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Abstract

Families who earn more or who heed the "experts'" advice and save for college typically receive less financial aid. The financial aid system therefore implicitly taxes both income and assets. We use NPSAS aid award data to estimate these implicit taxes, and find that at average-priced colleges the marginal income tax ranges from 2 to 16% and the marginal asset levy from 8 to 26%. A typical family loses aid worth about $11,000 at average-priced colleges and $15,000 at expensive colleges by accumulating an extra $50,000 in assets.

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1. Introduction

Parents are bombarded with advice to start saving early for their children's college education. For instance, First Interstate Bank runs advertisements showing footage of a newborn baby superimposed on that baby's hypothetical college graduation in 2016. The message to parents is clear: your child won't be able to go to college unless you open an account and begin to save.[1]

The irony is, however, that those who heed the "experts'" advice and save for college, reduce their eligibility for financial aid. Because "need-based" aid depends on assets, two families with the same earnings can pay dramatically different prices for college if one saved while the other spent.[2] This price variation functions as a large tax on savings. In a similar way, the fact that those with higher incomes typically must pay more to send children to college is, in effect, an income tax.

Although the taxes implicit in many smaller government aid programs such as Aid to Families with Dependent Children have motivated substantial research efforts,[3] little empirical work investigates the "tax schedules" implicit in the college financial aid process.[4] This paper fills part of this gap by using the National Postsecondary Student Aid Study (NPSAS 1987) to estimate the size of the income and asset taxes and how they vary among institutions and among families of different means. These estimates provide insight into two things: first, the vertical and horizontal equity characteristics of the financial aid taxes; and second, the size of the incentives to alter assets and income.

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[1] For other examples of such advice, see Dennis [1990] or Clements [1994].

[2] We should note that not all financial aid is need-based. A significant minority of aid is merit-based, as documented in McPherson and Schapiro [1994].

[3] For a review of the AFDC literature, see Hoynes [1996].

[4] Case and McPherson [1986], Edlin [1992,1993], and Feldstein [1995] take a non-empirical approach to deriving tax schedules, as we will explain shortly. Venti [1983] does the only empirical estimates we know of, estimating that the implicit income taxes from college financial aid are 7.5%. His work differs from ours in that he estimates only average tax rates, or put differently, does not allow marginal rates to vary; he does not estimate asset taxes; he studies the year 1972, when most financial aid was provided by universities instead of by the federal government.

Case and McPherson [1986], Edlin [1992,1993], Feldstein [1995], and Kim [1995] have recently brought attention to the disincentive to save under the current need-based financial aid system. They calculate that each dollar saved before college may purchase as little as half the consumption that it would without the tax. Such a tax has the potential to induce significant distortions. The simulations of Edlin suggest that once parents realize that they face these implicit taxes, their steady state asset holdings will fall by 24%-50% or more. According to Feldstein, parents already understand these taxes: in fact, he estimates that the parents in his sample would hold 50% more assets on average were it not for this tax ($35,770 instead of $23,785). Both Edlin's and Feldstein's estimates are worrisome, particularly to those who already believe that the U.S. savings rate is too low.

On the other hand, the taxes that Case and McPherson, Edlin, Kim, and Feldstein calculate may be poor approximations of the true implicit taxes from financial aid, because they are not based on the aid students actually receive. Instead, these authors assume that aid covers the entire difference between college cost and the student's "Expected Family Contribution" (EFC), i.e., what a particular family can reasonably be expected to pay according to Department of Education guidelines.[5] However, aid does not generally cover all of this so-called "need". The federal need-determination formulas do not create an entitlement to have all need met with aid, and federal programs do not stand ready to dole out enough subsidized aid to meet the need of all students.[6,7] Colleges have the discretion to fill any remaining gap as they choose, but most are not committed to supplement federal funds to meet all of the residual need.[8] These observations could

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[5]For a description of how EFC is defined, see Edlin [1993].

