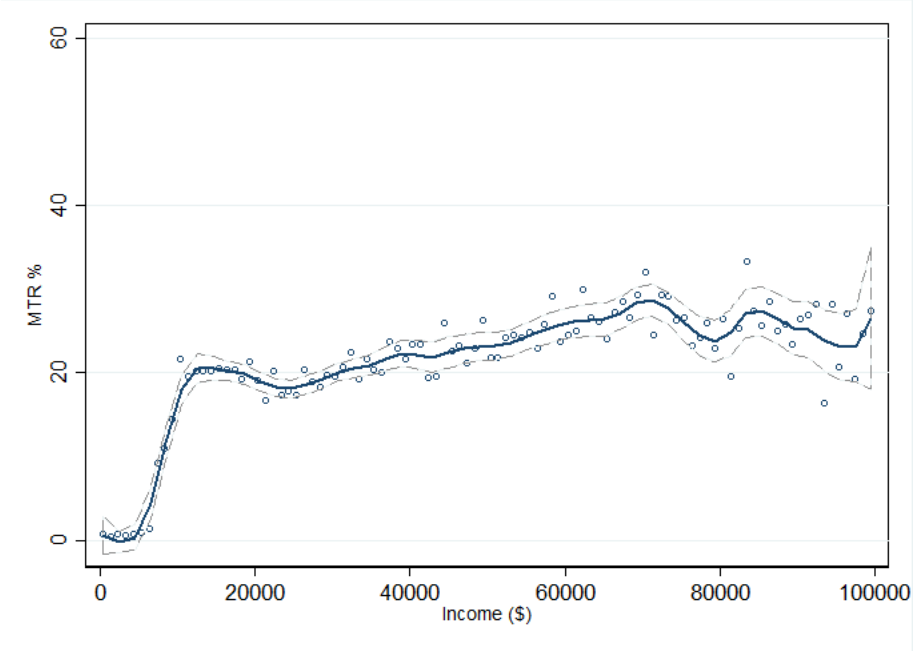
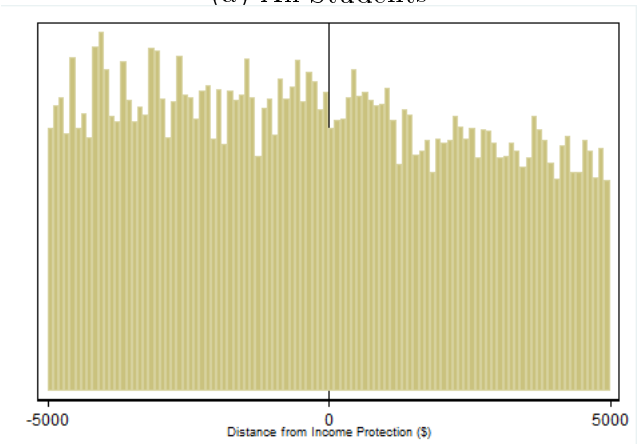


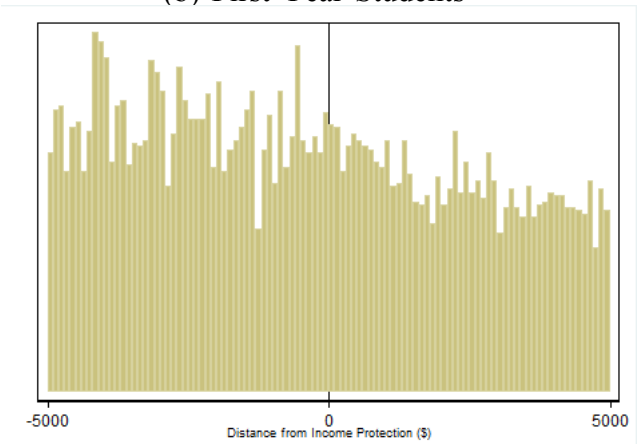
Figure 4: Income and MTR

NOTE: Sample is independent undergraduate students from NPSAS 2008 & NPSAS 2012. All dollars in 2012 dollars. Survey weights used. Markers are the average aid receipt in $1,000 income categories. The solid line is a local 2nd degree polynomial smoothed line with a triangular kernel. Dashed lines are the 95% confidence level.

