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THE EFFECT OF TAX-BASED FEDERAL STUDENT AID ON COLLEGE ENROLLMENT

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JEL Codes: I23; I28; H29

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Abstract: *Tax-based federal student aid—the Hope Tax Credit, Lifetime Learning Tax Credit and Tuition Deduction—marks a new paradigm for federal aid by offering tax incentives for postsecondary enrollment for the middle-class. I exploit policy-induced variation in tax-based aid eligibility to estimate its casual effect on college enrollment. I find that tax-based aid increases full-time enrollment in the first two years of college for 18-19 year-olds by 2.2 percentage points (6.7 percent). Yet, the enrollment increase comes at a steep price. Between 7 and 13 inframarginal youths are subsidized for each marginal youth that is induced to enroll in college.*

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INTRODUCTION

Tax-based federal student aid—the Hope Tax Credit (HTC), the Lifetime Learning Tax Credit (LLTC) and the Tuition Deduction (TD)—offer tax incentives for postsecondary enrollment for the middle class. These programs are a departure in federal student aid policy. Previously, the federal government awarded student aid largely outside the tax code,¹ and primarily targeted lower-income students. First introduced in 1998, tax-based aid has quickly become an important component of federal student aid. In the 2005-2006 academic year, approximately 8.5 million students claimed one of the tax-based aid programs, about 3.4 million more than the number that received Pell Grants (Baum and Steele 2007). In that same year, the price tag of tax-based aid was nearly \$6 billion, roughly half the cost of Pell Grants (Baum and Steele 2007). However,

¹ There are some tax benefits related to higher education including the deduction of student loan interest, the exclusion of taxes on the interest of savings bonds redeemed for educational expenses, and allowing parents to claim personal exemptions for students until age 24.

the tax-based aid programs are tax expenditures and their costs may grow more rapidly compared to student aid programs that require active government appropriation.²

How does tax-based aid affect college enrollment? Given its targeting towards the middle-class, is tax-based aid simply a transfer to students that would have attended college in the absence of the programs? Or, does tax-based aid increase enrollment and/or the amount of education? The enactment and expansion of tax-based aid creates a convenient natural experiment for examining these questions. Policy-induced variation in tax-based aid is plausibly exogenous to unobservable determinants of college enrollment. In this paper, which is among the first to explore how tax-based aid affects college enrollment, I exploit variation in program eligibility to estimate the intention to treat effect of tax-based federal student aid. This is one of the first studies to measure the enrollment effect of student aid on youths from middle-class families, because most student aid programs target lower-income youths. It is also one of the first to examine a student aid program administered through the federal tax code. This aspect may be especially relevant to policymakers considering the adoption of an IRS-based application for federal student aid (Baum and McPherson 2008; Dynarski 2000).

In the only other work to consider the enrollment effects of tax-based aid, Long (2004a) examines the two the tax credit programs (HTC and LLTC) for an earlier period using a more reduced form approach and interprets her results as showing no enrollment effect. However, her finding could be the result of measurement error of program eligibility, of bias introduced from survey treatment of college students, and also of an econometric error that is common in the applied literature. I improve on this work by implementing a more flexible specification using

² Pell Grants, which do require active appropriation, are expected to face a \$6 billion shortfall in 2009 (Dillon and Lewin 2008).

data that are less likely to result in measurement error of program eligibility and that better characterize the population of college students.

The empirical results of this paper imply that tax-based aid increases full-time enrollment in the first two years of college by about 2.2 percentage points (6.7 percent). Increasing postsecondary enrollment is a goal of federal student aid (Burgdorf and Kostka 2006), and these results suggest that tax-based aid meets this benchmark. However, the enrollment increase comes at a steep price. Assuming complete take up of tax-based aid among eligible youths, a 7 percent increase in enrollment implies that 93 percent of tax-based aid recipients are students that would have attended college in the absence of the programs. To put it another way, 13 inframarginal youths are subsidized in order to entice one marginal student to enroll in college. Accounting for less than complete take up of the tax-based aid programs (Maag and Rohaly 2007) the results suggest that roughly 7 inframarginal youths are subsidized per marginal enrollment. This represents an important friction that policymakers confront when designing student aid programs to increase postsecondary attendance.³

The remainder of the paper proceeds as follows. In the next section, I provide background information on tax-based aid and outline individual responses to the programs. I describe the data and the econometric technique used to identify the enrollment effect of tax-based student aid in the third section. In the fourth section, I present baseline enrollment results as well as a set of further results exploring heterogeneous effects of tax-based aid for certain groups. I also discuss the results from a variety of sensitivity tests. In the last section, I offer a brief conclusion and discuss several avenues for future work.

³ To the extent that these inframarginal students decrease their debt burden, tax-based aid may meet an important goal of federal student aid (Turner 2010).

TAX-BASED FEDERAL STUDENT AID

Program Details

In 1997, the Taxpayers' Relief Act introduced the Hope Tax Credit (HTC) and the Lifetime Learning Tax Credit (LLTC). In 2001, the Economic Growth and Taxpayers' Relief and Reconciliation Act added the Tuition Deduction (TD). These policies create discrete changes in aid over time that are plausibly exogenous to unobserved determinants of postsecondary enrollment. Eligibility for tax-based aid is determined by adjusted gross income, tax filing status and enrollment. Only one of the three programs may be claimed per student per year. The HTC offers a maximum award of \$1,500 per student and may only be used during the first two years of undergraduate education (Internal Revenue Service [IRS] 1998). The LLTC covers 20 percent of qualified expenses for undergraduate, graduate, vocational and non-degree students. Between 1998 and 2002, the qualified spending limit for the LLTC was \$5,000, resulting in a maximum award of \$1,000 per return. In 2003, the qualified spending limit increased to \$10,000, creating a maximum award of \$2,000 per return. Both the HTC and the LLTC are subject to a phase-out for high income tax returns (IRS 1998, 2002, 2003). The TD allows tax filers to deduct 100 percent of the first \$3,000 of qualified education expenses.⁴ Like the LLTC, the TD is open to most types of students at qualifying educational institutions and is available for an indefinite number of years. The adjusted gross income eligibility range is broader for the TD program as compared to the tax-credit programs, and there is no phase-out region (IRS 2002). Table 1 provides details on all three programs. Figure 1 shows the maximum value of each of the tax-based aid programs for a joint-filing family of four in various years.