[6]For example, during the 1994-95 academic year, if a student's EFC was greater than $2,100, the student was not eligible for a Pell grant, regardless of her need. See "Federal Pell Grant Program Schedule for Determining Full-Time Scheduled Awards for the 1994-95 Award Period," United States Department of Education.

[7]Need must be determined not so that it can be filled, but so that no federal aid goes to those who don't need it.

[8]*Peterson's 1991 College Money Handbook* lists institutions that are committed to meeting all need.

cause skeptics to doubt that aid taxes are significant at all, and certainly brings into question the above estimates.

Our empirical work uses data on aid awards to estimate the marginal tax rates families actually face. We find that a one dollar fall in EFC does not generally lead to an extra dollar in aid. In fact, the difference in aid depends upon the type of school the student attends and her family's means. At average-priced colleges, the marginal income tax ranges from 2% to 16% and the marginal asset levy from somewhat under 8% to as high as 26% for typical families. The marginal asset levy reaches 33% at expensive private institutions with costs of $15,000. These asset taxes are not as large as those calculated directly from federal need determination formulas; nonetheless, they are large enough to raise concerns about savings disincentives and the horizontal equity of the financial aid system.[9] Two families with the same lifetime income may wind up paying vastly different prices for college. If a typical family chooses to accumulate $50,000 in assets rather than consuming these resources, it loses financial aid worth $11,000 at average-priced institutions.[10] The figure climbs to $15,000 at expensive private institutions.

At the same time, the variation of tax rates with financial means raises questions of vertical equity. The federal need determination formulas are designed to use increasing marginal tax rates to determine what a family can be expected to pay (EFC).[11] This feature can be labeled “progressive,” and it dominates for families with very low means, so that as their means increases, their marginal and average tax rates on income

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[9]Feldstein [1994], commenting on capital income taxation, attests that “any fair system of income taxation should be based on the principle that two similar individuals with the same income should pay the same tax.”

[10] For this calculation we assume that the typical family sends two children to college over an eight year period. If children spend more than eight years in college, more aid will be lost, and if they are in college for less time, less will be lost.

[11]According to the Department of Education [1990]: "The rate is based on the principle that as income increases beyond the amount needed to maintain a basic standard of living, the portion used for family maintenance decreases, while the portion available for discretionary purposes increases." (Formula A-20).

and assets rise. On the other hand, the correspondence we estimate between EFC and the aid a student is ultimately awarded implies that marginal tax rates eventually fall, and fall precipitously. In other words, families with low means find that more of their aid is taken away for a given increase in income or assets than would be taken from a family with high means. This regressive tendency is large enough to make average tax rates fall, so that we conclude there are substantial ranges over which the financial aid system imposes regressive taxes.[12]

Our finding that marginal (and eventually average) tax rates decline with income deserves some explanation. This finding would not be at all surprising if we considered students with a sufficiently broad range of financial means. After all, those with extremely high means typically pay full tuition, and so face no marginal tax and an average tax that asymptotes toward 0. Our finding may be somewhat surprising, though, since we restrict attention to students who are determined to have financial need. If all need were met for these students, they would face marginal and average tax rates that increase with their means. However, we find that not all need is met, and more importantly, that those with higher means have a smaller fraction of their need met with aid. This fact tends to undo the progressivity built into the federal need determination formulas.

In addition to their relevance for the equity of college financial aid, our tax rate estimates suggest that savings disincentives are smaller than previously thought. The simulated reductions in asset accumulation of 24-50% in Edlin [1992, 1993] overstate the optimal reaction for the typical family by roughly twofold, because Edlin [1992, 1993] used tax rates twice as large as those we find. The implications for Feldstein's [1995] estimates are more complex. When Feldstein [1995] estimated the impact of these taxes, he assumed that the implicit marginal tax rates are higher for those with higher income,

[12] We use standard terminology, and call a tax "regressive" if average rates decrease with means and "progressive" if they increase with means.

and this assumption was critical since he estimated the impact of aid taxes on asset holdings by comparing the holdings of families facing different marginal tax rates. Since we find that families with high incomes often have lower marginal tax rates than those with low incomes, our work should reopen questions about the extent to which aid taxes discourage families from accumulating assets.