(a) All Students



(b) First Year Students



(c) Returning Students

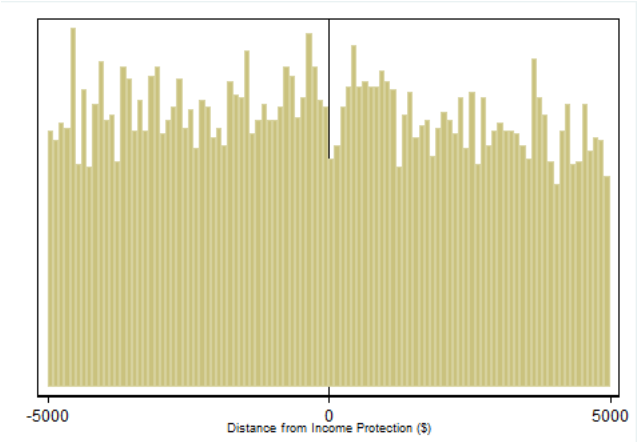


Figure 5: Density of Students Around Income Protection

NOTE: Sample is financially independent undergraduate students from NPSAS 2008 & NPSAS 2012. All dollars in 2012 dollars. Histogram bin sizes equal to $100.

Table 1 Federal Aid Receipt, Selected Programs, 2012–2013

	Aid per recipient	No. of recipients (millions)
Pell Grants	$3,650	8.84
Subsidized Direct Loans	$3,690	7.52
Unsubsidized Direct Loans	$6,450	8.59
Federal Work-Study	$1,403	0.70
Supplemental Educational Opportunity Grant	$463	1.58
Perkins Loans	$1,857	0.46

SOURCE: Baum and Payea (2013).

Table 2 Comparison of Financially Dependent and Independent Students

	Independent		Dependent	
	Mean	Std. dev.	Mean	Std. dev.
Age	31.0	9.0	20.0	1.5
Married	30%	46%	n/a	n/a
Has dependent(s)	56%	50%	n/a	n/a
African American/Black	27%	44%	17%	38%
Asian	5%	22%	7%	26%
White	65%	48%	73%	44%
Hispanic/Latino	16%	37%	17%	37%
Public two-year	41%	49%	30%	46%
Public four-year	22%	41%	43%	49%
Private nonprofit four-year	10%	29%	20%	40%
For-profit	27%	45%	7%	26%
Full-time attendance	47%	50%	67%	47%
Works	72%	45%	70%	46%
Work hours (if employed)	32.8	13.4	23.5	12.9
Total income	$24,379	$26,142	$70,285	$64,502
EFC	$2,942	$6,404	$11,187	$16,253
Financial help from parents	n/a	n/a	80%	40%
Observations	74,340		87,970	

NOTE: Sample is from NPSAS 2008 and 2012. All dollars in 2012 dollars. Survey weights used. Unweighted observation count rounded to the nearest 10. Differences between independent and dependent students are all statistically significant with 99% confidence with the exception of the percentage of Hispanic/Latino students.

Table 3 Analysis Data Summary Statistics

	Mean	Std. dev.
Prior year income	$24,379	$26,142
Current year income	$11,058	$15,673
EFC	$2,942	$6,404
Asset contribution	$1,188	$6,133
Asset contribution > 0	31%	46%
Total educational cost	$15,047	$9,418
Tuition and fees	$5,506	$6,157
Total aid	$8,107	$7,348
Total grants	$2,998	$3,695
Total loans	$4,579	$5,118
Total work study	$110	$667
Public	62%	48%
Private nonprofit	10%	30%
For-profit	27%	45%
Four-year institution	48%	50%
Two-year institution	52%	50%
African American/	27%	44%
Black Asian	5%	22%
White	65%	48%
Other race Hispanic/	7%	25%
Latino	16%	37%
Age	31.0	9.0
Married	30%	46%
Spouse in college	7%	26%
No. dependents	1.2	1.4
HH no. in college	1.1	0.4
Observations	74,340	

NOTE: Sample is from NPSAS 2008 and 2012. All dollars in 2012 dollars. Survey weights used. Unweighted observation count rounded to the nearest 10.