Many scholars (Dynarski and Scott-Clayton 2006; Long 2004a; Hoxby 1998; Kane 1998, 1997) voice concern that tax-based aid benefits students from middle-class families who would

⁴ The maximum deduction increased in 2004 to \$4,000. However, in this paper I use data only through 2003.

have attended college absent the tax-based aid programs. Middle-class targeting is the result of several program features. First, neither the HTC nor the LLTC is refundable, and the TD cannot reduce taxable income below zero. Second, qualified spending for each program is determined net of grants, scholarships and other forms of student aid. As a result, students may not fully benefit from the programs if they have insufficient tax liability or low levels of qualified spending. Third, the adjusted gross income eligibility limits and the phase out range for the tax credits prevent high-income families from benefitting from tax-based aid. Figure 1 shows these features. As a result of middle-class targeting, students that are eligible for tax-based aid are unlikely to benefit from other direct federal aid, including Pell Grants or campus-based aid that target lower-income students. Maag and Rohaly (2007) estimate that tax returns with income of at least \$40,000 receive about 65-70 percent of the total expenditures for the tax credit programs. In contrast, Mercer (2005) notes that 90 percent of families claiming Pell Grants have income less than \$40,000.⁵

The use of the tax code to determine need and administer student aid also sets tax-based aid apart from traditional student aid. Most federal aid programs require the Free Application for Federal Student Aid (FAFSA), which takes roughly 10 hours to complete for a family that has already prepared its taxes (Dynarski and Scott-Clayton 2006). Dynarski and Scott-Clayton (2008, 2006) and Davis (2002) argue that the complexity of the existing federal aid system imposes a large social cost while adding little information on student ability to pay. Ellwood and Kane (2000) and Dynarski (2000) suggest that this complexity disproportionately affects low-income youth. In contrast to the FAFSA, the application for the HTC or the LLTC requires only one additional form (IRS 8863) after completing the personal income tax return. Prior to 2007,

⁵ Long (2004a) exploits this relationship between tax-based aid and Pell Grants in order to estimate college pricing behavior in response to the tax credit programs. Turner (2010) provides evidence that students who benefit from the introduction of tax-based aid experience relatively small changes in other federal aid for a sample of 4-year schools.

the TD was claimed directly on the 1040 form.⁶ The transparent formula for tax-based aid allows students and families to estimate their award prior to making college application decisions, unlike FAFSA-awarded student aid. Results from Bettinger, Long, Oreopoulos, and Sanbonmatsu (2009) suggest that the reduced uncertainty and ease of application for tax-based aid may increase college enrollment.

While applying for tax-based aid is easier compared to traditional FAFSA-based aid, there is mixed evidence on program use. Long (2004a) provides evidence that many parents/guardians were unaware of tax-based student aid and that take-up was less than expected in the first years of the programs. However, the data that she uses may not accurately capture program take up because it queries students about tax-based aid use while it is likely the parent/guardian that claims the program on the tax return.⁷ Maag and Rohaly (2007) use an alternate approach, relying on a simulation using several data sources. They find that program take up for the HTC and LLTC is 63-74 percent, comparable to that found for other programs including Unemployment Insurance, Head Start and the Earned Income Tax Credit (Currie 2006).

Student Responses to Tax-Based Aid

It is expected that students respond to tax-based aid along both the extensive and intensive margins. Movement along the extensive margin is driven by a lower total cost of attendance. Along the intensive margin, the propensity to consume more education is driven by the marginal

⁶ The Tax Relief and Healthcare Act of 2006 introduced IRS form 8917 in order to identify the student claiming the deduction and show the computation of the deduction.

⁷ Long (2004a) examines the National Postsecondary Student Aid Study for the 1999-2000 school year. Response rates for undergraduates asked about tax-based aid use in 1999 are: “Don’t know” (9.4 percent); “Yes Hope Tax Credit” (2.7 percent); “Yes Lifetime Learning Tax Credit” (6.2 percent); “No” (35.8 percent); and “Not reached/Missing” (28.8 percent).

subsidy of the programs, which may be substantial. For example, the marginal subsidy from the HTC is 100 percent for the first \$1,000 of education spending and 50 percent for the next \$1,000. I measure movement along the intensive margin as a shift towards full-time enrollment away from part-time enrollment.⁸

Studies using natural experiment settings to measure the enrollment effect of student aid provide insight into the expected effect of tax-based aid.⁹ Several papers estimate the enrollment effects of the Georgia HOPE scholarship. (The HTC was named after the Georgia HOPE program.) This state administered program is not need-based, similar to federal tax-based aid. Unlike tax-based aid, eligibility for the Georgia HOPE depends on student merit. Cornwell, Mustard, and Sridhar (2006) and Dynarski (2000) find that enrollment increases roughly 0.4-0.5 percentage points for each \$100 of HOPE aid, an effect similar to that found in response to Social Security student benefits (Dynarski 2003) and to changes in tuition at public schools (Kane 1994). Various studies find similar effects in the context of other student aid programs in the U.S., including state-based grants (Kane 2003), state merit-based aid (Dynarski 2004) and Pell Grants (Curs, Singell and Waddell 2007). Nielsen, Sorensen and Taber (2008) report a smaller response to student aid among youths in Denmark, relative to enrollment effects found for the U.S., and suggest that this is the result of larger total aid levels for Danish students.

The timing of award receipt sets tax-based aid apart from traditional student aid, and this aspect may affect how students respond to the programs. The benefits from tax-based aid are likely realized when tax returns are received, generally after the payment of educational

⁸ It is also possible that students adjust on the intensive margin by selecting more expensive schools. Long (2004b) finds evidence that direct student aid alters enrollment patterns across public and private schools. Data limitations prevent me from exploring this possibility.

⁹ There is also substantial work relying on traditional approaches that exploit cross-sectional and/or time-series variation in postsecondary costs (Leslie and Brinkman 1987; Heller (1997).

expenses.¹⁰ In contrast, students receive scholarships, grants and other forms of aid when tuition is paid. The delay in payment of tax-based aid may preclude short-term credit constrained youths from capitalizing on the programs. As a result, tax-based aid may not alter the enrollment decision of marginal youths, but rather may largely serve as a transfer to inframarginal youths.