We also investigate the role played by the source of aid (federal government or institution) and the type of aid (grant or loan). We do this by disaggregating aid into its components and estimating the financial aid taxes generated by each component separately. We find that one dollar of additional earnings or savings leads to a greater reduction in federal aid for a family of low means than for a family of high means. Institutional aid, in contrast, has the opposite pattern. In net, the regressive allocation of federal aid outweighs the progressive allocation of institutional aid so that the aid system becomes regressive overall. When we disaggregate financial aid by type and estimate separate tax schedules resulting from the distribution of grants and loans, we find that most of the taxes come from a reduction in grants, and little of the taxes come from a reduction in loans.

An incidental by-product of our analysis may interest those concerned about the price or demand for college. As we discuss at the end of Section 5, we find that if a typical student moves from a lower to a higher priced institution his net price rises by 85 cents for each dollar increase in sticker price at public institutions. At private institutions, net price rises by only 55 cents.

The remainder of this article is organized as follows. Section 2 provides an overview of the student financial aid system. Section 3 discusses the NPSAS data set. Section 4 explores the relationship of expected family contribution to the aid a student receives. Section 5 estimates the full determinants of aid and uses these estimates to calculate implicit marginal tax rates on income and assets. Section 6 investigates the role

played by different sources and types of aid and calculates the implicit marginal tax rates associated with each. Section 7 discusses the implications of our results.

2. Overview of the Financial Aid System

In the 1994-95 school year the Student Financial Assistance programs administered by the U.S. Department of Education disbursed $27 billion in financial aid to 6 million students, an average of $4,500 per student. This aid accounts for 70 percent of all student aid.[13] Both now and in the 1986-87 school year, for which we have data, the primary types of federal aid are Pell grants, Supplemental Education Opportunity grants, Stafford loans, PLUS loans, Supplemental Loans for Students, Perkins Loans, and Federal College Work Study. The federal government subsidizes federal loans by paying interest and guaranteeing principal. Traditionally, these loans were issued by private banks, but the recent Federal Student Overhaul Program will ultimately phase out the role played by banks in the hope that direct government administration will lower costs.[14]

When parents with dependent children seek federal college financial aid, they must fill out the Free Application for Federal Student Aid (FAFSA), which requests information such as the parents' income, assets, and number of children. The "Central Processing System" at the Department of Education uses the information on the FAFSA to generate a summary statistic representing what the parents can afford to pay for college. This figure is divided by the number of college students in the family and then added to any given student's own contribution. The result is the Expected Family Contribution (EFC) to that student's education, a figure reported to the colleges. EFC is intended to measure what a family can reasonably be expected to contribute to a child's education. A student's financial need is defined to be the difference between the cost of attending a given college and EFC. In principle, therefore, these figures are all that a

[13]U.S. Department of Education [1994], p. 8.
[14]U.S. News & World Report [1994], p.70.

financial aid officer must know to determine need-based aid. However, in addition to this summary statistic, colleges can get the raw data from which the EFC is calculated. Often, the colleges also require parents to submit their IRS 1040s, which they can use to check the honesty or accuracy of the "estimated" data on the FAFSA.

For each student, the college assembles an aid package which may include federal subsidized loans, federal grants, federal work-study, and aid provided by the state or the college itself. If the college gives a student too much aid, so that she no longer has need, she will not be eligible for federal grants or other subsidized programs.[15]

One of the important changes of the 1992 Higher Education Amendments was the exclusion of home equity from the federally required financial aid form. This prompted the College Scholarship Service to develop an "Institutional Methodology" separate from the Federal Methodology. This Institutional Methodology incorporates home equity, and many colleges require parents to fill out the Financial Aid Form (FAF), in addition to the FAFSA. This form requires them to report the year they bought their home, the price at which they purchased it, its current value, and the amount owed on it, so this information may still enter into a college's aid decisions.