Table 4 Density and Slope Discontinuity Tests Near Income Protection Threshold

	Bandwidth		
	$2,000	$3,000	$4,000
A. Estimated density change			
All students	−0.050	−0.032	−0.025
	(0.050)	(0.041)	(0.036)
First-year students	−0.007	−0.004	−0.010
	(0.075)	(0.062)	(0.054)
Returning students	−0.093	−0.056	−0.036
	(0.068)	(0.055)	(0.048)
B. Estimated slope change			
All students	−0.022	0.061	0.061
	(0.095)	(0.047)	(0.047)
First-year students	0.016	0.052	0.052
	(0.068)	(0.034)	(0.034)
Returning students	−0.016	(0.205)	(0.205)
	(0.062)	(0.031)	(0.031)

Table 5 Density and Slope Discontinuity Tests Near Grants Threshold

	Bandwidth		
	$2,000	$3,000	$4,000
A. Estimated density change			
All students	−0.074	−0.061	−0.049
	(0.057)	(0.046)	(0.040)
First-year students	−0.047	−0.054	−0.049
	(0.093)	(0.074)	(0.064)
Returning students	−0.072	−0.049	−0.032
	(0.073)	(0.060)	(0.052)
B. Estimated slope change			
All students	0.007	−0.047	−0.025
	(0.118)	(0.055)	(0.034)
First-year students	−0.049	0.048	−0.018
	(0.074)	(0.039)	(0.023)
Returning students	0.040	0.005	0.004
	(0.074)	(0.036)	(0.023)

NOTE to Tables 4 and 5: Estimated density change is based on McCrary (2008). Estimated slope change is based on equation 4 from the text. Both tests use $100 income bins. Standard errors are included in parentheses. Sample is from NPSAS 2008 and 2012.

Table 6 MTR and Earnings

	Prior Year Income Category					
	$0 < Inc ≤ $10K	$10K < Inc ≤ $20K	$20K < Inc ≤ $30K	$30K < Inc ≤ $40K	$40K < Inc ≤ $50K	$50K < Inc ≤ $100K
All students	−16.93**	16.04**	30.32***	9.43	−41.93	27.63
	(8.38)	(7.25)	(9.08)	(16.95)	(49.33)	(28.59)
First-year students	−2.30	31.77***	27.46**	18.87	44.94	54.30
	(13.66)	(11.18)	(13.90)	(26.68)	(74.03)	(47.83)
Returning students	−27.74***	4.92	23.37*	−11.49	−69.46	25.52
	(10.50)	(9.66)	(12.15)	(22.78)	(67.54)	(36.20)
Average current year earnings ($)						
All students	5,206	8,382	12,485	15,902	21,040	22,648
First-year students	4,929	7,848	11,185	14,059	20,477	20,197
Returning students	5,431	8,870	13,587	17,180	21,389	23,883
Observations						
All students	17,060	14,330	10,070	6,210	1,970	5,380
First-year students	9,930	7,720	5,160	2,810	810	2,100
Returning students	7,020	6,530	4,820	3,350	1,140	3,220

NOTE: ***p < 0.01, **p < 0.05, *p < 0.1. Standard errors in parentheses. Tobit estimates from equation 6, with controls suppressed (selected full output is available in Appendix C). Income categories are based on prior year income. Average earnings reported are current year income. Sample is from NPSAS 2008 and 2012. All dollars in 2012 dollars. Survey weights used. Unweighted observation count rounded to the nearest 10.

Appendix A

EFC Calculation for Independent Students with Dependents

For independent students with dependents, the implicit tax is assessed based on income and assets, net of taxes and allowances, called the adjusted available income (AAI). The calculation of EFC for independent students with dependents is

$$EFC = \{X_j + (AAI - P_{AAI})\Omega_j\}/S$$

$$= \{X_j + (I - P_I + A - P_{AAIj})\Omega_j\}/S$$

where j indexes AAI tier; X_j is a tier-specific fixed amount; I and P_I are income and income allowance; A is the asset contribution; S is the number of students in college; and X_j , $P_{AAI,j}$, and Ω_j are tier-specific dollar contribution, AAI allowance, and assessments, respectively. AAI tiers vary by year, with an example schedule for the 2011–2012 school year included in Table A1. EFC is considered zero if the calculation yields a value less than zero.