DATA AND EMPIRICAL STRATEGY

Analysis Sample from the Survey of Income and Program Participation

To quantify the enrollment effect of tax-based aid, I use data from the U.S. Census Bureau's Survey of Income and Program Participation (SIPP). The SIPP is a nationally representative survey of the United States designed to provide accurate and comprehensive information on income and program use.¹¹ The SIPP offers several advantages over other datasets. Unlike the October supplement of the Current Population Survey, income data in the SIPP are not categorical, so that program eligibility is likely to be measured with less error using SIPP data. Long (2004a) relies on October Current Population Survey data, and her difference-in-differences estimation strategy that compares eligible students to ineligible students, before the enactment of tax-based aid relative to after, may be plagued by measurement error that biases the effect towards zero. Another benefit of the SIPP is its treatment of college students. Students that are at college remain on their family record and the SIPP continues to collect their information, so that observations of youths may be linked to observations of their parents or

¹⁰ Tax filers could smooth the impact of the credit by adjusting their withholdings in earlier periods. However, this requires a high level of sophistication, and it is likely that most returns realize the benefits as a lump sum after education costs are paid.

¹¹ I use cross sectional survey weights to ensure that the SIPP sample mirrors the nation as a whole. I use the weight from an individual's final observation divided by the number of appearances for that individual. This weighting takes into account both sample attrition, by using the final weight, and the frequency of appearance. I repeated the analysis using the cross sectional weight for each observation and the results were similar.

guardians.¹² Information on parents/guardians is crucial for determining program eligibility, because in most cases dependent students are claimed on their family tax return.¹³ In contrast to the SIPP, the likelihood of observing a student in other surveys, including the Current Population Survey, is related to their decision to live at home.¹⁴ Long (2004a) conditions on these living arrangement variables, which may lead to biased estimates (Cameron and Heckman 2001), and also results in a sample that is not nationally representative.

To construct the analysis sample I take the following steps. First, I link observations on college-aged youths to observations on their parents/guardians, removing youths that could not be linked (3.6 percent). Next, because the SIPP are monthly data, I measure enrollment using information from October (fall enrollment) and from March (spring enrollment). (As a robustness check I consider alternate months.) However, I rely on annual income data to determine program eligibility. I also limit the sample to 18-19 year olds to capture college entry and the transition into the second year of college. The data cover the period from January, 1996 through December, 2003.¹⁵ Individuals enter the sample at age 18, and remain until the end of the school year when they are 19 or until the sample period ends. This creates a sample of 23,030 observations for 8,237 youths. Roughly 30 percent of youths in this sample are enrolled full-time in the first two years of college, with 24 percent enrolled in the first year and 6 percent in the second year. Another 2 percent are enrolled part-time in the first two years of college.

¹² In the SIPP, respondents are asked about parents/guardians until age 19.

¹³ Since virtually no students in the data earn enough to cause a (jointly) income maximizing family to have the student file separately, I use family income to determine eligibility.

¹⁴ The Current Population Survey uses a concept of “usual residence” which should include individuals that refer to the household as their “regular residence,” whereas the American Community Survey uses a concept of “current residence” excluding individuals that have been away from the residence for 2 months or more. See Shin (2007) for full details.

¹⁵ Because the coverage of the 1996 and 2001 SIPPs is not continuous, there is a gap in the data between April, 2000 and September, 2000.

Unfortunately, the SIPP does not include data on tax-based aid, or some of the variables needed to determine its value, including taxes owed and education spending. To address these shortcomings of the data, I calculate tax-based aid in the following manner. First, I use information from the IRS (1998, 1999, 2000, 2001, 2002, 2003) to define the tax-based aid function for each of the three programs. (See Table 1 for program details.) The functions depend on income, taxes owed and education spending. I use family income from the SIPP, and I estimate taxes owed and the marginal tax rate using the standard deduction and personal exemptions.¹⁶ To focus on policy-induced variation in tax-based aid eligibility, I abstract from heterogeneity in education spending by calculating the value of tax-based aid at the programs' spending limits.¹⁷ For most of the analysis period, program spending limits are relatively low. Data from the National Postsecondary Student Aid Study suggests that average spending by 18-19 year olds at 4-year schools is at least as large as the programs' limits, although students at 2-year schools have lower levels of spending.¹⁸ (In the fourth section, I discuss the results using an estimation of tax-based aid that includes heterogeneity in education spending based on student characteristics, including differences across school types that may provide a better measure of the tax-based aid subsidy for students at 2-year schools.) Using the programs' limits for education spending, along with data on income and taxes, I apply the tax-based aid function for

¹⁶ The value of the HTC and LLTC depends on taxes owed, while the value of the TD depends on the marginal tax rate. Assuming only the standard deduction and personal exemptions results in an upper bound of taxes owed and of tax-based aid.

¹⁷ Even if spending data were available in the SIPP, it is endogenous to the enrollment decision. Turner (2010) addresses this source of endogeneity in a separate context using instrumental variables.

¹⁸ Qualified spending by 18-19 year olds in the 1999-2000 school year was \$2,518 (4-year public), \$8,307 (4-year private), \$470 (2-year public), and in the 2003-04 school year spending was \$3,286 (4-year public), \$10,510 (4-year private), \$644 (2-year public).

each program for a given youth. Lastly, as students can claim only one program per year, and I assign the program with the largest value.¹⁹

A further complication for estimating the value of tax-based aid is the overlap of two school years within a given calendar year. As an example, consider the tax-based aid subsidy for calendar year 2000. This subsidy is based on education spending in both the spring of the 1999-2000 school year as well as fall of the 2000-2001 school year. When assigning the tax-based aid subsidy for a given school year, I do not account for this overlap. For example, when estimating tax-based aid eligibility in October 2000, I abstract from the enrollment in March of 1999. More generally, I assign the entire incentive in each month, an approach that treats the enrollment data as a repeated cross-section.²⁰ (I cluster the standard errors at the individual level to address serial correlation in enrollment.) This approach is conservative and works against finding a substantive effect of tax-based aid. As a robustness check, I limit the sample to 18 year olds, so that each individual is observed at most twice, and there is no school year overlap for a given calendar year.

Figure 2 shows tax-based aid eligibility by adjusted gross income for various years, highlighting the sources of policy-induced variation. Cross-sectional variation arises from program rules that create differences in the subsidy by adjusted gross income, taxes owed and tax-filing status. For example, the dip in Figure 2 beginning around \$40,000 corresponds to the phase-out range of the tax-credits for non-joint tax returns, while the phase out range for joint returns is evident in the \$80,000-\$100,000 range. The subsidy also varies over time: in 1998 the

¹⁹ In forthcoming work, I examine the frequency and value of mistakes in tax-based aid selection using data from the Internal Revenue Service. While I find evidence that some tax filers do not maximize their tax-based aid award, the dollar value of these mistakes is small so that the bias in the subsidy value should be minimal.