3. The National Postsecondary Student Aid Survey (NPSAS)

We use data from the 1987 National Postsecondary Student Aid Survey (NPSAS). This survey, conducted by the Department of Education, is a nationally representative sample of post-secondary students enrolled in Fall 1986. It provides financial aid, school cost, and family background data on about 43,000 students from institution, student, and parent surveys. The Fall 1986 survey was updated in 1987 to account for changes in financial aid during the academic year. Institutional records are available only for

[15]Today a student without need may be eligible for unsubsidized Federal Stafford or PLUS loans, provided the total amount of aid does not exceed the college's cost of attendance (including tuition and fees, an allowance for living expenses, books and supplies and transportation costs). U.S. Department of Education [1994] p. 12. This was not true in the 1986-87 school year that we study.

students who applied for financial aid and thus filled out appropriate financial aid forms. Since these data are the most reliable, and the student and parental survey data are poor, we restrict our study to applicants.[16]

We further restrict our sample to undergraduate students who are dependent on their parents, who are U.S. citizens or residents eligible for federal aid programs, and who are attending four-year colleges and universities. This leaves us with 10,490 undergraduates, freshman through senior. We exclude students attending two-year colleges, because we think their implicit taxes are apt to be quite different, and we don't want to conflate the implicit taxes of four-year and two-year colleges. We assume that most of the decision of which of these two types of schools to attend rests on a family's value for education, financial situation, the cost of the two types of institutions, and the expected aid awards. For instance, our purposes would be served well if families decided school type before applying for aid and before receiving an idiosyncratic aid realization. If idiosyncratic shocks to aid were a major factor in choosing school type, our sample restriction would probably bias our estimated tax rates upward somewhat.[17]

3.1. Definition of Variables

NPSAS identifies financial aid according to its source (federal, state, institutional, or other) and according to its type (grant, loan, work study, or other). For each student we form two measures of aid. TOTAL AID is the sum of grants, loans, work study and other. This is the measure of aid usually referred to when "total aid" figures are quoted (such as the figure cited earlier that $27 billion of aid will be disbursed by the federal

[16]See U.S. Department of Education [1993] for an analysis of the reliability of data from the various NPSAS modules.

[17] This bias would result if parents with low income or assets tend to attend two-year colleges (see Kane and Rouse(1995, p. 604) for evidence on this tendency), but attend four-year schools when they receive unusually high aid awards. This self selection would make it appear that low income or assets lead to high aid, and we would therefore find a high implicit tax on income and assets, but only because we have thrown out those with low income or assets who receive low aid.

government in the 1994-95 school year). AID VALUE, on the other hand, we define to be grants plus one-half of loans. It is intended to capture the value of aid, and is the measure we use in our regressions in sections 4 and 5 to estimate the implicit taxes.

In practice, of course, the value of loans varies substantially. It depends upon the interest rate, the date interest payment begins, and the term of the loan. Federal loans typically have below-market interest rates and accrue no interest as long as students remain in school. Institutional loans have widely varying characteristics. It is therefore very difficult to determine the extent to which loans should be discounted. Feldstein [1995] values a one dollar loan at sixty cents, while Ehrenberg and Sherman's [1984] study of Cornell suggests a value of fifteen or twenty-five cents.[18] In constructing AID VALUE, we chose to follow McPherson and Schapiro [1991] and Edlin [1993] by valuing a one dollar loan at fifty cents. In Section 6, however, we will disaggregate our regressions and show that the value placed on loans makes little difference for this exercise, because most of the implicit taxes result from the allocation of grants.