It follows that out of pocket expenses, *OPE*, for independent students with dependents are

$$OPE = \begin{cases} 0, & EFC = 0 \\ \{X_j + (I - P_I + A - P_{AAIj})\Omega_j\}/S, & 0 < EFC < C \\ C, & EFC \geq C \end{cases}$$

Therefore, the marginal tax rate on net income earned above each tier allowance is Ω_j/S when EFC is greater than zero but less than the cost of attendance, C , and zero otherwise:

$$\frac{\partial OPE}{\partial I} = \begin{cases} 0, & EFC = 0 \\ \Omega_j/S, & 0 < EFC < C \\ C, & EFC \geq C \end{cases}$$

Table A1 Contribution from AAI, 2011–2012

AAI	Fixed contribution amount (X_j)	AAI allowance	Assessment (Ω_j)
$0 \leq$ AAI $\leq$ \$14,500	0	0	22%
\$14,500 < AAI $\leq$ \$18,200	\$3,190	\$14,500	25%
\$18,200 < AAI $\leq$ \$21,900	\$4,115	\$18,200	29%
\$21,900 < AAI $\leq$ \$25,600	\$5,188	\$21,900	34%
\$25,600 < AAI $\leq$ \$29,300	\$6,466	\$25,600	40%
AAI > \$29,300	\$7,926	\$29,300	47%

NOTE: Does not include negative AAI values since these are assigned EFC = 0.

SOURCE: 2011–2012 EFC formula, available at http://www.ifap.ed.gov/ifap/byAwardYear.jsp?type=efcformulaguide&set=archive.

Appendix B

Student Labor Supply Decision

Consider the labor-leisure supply trade-off in Figure B1. The y-axis is the total amount of income earned from working as well as the value of any financial aid received. All nonwork time is assumed to be leisure. The student's budget constraint with no financial aid is the line AB. Financial aid provides students with aid for college, and therefore allows some students to work less while maintaining a sufficient amount of money to afford college expenses. The distance from B to C represents the amount of financial aid available to the student when earnings equal zero. Because of the income allowance, the student can work from C to D without any reduction in aid. At point D, each dollar of earnings results in a reduction of financial aid. Therefore, students wishing to escape the tax altogether will avoid moving to the left of point D.

From E to D, after the maximum income allowance, aid is reduced for each additional dollar of income, where the slope is equal to the student's marginal income tax rate (Ω, as previously described). At point E, the maximum aid has been reached such that there is no tax from segment AE. Therefore, the budget constraint for someone with access to financial aid is AEDC. Because of financial aid, a student working H hours can reduce labor to H' while increasing utility since aid more than offsetting loss of income. Moreover, the value of each additional hour worked by students in the segment ED is dampened by the loss of financial aid.

Consider next a student who discounts the value of student loans and work-study relative to grants in Figure B2. The distance from B to F represents the amount of grant aid available to the student when earnings equals zero; therefore, the budget constraint for someone who values student loans and work-study at 0 is AEGF. For this student, grant aid is reduced with increased

earnings at point G and students wishing to escape a reduction on grant aid will avoid moving to the left of point G. The budget line for a student who discounts student loans and work-study but values it at some positive value is AEGJI. These students can similarly escape a reduction in grant aid by not moving to the left of point G, and would avoid moving to the left of point J (equal to the income protection) if they wish to avoid forgoing student loans and work-study funds.