²⁰ I do not split the value of the tax-based aid award across school years within a given calendar year. This requires conditioning on previous enrollment for the later period and will bias the results. For example, a student would receive a partial award in the second period only if they were enrolled in the first period, whereas a student that was not initially enrolled would receive a full award in the second period.

HTC and LLTC are introduced (top panel); in 2002 the TD extends tax-based aid beyond the phase-out range of the tax credit programs (middle panel); and in 2003 the LLTC increases in generosity (bottom panel).

Table 2 shows the average value of tax-based aid, college enrollment, and other student characteristics by adjusted gross income eligibility before and after the introduction of tax-based aid in 1998.²¹ The average value of tax-based aid for eligible students in the post period (\$1,104) is relatively large compared to other forms of aid and tuition for 18-19 year olds during the 1999-2000 school year (Pell Grants [\$506 4-year public schools, \$500 4-year private schools, \$352 2-year public schools]; federal campus-based aid [\$267 4-year public schools, \$851 4-year private schools, \$55 2-year public schools]; and tuition [2-year schools \$1,014, 4-year schools \$3,847, 4-year private schools \$14,787]).²² The increase in enrollment for eligible youths following tax-based aid enactment (4.9 percentage points) is larger than that of ineligible (1.7 percentage points), however the baseline specification does not explicitly include the comparison of eligible and ineligible youths. The average changes in enrollment and tax-based aid for eligible students suggests roughly a 0.4 percentage point increase per \$100 of tax-based aid.

Detailed income data in the SIPP make it possible to construct a direct measure of credit constraints using an asset-based sample separation rule. Following work on credit constraints in other contexts (Jacoby 1994; Zeldes 1989), I consider families with a ratio of liquid assets to income less than the 25th percentile as likely to be constrained.²³ The use of a direct measure of credit constraints is a novel addition of this paper, as the literature on postsecondary enrollment

²¹ Eligible students are those that have positive tax liability and that meet the adjusted gross income limits for 2003-2004. In other words, I consider youths that are never eligible for tax-based aid as ineligible.

²² I calculated these values using the data analysis system for the National Postsecondary Aid Study.

²³ I use interest income to estimate liquid assets using a 4 percent interest rate. Interest income in the SIPP is the sum of interest from checking, savings and money market accounts, bonds, cash deposits and U.S. government securities. I also considered different interest rates, including different rates for different types of assets.

largely infers the effect of credit constraints in an indirect manner. Work by Nielsen, Sorensen and Taber (2008) who adopt a similar approach to examine the role of credit constraints on postsecondary enrollment in Denmark is a notable exception.²⁴ Leth-Petersen (forthcoming) offers evidence that low-levels of assets reflect binding constraints. Jappelli, Pischke, and Souleles (1998) adopt an innovative measure of credit constraints based on loan refusal, likely a more accurate measure of credit constraints. They show that asset-based separation rules like the one used here lead to a similar categorization of unconstrained individuals as compared to their loan-refusal measure.²⁵

Econometric Specification for College Enrollment

To estimate the effect of tax-based student aid on postsecondary enrollment I use the following probit model:

$$(1) \text{ Enrollment}_{it} = \Phi(\beta_1 \text{Subsidy}_{it} + \beta_2 X_{it} + \varepsilon_{it})$$

where the subscripts i and t index individuals and months. Subsidy_{it} measures the value of the available tax-based aid subsidy and is calculated as described earlier.

The subsidy is measured in hundreds of dollars, so that its impact measures the effect of eligibility for \$100 of tax-based aid for a student with spending at or above the program limits. This can be interpreted as the effect of increasing the maximum value of tax-based aid by \$100, which may be of interest to policymakers who set the statutory limits of tax-based aid. In the primary analysis sample, I remove youths that are never eligible for a tax-based aid award. (I drop youths with no tax liability and also remove youths that do not meet the 2003-04 adjusted

²⁴ Nielsen, Sorensen, and Taber (2008) identify observations with liquid assets less than one or two months of income as constrained. Their definitions find between 19 to 40 percent as credit-constrained. I also tried their definition based on monthly income and the results were similar.

²⁵ They show that only 3 percent of households that were turned down for a loan would be classified as unconstrained using the asset-based separation rule used in Zeldes (1989).

gross income requirements.) By excluding ineligible youths, I remove the identification assumption of a shared preexisting time trend in enrollment for eligible and ineligible students. Difference-in-differences estimation, which is commonly used to estimate the enrollment effects of student aid (Cornwell, Mustard, and Sridhar 2006; Long 2004a; Dynarski 2003, 2000), requires this assumption. Compared to this approach, I use a more flexible specification. Identification comes from the intensity of treatment that arises from policy-induced variation in tax-based aid among eligible students, and also from time series variation in program rules that create discrete changes in aid over time, but not from the comparison of eligible and ineligible youths. (As a sensitivity check, I include ineligible youths as a control group.)

In X_{it} , I control flexibly for both time effects and family income to guard against the possibility that the impact of tax-based aid is identified by a non-linear relationship between enrollment and these factors. To account for time trends in enrollment, I include time dummy variables. I control for income using a cubic spline with three knots. I account for individual and parent/guardian characteristics that may affect student enrollment, including race, age, gender, household type and parent/guardian education level as well as indicator variables for the state of residence. I cluster the standard errors at the individual level to address concerns of serial correlation as suggested by Bertrand, Duflo, and Mullianathan (2004).

To identify the enrollment effect of tax-based aid using Equation (1), a key assumption is that other forms of aid for eligible students are roughly constant over the analysis period. Unfortunately the SIPP does not contain information on student aid awards. However, the targeting of tax-based aid is different than that of other federal programs, so that students eligible for tax-based aid are unlikely to benefit from Pell Grants or federal campus-based aid (Maag and Rohlay 2007; Mercer 2005; Long 2004a). Further, the discrete change in tax-based aid that

results from the initial program introduction is substantively larger than that of other federal programs. For example, the average increase in tax-based aid per student that results from the introduction of the HTC and LLTC is roughly \$900 in the analysis sample, compared to a \$67 dollar increase in Pell Grants and a \$140 increase in campus-based aid nationally over the same period.²⁶

Measuring the Marginal Effect of Interaction Terms in Non-linear Models

Tax-based aid may have a differential effect for some groups of students. To explore this possibility, I use several specifications that include interactions with the subsidy variable. An example of one specification using interaction terms is given in Equation (2).