Expected Family Contribution (EFC) is the amount that the Student Aid Methodology determines a family can reasonably be expected to pay to send a child to college given the family's assets, income, and demographic characteristics. For each student, the National Center for Education Statistics calculates the EFC using the 1986-87 Family Contribution Formula of the Office of Student Financial Aid, Department of Education. The EFC takes into account both the number of children and the number of children in college (see Edlin, 1993).

Our variable for the cost of attendance at an institution (COST) includes tuition and fees together with an allowance for living expenses as determined by the federal student aid methodology. Living expenses include books and supplies, room and board,

[18] We compute these figures by dividing the Cornell loan coefficients by the Cornell grant coefficients in regressions 1S and 1E of Ehrenberg and Sherman [1984, p. 214].

health care insurance and transportation.[19] When we speak of "need," we mean COST less EFC. As described below, our implicit tax estimates are for students who have need.

We also have data on a family's income and assets. Income was measured as the parent's 1986 adjusted gross income plus untaxed income. Total assets include financial assets, housing equity,[20] business equity, plus equity in other investments. Pensions and retirement accounts are excluded from the federal need determination formulas and from our measure of assets.

Finally, we have variables representing sex, race, age, residency status, marital status, and whether a student applied for aid.

3.2. Relationship Between Means and Aid

A quick look at the NPSAS data suggests that financial aid declines significantly as a family's income or assets increase. For instance, the average TOTAL AID for a family with income between $50,000 and $60,000 is $3,066, with the average AID VALUE coming to $2,245. In contrast, families with incomes between 0 and $10,000 receive an AID VALUE of $4,124. Similarly, families with $50,000 to $60,000 of assets receive aid worth $692 less on average than those with $0 to $10,000 of assets.

One could naively calculate the financial aid taxes on income and assets from these values. The reduction in AID VALUE of $1,879 as income rises by $50,000 suggests an income tax of 3.7%. Since assets are a stock, not a flow, the reduction of $692 corresponding with the asset increase should be multiplied by the number of years a typical family has children in college. Assuming two children go to college sequentially for 8 years the total loss in aid may be $5,536. This suggests an asset levy of 11%, a figure substantially lower than Edlin's [1993, p. 147] figure of 32-43% or Feldstein's

[19]See e.g. U.S. Department of Education [1994], p.10.

[20]In 1986-87, home equity was included in the financial aid formula; thus we include it in our measure of assets.

[1995, p. 555] figure of 52%.[21] (Recall that their calculations are based on federal guidelines under the assumption that financial aid is equivalent to a family's need).

We cannot, however, realistically infer the tax on asset accumulation from the calculation above. On one hand, it tends to overestimate the tax on assets since families with high assets probably also have high income and much of the "tax" is really, therefore, a tax on their income. On the other hand, it may actually understate the financial aid tax because it does not account for heterogeneity in school choice and family characteristics. For instance, aid awards at private colleges are approximately twice as high as those at public colleges.[22] If high-means families tend to go to private colleges we might calculate a low "tax" rate even if, holding school fixed, the budget constraint trading off pre- and post-college consumption corresponds to a high tax rate. Likewise, consider heterogeneity among families. Those with high means who apply for aid will be disproportionately likely to have multiple children in college at once, because this tends to make them needy.[23] Comparing the aid they receive with the aid of a lower means family with fewer children does not yield the tax rate on either family; it biases the measured tax rate downward. We must run multivariate regressions since we seek answers to questions such as: How much would an increase in assets lower aid for a family sending a child to a private college with tuition of $3,000?

4. Expected Family Contribution and Aid

This section explores the empirical relationship between a family's expected family contribution (EFC) and the college financial aid its children receive. We address four questions. Do colleges fully meet need? Do colleges meet 100% of marginal need?

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[21] In order to convert the tax rates t in Table 1 of Edlin [1993] to fit this context, we use the formula t/(1 + t).

[22] McPherson and Schapiro [1991], p. 7.

[23] Recall that EFC includes a division by number of children.

What is the relationship between aid and EFC? Finally, what are the vertical equity implications of the results?