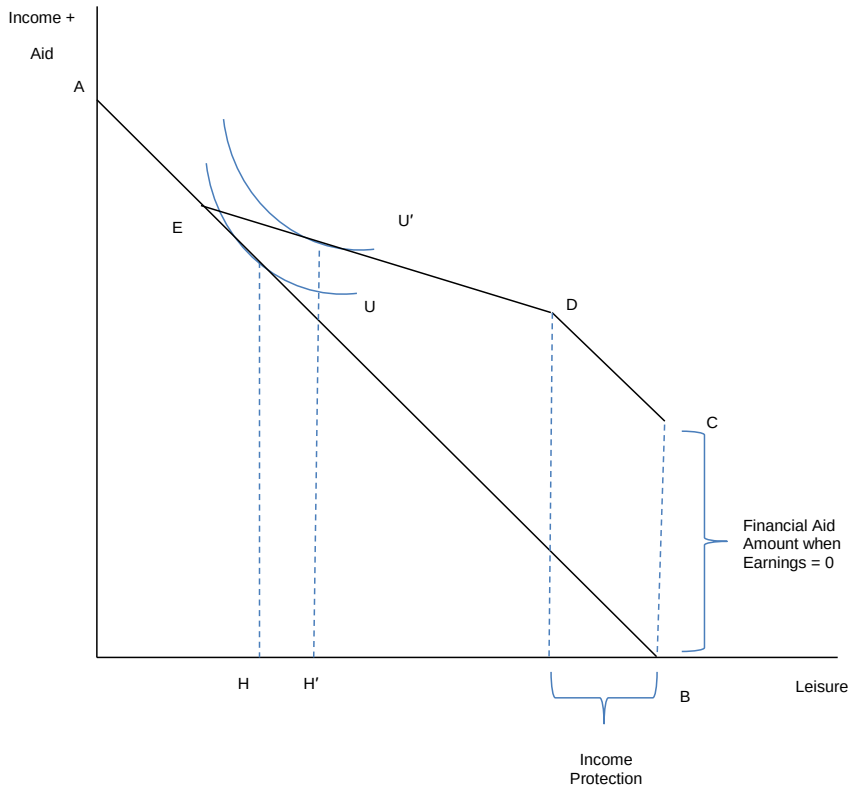


Figure B1 Student Labor Decision

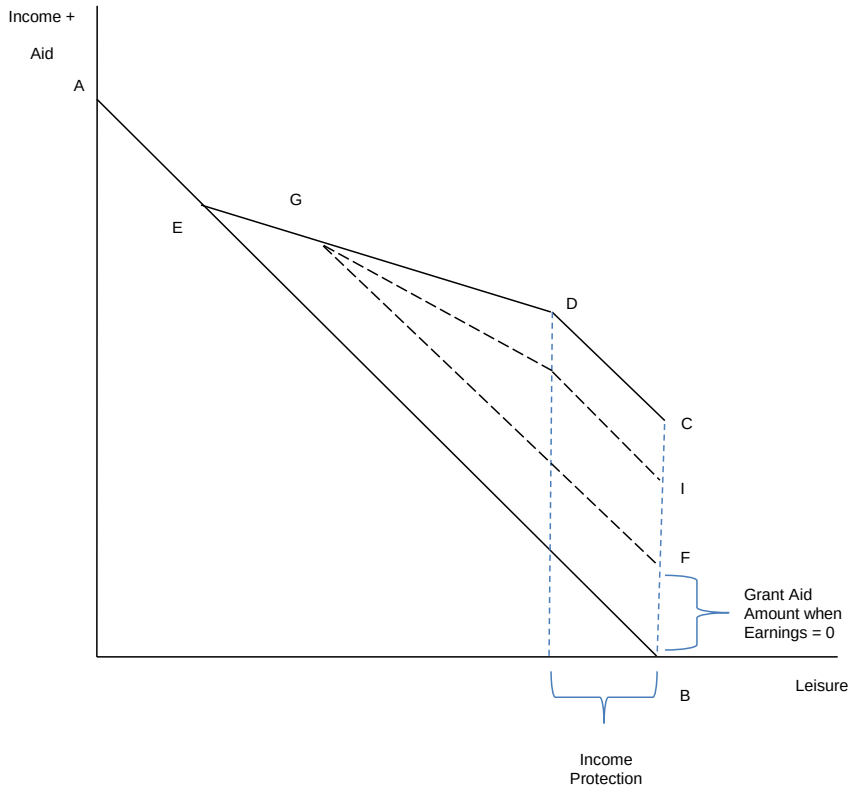


Figure B2 Student Labor Decision Discounting Non-Grant Aid

Appendix C

Supplementary Tables

Table C1 Marginal Tax Rates and Earnings, Ordinary Least Squares Estimates

	Prior year income category					
	$0 < Inc ≤ $10K	$10K < Inc ≤ $20K	$20K < Inc ≤ $30K	$30K < Inc ≤ $40K	$40K < Inc ≤ $50K	$50K < Inc ≤ $100K
All students	−7.71	13.81**	18.30**	−7.51	−47.64	13.02
	(5.61)	(5.50)	(7.14)	(13.65)	(40.06)	(22.92)
First-year students	−0.39	26.61***	13.68	−5.80	15.51	26.49
	(8.55)	(7.87)	(10.21)	(20.09)	(59.42)	(35.67)
Returning students	−14.78*	3.98	14.60	−20.61	−66.83	16.11
	(7.62)	(7.97)	(10.28)	(19.43)	(56.97)	(30.58)
Average current year earnings ($)						
All students	5,206	8,382	12,485	15,902	21,040	22,648
First-year students	4,929	7,848	11,185	14,059	20,477	20,197
Returning students	5,431	8,870	13,587	17,180	21,389	23,883

NOTE: * p < 0.1; ** p < 0.05; *** p < 0.01. Standard errors in parentheses. OLS estimates from equation 6, with controls suppressed (full output is available upon request). Income categories are based on prior year income. Average earnings reported are current year income. Sample is from NPSAS 2008 and 2012. All dollars in 2012 dollars. Survey weights used.

Table C2 Estimates of Current Year Earnings, Full Output for Students with Prior Year Income > $10K and ≤ $20K

	All students	First-year students	Returning students
MTR	16.04**	31.77***	4.92
	(7.25)	(11.18)	(9.66)
Prior year income	0.35***	0.38***	0.29***
	(0.04)	(0.07)	(0.06)
Cost	−0.36***	−0.43***	−0.28***
	(0.05)	(0.08)	(0.06)