$$(2) \text{ Enrollment}_{it} = \Phi(\beta_1 \text{Constrained}_{it} + \beta_2 \text{Subsidy}_{it} + \beta_3 \text{Subsidy}_{it} * \text{Constrained}_{it} + \beta_4 X_{it} + \epsilon_{it})$$

The marginal effect of the interaction term in Equation (2) measures the differential effect of the subsidy for individuals that are credit constrained, relative to non-constrained youths. Using a Linear Probability Model (LPM), this marginal effect, calculated as the discrete difference (with respect to the constrained variable) of the partial derivative (with respect to the subsidy variable) of enrollment, is β_3 . In the non-linear case, this effect is more complicated because it includes derivatives of the non-linear function.²⁷ Ai and Norton (2003) and Norton, Wang and Ai (2004) note that the applied economics literature has largely interpreted interactions in non-linear specifications incorrectly. Long (2004a) falls into this category by

²⁶ Differences in tax-based aid calculated by author. Differences in Pell Grants and campus-based aid are from Baum and Steele (2007).

²⁷ Using a probit, the marginal effect is:

$$\frac{\Delta \left(\frac{\partial \Phi(XB)}{\partial \text{Subsidy}} \right)}{\Delta \text{Constrained}} = (\beta_2 + \beta_3) \varphi(xb_1) - (\beta_2) \varphi(xb_0) \text{ where } \varphi(\bullet) = \Phi'(\bullet), \text{ } xb_1 \text{ (} xb_0 \text{) note when the binary variable is equal to one (zero).}$$

reporting the odds ratio for an interaction term in a difference-in-differences logit model. The odds ratio interpretation does not extend to the case of interaction terms, and her results are insufficient to determine the magnitude or statistical significance of the true interactive effect (Norton, Wang and Ai 2004).²⁸ I report average marginal effects and calculate the associated standard errors, which are robust to correlation at the student level, using the delta method as suggested by Ai and Norton (2003).²⁹

EMPIRICAL RESULTS

Baseline Enrollment Effects of Tax-Based Aid

Tax-based aid meets an important federal student aid goal by increasing college enrollment.

Panel A of Table 3 shows the baseline results. An increase of \$100 of tax-based aid is predicted to increase full-time enrollment in the first two years of college by 0.3 percentage points.

Multiplying this effect by the average value of tax-based aid suggests that enrollment increases by 2.2 percentage points (6.7 percent).³⁰ The enrollment increase does not appear to extend to part-time enrollment. Column (2) of Panel A shows the results for part-time enrollment.

Instead, the point estimate implies a decrease in part-time enrollment that may be evidence of a shift away from part-time status towards full-time enrollment. However, the estimate on part-

²⁸ Puhani (2008) shows that the sign on the coefficient of the interaction term is the same sign as the treatment effect in a non-linear difference-in-differences model.

²⁹ The expression for the standard error for the interaction of “subsidy” and “constrained” is:

$$\frac{\partial}{\partial \beta'} \left\{ \frac{\Delta \frac{\partial \Phi(XB)}{\partial \text{Subsidy}}}{\Delta \text{Constrained}} \right\} \hat{\Omega}_{\beta} \frac{\partial}{\partial \beta} \left\{ \frac{\Delta \frac{\partial \Phi(XB)}{\partial \text{Subsidy}}}{\Delta \text{Constrained}} \right\} \text{ where } \hat{\Omega}_{\beta} \text{ is a consistent covariance estimator of } \hat{\beta}.$$

³⁰ These enrollment effects may include students that would otherwise enroll at a later age but enroll earlier to receive a positive award as part of a parent/guardian tax return. I cannot separately identify this effect from enrollment by youths that would otherwise not enroll.

time enrollment is imprecise, so this implication is unclear.³¹ Tax-based aid also appears to increase both postsecondary entry and persistence into the second year, although these estimates are not significant. Successful transition into the second year is a good predictor of later success in college, because a large share of attrition occurs in the first year (Horn 1998; Bradburn 2002). In Panel B of Table 3, I report the effect of the subsidy on the first and second years of college separately.

If all youths eligible for tax-based aid avail themselves of the programs, then a 7 percent enrollment increase implies that 93 percent of tax-based aid recipients would have enrolled without the tax-based aid subsidy. In other words, 13 inframarginal youths are subsidized for each marginal youth that is induced to enroll. This finding confirms speculation by Dynarski and Scott-Clayton (2006), Long (2004a) and Kane (1998, 1997) that tax-based aid will mostly serve as a transfer to youths that would have enrolled in the absence of tax-based aid. To put a lower bound on the level of inframarginal subsidization, suppose that program take up is complete among marginal youths but less than complete among inframarginal youths so that the total take up is equal to the lower limit reported by Maag and Rohlay (2007). In this case, the amount of inframarginal subsidization is still high. Roughly 7 inframarginal youths are subsidized per marginal enrollment. To the extent that tax-based aid allows inframarginal students to reduce their student loan amounts, tax-based aid may still meet an important goal of federal student aid.

³¹ This may also be evidence that fears over increased part-time enrollment for leisure and/or recreation courses may be unwarranted (Hoxby 1998; Kane 1997). However, use of tax-based aid for these reasons is more likely for older students that are not in the analysis sample.

Differential Enrollment Effects of Tax-Based Aid

In this section, I allow for heterogeneous effects of tax-based aid for students that may be credit constrained, by family income levels, and by race/ethnicity. These results rely on the interaction effects discussed in the third section.

Targeting towards the middle-class and the delay in benefit receipt may prevent credit-constrained youths from responding to tax-based aid. Alternatively, for constrained youth that are able to capitalize on the programs, the differential effect of the subsidy may be positive. The effect of short-term credit constraints on postsecondary enrollment has not been resolved in the literature. Lochner and Monge-Naranjo (2008), Ellwood and Kane (2000) and Kane (1995, 1994) argue that credit constraints may impede higher education enrollment for some students. Alternatively, Nielsen, Sorensen and Taber (2008), Cameron and Taber (2004), Carneiro and Heckman (2002), Cameron and Heckman (2001, 1999), and Keane and Wolpin (2001) provide evidence that short-term credit constraints are unimportant.