We start with a simple model in which EFC fully captures the impact on aid of assets, income, and other factors. That is, we assume aid is fully determined by EFC and COST, so that colleges do not consider any other information in determining how much aid to provide in addition to federal aid. In Section 5, we check this assumption. In any event, we expect EFC and aid to be strongly related because most colleges want to charge lower prices to families with lower means.[24]

Feldstein [1995] assumes that financial aid is an affine function of need given by

$$\text{AID VALUE} = C + \alpha * \text{need}, \text{ where need} = (\text{COST} - \text{EFC}). \qquad (1)$$

In a system where aid is determined entirely by need and is enough to meet all need, C=0 and α=1. (α actually would be lower if some aid came as loans.) C may be nonzero for several reasons. Merit aid, for instance, might cause C to be positive. Even in the presence of merit aid, however, it is still possible that an extra dollar of need always raises the value of aid by one dollar, so that α equals 1.

The calculations by Feldstein [1995] and Edlin [1993] of financial aid tax rates presuppose that α is nearly 1, as do Edlin's [1992,1993] simulations estimating the potential impact of the taxes on savings. Feldstein's empirical estimates of the impact of the taxes on savings are not, however, so sensitive. His estimates are valid no matter

[24]In part, this discrimination in price may be an effort to capture consumer surplus, but it also results from a genuine concern about vertical equity and "keeping college affordable." Note the prominent usage of this phrase in sources as diverse as campaign literature and academic writing. For example, see Brown [1994] and McPherson and Schapiro [1991].

what value α takes. Nonetheless the aid process must match (1) for his estimation procedure to be sensible.[25]

We estimate a more general specification, of which (1) is a special case. This allows us first of all to test the joint hypotheses that $C = 0$ and $\alpha = 1$, implying that schools meet all need. Second, we can test the hypothesis that $\alpha = 1$, implying that 100 percent of marginal need is met. Third, we can test the hypothesis that α is constant over different values of need. If we were to reject this hypothesis, we would be forced to abandon (1). This would suggest revisiting Feldstein's work that estimates the impact of the implicit taxes on savings.

The third hypothesis has direct consequences for vertical equity. For instance, if families with higher EFC have a smaller fraction of their need met, this might imply that they have lower marginal tax rates on income and assets than do families with lower means. Although the EFC formula is designed to be highly progressive, if the rate at which marginal need is met with aid declines sufficiently with means, the overall implicit tax schedule of the financial aid system can be regressive. This could occur for at least two reasons. The nominal amount of financial aid awarded to relatively high means families may be insensitive to their means. Alternatively, the value of their aid packages might be more insensitive if their aid packages have a larger share of loans to grants.

Because of the importance and likelihood of these possibilities, our empirical specifications must be flexible enough to admit nonlinear relationships between EFC and the value of aid. The specifications we use lead us to reject all three of the hypotheses discussed above. We find that the rate at which higher EFC lowers aid depends on the type of institution attended (public or private), the cost of the institution, and upon EFC itself.

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[25]Feldstein's procedure uses the variation in the tax rates in the federal formulas (which determine EFC) to estimate the impact of these taxes. For this method to be sensible, the true tax rates must be proportional to those in the formulas (e.g., α must be constant and not a function of EFC).

4.1. Empirical Specification

In our general specification, we do not restrict the coefficients on EFC and COST to be equal and opposite in sign, nor do we restrict the relationship between AID and EFC to be linear. We estimate models of the form

$$\text{AID VALUE} = C + \beta_1 EFC + \beta_2 COST + \beta_3 EFC*COST + \beta_4 EFC^2 + \beta_5 COST^2 + \beta_6 EFC^2*COST + \beta_7 EFC*COST^2 + \beta_8 EFC^3 + \beta_9 COST^3 + \varepsilon. \quad (2)$$