Cost-squared	0.00***	0.00***	0.00***
	(0.00)	(0.00)	(0.00)
Asset contribution	−0.04	−0.03	−0.01
	(0.05)	(0.08)	(0.13)
Asset contribution squared	0.00	0.00	−0.00
	(0.00)	(0.00)	(0.00)
# Dependents	−59.04	−294.76	68.56
	(135.04)	(197.52)	(188.70)
Married	−3,098.44***	−2,244.51***	−3,627.69***
	(363.44)	(547.14)	(491.54)
HH # in college	1,621.72***	528.79	2,384.25***
	(422.15)	(680.76)	(542.18)
Age	128.68	315.30**	−62.89
	(98.24)	(139.41)	(140.06)
Age-squared	−2.12	−4.86**	0.51
	(1.34)	(1.92)	(1.90)
African American/Black	212.98	304.51	243.85
	(305.06)	(458.48)	(407.59)
Asian	999.62*	2,791.46***	487.60
	(606.97)	(1,003.16)	(762.03)
Other race	639.84	109.16	1,147.50*
	(511.19)	(840.07)	(641.59)
Hispanic/Latino	−629.46	−400.38	−616.83
	(386.42)	(586.57)	(514.10)
First generation immigrant	−1,025.38**	−1,930.02***	−325.79
	(444.95)	(686.20)	(584.25)
Public two-year	3,154.62**	5,636.54***	152.08
	(1,582.64)	(2,068.07)	(2,741.11)
Public four-year	1,716.93	5,132.49**	−842.75
	(1,611.63)	(2,171.29)	(2,756.40)
Private nonprofit four-year	1,923.66	5,401.59**	−536.95
	(1,632.02)	(2,269.31)	(2,759.95)
For-profit	2,965.36*	3,716.27*	2,768.56
	(1,579.29)	(2,053.45)	(2,750.48)
Observations	14,330	7,720	6,530

NOTE: * p < 0.1; ** p < 0.05; *** p < 0.01. Standard errors in parentheses. Tobit estimates from Equation (6), with controls for locale, state, and year suppressed. Income categories are based on prior year income. Average earnings reported are current year income. Sample is from NPSAS 2008 and 2012. All dollars in 2012 dollars. Survey weights used. Unweighted observation count rounded to the nearest 10.

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