Unfortunately, the results do not help to clarify the impact of credit constraints on postsecondary enrollment. Using the definitions of credit constraints discussed in section three, I allow for differential effects of the subsidy for individuals that are likely to be constrained. Panel A of Table 4 shows these results. The estimate implies a relatively large differential effect of tax-based aid for constrained students, although the estimate is imprecise so that both differential increases and decreases in enrollment for constrained youths are possible. The differential effect of tax-based aid for constrained youths may be biased by measurement error in the constrained variable. Given the ability of asset-based separation rules to properly classify unconstrained observations (Jaappelli, Pischke and Souleles 1998), limiting the sample to these observations may be less worrisome. Using sample splits, I find that the enrollment effects of

tax-based aid are comparable across the constrained and unconstrained groups, suggesting that there is not a substantive differential effect of tax-based aid for constrained students. These results are shown in Panels B and C of Table 4.

Differential effects by income may provide insight into the enrollment effects of making tax-based aid refundable. The American Opportunity Tax Credit enacted in 2009 expands eligibility in this manner, offering a partially refundable award. To measure differential effects by income, I interact the value of the subsidy with income tercile dummies of the eligible income range. Panel A of Table 5 reports these results. The first income tercile, the low-income group, is omitted so the differential effect is relative to individuals in this group. The estimated differential effects for the second and third terciles on full-time college enrollment are small relative to the effect of the subsidy and are not statistically significant. If youths with insufficient income to capitalize on tax-based aid will respond similarly to youths in the eligible income range, then these results imply that refundable tax-based aid will further increase enrollment. This result may also be evidence that the non-refundable tax-based aid considered here did not exacerbate enrollment gaps across the eligible income range. However, the estimates also allow for substantive differential effects by income consistent with an increasing enrollment gaps across income groups reported by Lochner and Monge-Naranjo (2008).

It is also unclear if tax-based aid exacerbates the enrollment gap between whites and minorities. Previous work on state-based student aid (Dynarski 2004, 2000; Heller 2004) finds differential effects of student aid by race. Possible explanations for these findings include academic requirements of merit-based aid, confounding income effects, and different price sensitivity. The results in Panel B of Table 5 that consider heterogeneous effects of tax-based

aid for black and Hispanic youths are imprecise, allowing for both positive and negative differential enrollment effects of tax-based aid relative to white youths.

Robustness Checks of the Enrollment Effect of Tax-Based Aid

In this section, I discuss the results from several sensitivity tests. These tests show that the baseline full-time enrollment results are robust to an alternate specification that includes ineligible youths as a control group, to the use of an alternate subsidy that includes student-level heterogeneity in education spending, and to the use of alternate months to measure college enrollment. The enrollment results also persist when the sample is limited to 18 year olds, so that each youth is observed at most twice and there is no school year overlap for a given calendar year. I also find that the results are robust to alternate time and income controls (not shown).³²

The main results limit the analysis to students eligible for tax-based aid, so that identification does not rely on the comparison of eligible and ineligible youths. Ineligible youths are composed of two distinct groups: those with income that is insufficient to capitalize on the programs; and those with income that exceeds the programs' limits. When both groups are included, the estimated effect of tax-based aid on full-time enrollment is significant and similar to the baseline results. This result is shown in Panel A of Table 6. I find similar effects when only one group of ineligible students is included (not shown). However, interpreting results that include ineligible youths is more complicated. The implicit comparison of eligible to ineligible youths requires the assumption that these groups were on similar enrollment trends prior to the enactment of tax-based aid. The baseline results, which exclude both ineligible groups, do not require this identification assumption.

³² The results are robust to separate time trends by income tercile and also to alternate income controls (cubic and linear spline functions with up to 7 knots).

In the baseline results, the tax-based aid subsidy abstracts from differences in education spending that also affect the value of tax-based aid. To test the importance of heterogeneity in education spending, I construct an alternate valuation of tax-based aid using a plausibly exogenous simulation of education spending. This approach may offer a better characterization of the tax-based aid award for students at 2-year schools, as it allows for lower levels of education spending. To estimate education spending, I use data from the National Post Secondary Aid Study, because the SIPP does not include information on educational spending. Using spending data for the 1995-96 school year, I estimate qualified education spending as a function of variables that are also available in the SIPP. Using these estimates, I predict spending for observations in the SIPP. (Results are reported in Appendix Table A1.) I adjust these estimates to future years using aggregate data from the National Center for Education Statistics on tuition growth. This approach simulates education spending by holding fixed the determinants of spending from a period before the enactment of tax-based aid, so that the simulation is free from student and/or institutional responses to the programs that may alter education spending in later years. Based on the estimates of qualified education spending, I construct the value of the tax-based aid subsidy as detailed in the third section. This alternate valuation includes the same sources of policy-induced variation in program eligibility as described in the third section, and also includes cross-sectional variation in education spending based on student characteristics.

The full-time enrollment results using the simulated spending measure of tax-based aid are similar compared to the basic results. The estimated effect on full-time enrollment is roughly 0.4 percentage points per \$100 of tax-based aid, implying an increase of 2.4 percentage points (6.4 percent). These results appear in Panel B of Table 6. The standard error of this estimate is

roughly comparable to the main results, suggesting that the simulation of education spending does not add a relevant source of identifying variation. (Note that the standard errors are clustered at the individual level.)

The baseline results measure enrollment in the academic year using data from the months of October and March. These months are likely to capture fall and spring postsecondary enrollment. In Panel C of Table 6, I show the results using the months of September and February. The estimated increase in full-time enrollment in the first two years of college in these two months is 0.3 percentage points per \$100 of tax-based aid, identical to the baseline results. I also find similar enrollment effects using other months (not shown).

When calculating tax-based aid eligibility, I abstract from school year overlap within a given calendar year by assigning the entire tax-based aid award in both the fall and the spring of a given school year. In Panel D of Table 6, I limit the sample to 18 year olds, so that each individual is observed at most twice and there is no overlap of school years within a given calendar year. For this sample, the estimated enrollment effect is 0.4 percentage points per \$100 of tax-based aid on this sample, similar to the baseline results.

CONCLUSION

A primary goal of federal student aid is to increase postsecondary attendance. Many federal student aid programs, such as Pell Grants and campus-based aid, work towards this goal by targeting lower-income youths and their families. Federal tax-based aid is among the first to target the middle-class, and also one of the first student aid program administered through the federal tax code. In this paper, I estimate the enrollment effects of the tax-based aid programs.

The results suggest that tax-based aid increases full-time college enrollment of 18-19 year olds by about 2.2 percentage points (6.7 percent) in response to tax-based aid.

The enrollment increase of tax-based aid appears to come at a heavy price. If tax-based aid take up is complete, then a 7 percent increase in enrollment among eligible youths implies that 93 percent of tax-based aid recipients are students that would have attended college absent the tax-based aid programs. To put it another way, tax-based aid subsidizes 13 students for each marginal student that is induced to enroll. Accounting for less than complete take up of tax-based aid among eligible youths (Maag and Rohaly 2007), the results suggest that about 7 inframarginal students are subsidized for each marginal student that is induced to enroll. This finding suggests that tax-based aid largely serves as a transfer to middle-income students that would have attended college absent the tax-based aid programs.

The implied price sensitivity of postsecondary enrollment, roughly 0.3 percentage points per \$100, is estimated assuming that students realize the full statutory value of their tax-based aid awards. However, the intended cost reduction of tax-based aid may be offset by increases in the price of postsecondary education. In recent work, Turner (2010) finds that 4-year colleges and universities strategically lower school grant aid for students that are likely to benefit from tax-based aid. To the extent that this occurs, the results here are underestimates of the true price sensitivity of enrollment, because students may realize only a partial reduction in their net price for college.

Yet, even if tax-based aid is offset by reductions in school grant aid, enrollment may still increase. Unlike traditional student aid, the transparent formula for tax-based aid gives students and families information on likely aid receipt prior to making application decisions. Further, students and families cannot perfectly observe the offsetting price increase, as there is no

information on the counterfactual level of school grant aid that they would have received absent the school response. Recent work (Bettinger, Long, Oreopoulos and Sanbonmatsu 2009; Cellini 2009) suggests that reduced uncertainty about the cost of college and lower transaction costs may increase postsecondary enrollment. Clarifying how information on the cost of postsecondary attendance affects enrollment, as well as how the transaction costs of aid application impact student aid use and subsequent enrollment, are avenues for future research. Other topics to address in future work include examining how tax-based aid impacts the transition from 2-year schools into 4-year schools, the decision to enroll in public vs. private institutions, and the impact of tax-based aid on degree attainment, possibilities not considered here due to data limitations.

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Figure 1

Maximum Tax-Based Aid by Adjusted Gross Income, Joint-Filing Married Family of Four with one College Student in Various Years

Note: Tax filing status and family size determine tax liability. Tax liability is estimated using only standard deduction and personal exemptions. See text for a description of tax-based aid awards.

Figure 2

Average Tax-Based Aid Eligibility by Adjusted Gross Income, Various Years

Table 1 <i>Tax-Based Aid Program Details, 1998-2003</i>			
	Hope Tax Credit (HTC)	Lifetime Learning Tax Credit (LLTC)	Tuition and Fees Deduction (TD)
Expenses Covered	Tuition and required fees at an educational instituion eligible for Department of Education student aid programs. Expenses covered do not include medical expenses, room and board, transportation, insurance, scholarships, Pell Grants or any other tax free funds used to pay education expenses.		
Adjusted Gross Income Eligibility	1998-2001: Full credits for single (joint) returns less than \$40,000 (\$80,000). Credits linearly phased out for single (joint) returns until \$50,000 (\$100,000). 2002: Limits changed to \$41,000 (\$82,000) and \$51,000 (\$102,000) for single (joint) returns. 2003: Limits changed to \$83,000 and \$103,000 for joint returns.		Single filiers with less than \$65,000. Married couples must file a joint return less than \$130,000.
Amount	100 percent of first \$1,000 plus 50 percent of the next \$1,000 of qualified education spending. Max credit \$1,500 per student.	1998-2002: 20 percent of first \$5,000. Max credit \$1,000 per return. 2003: 20 percent of first \$10,000. Max credit \$2,000 per return.	100 percent of first \$3,000 of qualified education spending per return.
Recipient Eligibility	Only available for two tax years for students in the first two years of postsecondary education. Must be enrolled at least half-time, pursuing a degree or credential and student cannot have a felony drug conviction.	Undergraduate, graduate, vocational education and job skills programs. Available for an indefinite number of years. Lack of a felony drug conviction rule does not apply.	
Start Date	January 1, 1998	July 1, 1998	Janury 1, 2002
Source: IRS Publication 970 "Tax Benefits for Education" Various Years.			

Table 2
Differences in Enrollment, Tax-Based Aid and Student Characteristics by Program Eligibility and Start Date

	Before Tax-Based Aid		After Tax-Based Aid	
	Ineligible	Eligible	Ineligible	Eligible
<i>Enrollment</i>				
Full-time	22.5	28.7	24.2	33.6
First Year	17.0	22.8	19.6	26.6
Second Year	5.5	5.9	4.6	7.0
Part-time	1.6	2.5	1.0	2.8
<i>Tax-Based Aid</i>				
Subsidy	0	0	0	1,104
<i>Student Characteristics</i>				
Black	22.8	13.6	24.6	14.2
Hispanic	23.1	14.4	22.1	15.4
Female	50.6	47.2	48.9	48.0
Age 18	74.5	77.6	75.9	74.3
Data from the 1996 and 2001 Core Wave files of the Survey of Income and Program Participation. All dollar values are in constant (\$1996). Tax-Based Aid became effective January 1, 1998. Eligibility is based on adjusted gross income using 2003 program rules. See text for details.				

Table 3		
<i>Estimated Enrollment Effects of Tax-Based Student Aid</i>		
	(1)	(2)
<i>Panel A: College Enrollment Effects</i>		
Enrollment Level	Years 1 & 2 Undergraduate	
Dependent Variable	Full-time	Part-time
Subsidy	0.320 (0.141)	-0.023 (0.036)
Wald Chi ²	1,128	371
Pseudo R ²	0.145	0.075
Sample Size	18,990	18,990
Mean Dependent Variable	32.31	2.90
Mean Subsidy	6.76	6.76
<i>Panel B: Individual Year Effects</i>		
Enrollment Level	1st Year of College	2nd Year of College
Dependent Variable	Full Time	Full Time
Subsidy	0.235 (0.129)	0.088 (0.059)
Wald Chi ²	627	1,469
Pseudo R ²	0.090	0.224
Sample Size	18,990	18,990
Mean Dependent Variable	25.20	7.11
Mean Subsidy	6.76	6.76
<p>The average marginal effects from a probit analysis are reported in percentage points per \$100 of subsidy. The value of the subsidy is measured in hundreds of dollars. Standard errors are calculated using the delta method and are robust to correlation at the student level. Control variables include dummy variables for race, Hispanic, gender, married, age, state of residence, parent/guardian education, household type and month and a spline function of income (3 knots). Data from the 1996 and 2001 core wave files of the Survey of Income and Program Participation.</p>		

Table 4	
<i>Estimated Enrollment Effect of Tax Based Student Aid and Credit Constraints</i>	
(1)	
Enrollment Level	Years 1 & 2 Undergraduate
Dependent Variable	Full-time
<i>Panel A: Differential Effects of Credit Constraints</i>	
Subsidy	0.337 (0.143)
Subsidy*Constrained	0.263 (0.174)
Constrained	-2.786 (1.805)
Wald Chi ²	1,136
Pseudo R ²	0.142
Sample Size	18,990
Mean Dependent Variable	32.31
Mean Subsidy	6.76
<i>Panel B: Constrained Youths</i>	
Subsidy	0.286 (0.181)
Wald Chi ²	686
Pseudo R ²	0.158
Sample Size	9,479
Mean Dependent Variable	32.73
Mean Subsidy	6.70
<i>Panel C: Unconstrained Youths</i>	
Subsidy	0.369 (0.174)
Wald Chi ²	731
Pseudo R ²	0.142
Sample Size	9,511
Mean Dependent Variable	31.88
Mean Subsidy	6.83
<p>The average marginal effects from a probit analysis are reported in percentage points per \$100.</p> <p>The value of the subsidy is measured in hundreds of dollars.</p> <p>Constrained equals one for youths with a ratio of liquid assets to income below the 25th percentile.</p> <p>Standard errors are calculated using the delta method and are robust to correlation at the student level.</p> <p>Control variables include dummy variables for race, Hispanic, gender, married, age, state of residence, parent/guardian education, household type and month and a spline function of income (3 knots).</p> <p>Data from the 1996 and 2001 core wave files of the Survey of Income and Program Participation.</p>	

Table 5	
<i>Estimated Differential Enrollment Effect of Tax Based Student Aid by Income and Race/Ethnicity</i>	
Enrollment Level	Years 1 & 2 Undergraduate
Dependent Variable	Full-time
<i>Panel A: Income Interactions</i>	
Subsidy	0.309 (0.142)
Subsidy*Middle Income	-0.083 (0.211)
Subsidy*High Income	-0.008 (0.218)
Middle Income	1.079 (2.997)
High Income	4.046 (4.256)
Wald Chi ²	1,147
Pseudo R ²	0.142
<i>Panel B: Race/Ethnicity Interactions</i>	
Subsidy	0.319 (0.141)
Subsidy*Black	0.199 (0.237)
Subsidy*Hispanic	-0.216 (0.249)
Black	-1.338 (2.046)
Hispanic	-3.779 (2.415)
Wald Chi ²	1,130
Pseudo R ²	0.142
Sample Size	18,990
Mean Dependent Variable	32.31
Mean Subsidy	6.76
<p>The average marginal effects from a probit analysis are reported in percentage points per \$100.</p> <p>The value of the subsidy is measured in hundreds of dollars.</p> <p>Standard errors are calculated using the delta method and are robust to correlation at the student level.</p> <p>Middle Income and High Income are indicator variables defined by the 2nd and 3rd income terciles of the eligible income range.</p> <p>Control variables include dummy variables for race, Hispanic, gender, married, age, state of residence, parent/guardian education, household type and month and a spline function of income (3 knots).</p> <p>Data from the 1996 and 2001 core wave files of the Survey of Income and Program Participation.</p>	

Table 6	
<i>Robustness Checks of Enrollment Effect of Tax Based Student Aid</i>	
(1)	
Enrollment Level	Years 1 & 2 Undergraduate
Dependent Variable	Full-time
<i>Panel A: Ineligibles as Control Group</i>	
Subsidy	0.266 (0.112)
Pseudo R ²	0.159
Sample Size	23,175
Mean Dependent Variable	30.72
Mean Subsidy	5.52
<i>Panel B: Simulated Spending Subsidy</i>	
Subsidy	0.357 (0.153)
Pseudo R ²	0.146
Sample Size	18,990
Mean Dependent Variable	32.31
Mean Subsidy	5.77
<i>Panel C: Alternate Enrollment Months</i>	
Subsidy	0.288 (0.119)
Pseudo R ²	0.132
Sample Size	18,990
Mean Dependent Variable	31.11
Mean Subsidy	6.77
<i>Panel D: Eighteen Year Olds</i>	
Subsidy	0.372 (0.169)
Pseudo R ²	0.132
Sample Size	10,971
Mean Dependent Variable	29.77
Mean Subsidy	7.31
<p>The average marginal effects from a probit analysis are reported in percentage points per \$100.</p> <p>The value of the subsidy is measured in hundreds of dollars.</p> <p>Panel A includes all ineligible observations.</p> <p>Panel B uses the tax-based aid subsidy based on simulated spending. See Section 4.3.</p> <p>Standard errors are calculated using the delta method and are robust to correlation at the student level.</p> <p>Control variables include dummy variables for race, Hispanic, gender, married, age, state of residence, parent/guardian education, household type and month and a spline function of income (3 knots).</p> <p>Data from the 1996 and 2001 core wave files of the Survey of Income and Program Participation.</p>	

Table A1			
<i>Predicting Qualified Education Spending, 1995-1996 School Year</i>			
	SIPP	NPSAS	Estimates
	(1)	(2)	(3)
Qualified Undergraduate Spending	-	3,524	3,111
<i>Student Characteristics</i>			
Female	0.47	0.48	11.86 (107.74)
Married	0.02	0.03	-210.65 (150.93)
Black	0.16	0.10	-268.37 (210.97)
Asian	0.04	0.05	262.01 (268.72)
Hispanic	0.17	0.10	-172.71 (304.62)
Family Income	53,033	53,681	0.037 (0.003)
<i>Parent Education Level</i>			
High School	0.29	0.20	368.22 (193.90)
Vocational	0.07	0.16	14.20 (292.87)
Some College	0.22	0.20	518.03 (214.95)
BA/BS or more	0.20	0.32	1035.67 (214.95)
Wald F			33.22
R ²			0.22
<p>The dependent variable is tuition and fees minus all grants for the 1995-1996 school year.</p> <p>The model also includes indicators for Census region of residence that are jointly significant.</p> <p>Data in column (1) from the U.S. Department of Education, National Center for Education Statistics, 1995-1996 National Postsecondary Student Aid Study.</p> <p>Data in column (2) is from the Survey of Income and Program Participation.</p> <p>Qualified Education Spending is predicted for SIPP data using parameter estimates from Column 3.</p>			