Naturally, the disturbance term ε must be uncorrelated with the regressors in order for an OLS estimate to tell us how changes in EFC affect AIDVALUE. The most likely cause of a substantial correlation would be that each student chose from schools on which she placed substantially different net values, and that those with high EFC were relatively unresponsive to differences in aid awards, or in other words, placed larger value differences on schools than did low EFC students. Then, those with high EFC would tend to have lower disturbance terms than those with low EFC who would tend to choose schools offering unusually high aid. This phenomenon would make our tax rate estimates high, so that our estimates would not reflect how an aid offer at a given institution would be expected to rise if a family lowered its EFC. (Observe that the low EFC families had to switch schools to get their high aid awards.) Such a bias would not arise if cost were a good proxy for school quality, and each student chose from some given number of schools with comparable cost. Then, each student would simply take his highest offer, so that disturbances would be uncorrelated with EFC and our tax rates would accurately reflected how aid changes, holding school constant. Any bias would also be slight if students' valuations of colleges

were fairly homogeneous, or if differences were uncorrelated with EFC. Then, the aid responsiveness of high and low EFC students would be similar, and the disturbances would again be uncorrelated with EFC. Note that valuation differences will probably be similar if they are driven by an institution's value-added in terms of increased wages.

The second and third order terms of expression (2) allow AID to vary nonlinearly with EFC and COST. The interaction terms allow the relationship between EFC and AID to vary at different levels of COST. If the coefficients on the second and third-order terms and on the interaction terms are restricted to zero, and if the coefficients on the first-order terms are restricted to be equal and opposite in sign, (2) becomes (1). Thus, (2) allows us to test the assumptions made by Edlin [1993] and Feldstein [1995].

Because some students in our sample do not receive any financial aid, we also estimate a tobit model of the form

$$\text{AID VALUE}^* = C + \beta_1 \text{EFC} + \beta_2 \text{COST} + \beta_3 \text{EFC*COST} + \beta_4 \text{EFC}^2 + \beta_5 \text{COST}^2 + \beta_6 \text{EFC}^2\text{*COST} + \beta_7 \text{EFC*COST}^2 + \beta_8 \text{EFC}^3 + \beta_9 \text{COST}^3 + \varepsilon. \quad (3)$$

$$\text{AID VALUE} = \text{AID VALUE}^* \text{ if AID VALUE}^* > 0 \text{ and}$$

$$\text{AID VALUE} = 0 \text{ otherwise.}$$

We assume ε is a normal i.i.d. random variable. We restrict the sample to aid applicants who are full-year and full-time students and who have positive need, i.e. applicants for whom EFC < COST. This leaves us with a sample containing 6,537 students. We also allow the relationships to differ for public and private institutions by estimating (2) and (3) separately for each. Table 1 contains summary statistics for this sample.

4.2. Results

Table 2 contains parameter estimates of (2) and (3). Columns 1 and 2 are for private institutions while 3 and 4 are for public institutions. We test down to eliminate

regressors that are not significantly different from zero at the 5% level. For purposes of comparing the results in this section with those in Section 5, however, we retain regressors that are significant in either set of regressions. This eliminates the EFC^3 term from the private school regressions and $COST^3$, EFC^2*COST, and EFC*$COST^2$ from the public school regressions. The rest of the regressors, however, give significant predictive power.

We strongly reject the model given by (1) for both public and private institutions.[26] We also reject the hypothesis that the relationships are the same for public and private institutions. Thus, the effect of an increase in EFC on the value of aid depends upon whether a student attends a public or private school, the cost of attending the school, and the level of EFC.

The fact that the coefficients on EFC^2 are large and positive at both public and private institutions implies that higher means families have a lower "marginal EFC tax."[27] If we compute the negative of the derivative of AID VALUE with respect to EFC for students attending colleges of average cost, we find that the marginal EFC tax rate decreases rapidly as EFC rises.[28] It decreases from 70% at EFC of $1,000 to under 10% at EFC of $5,000 for public institutions and from 60% at EFC of $3,000 to 4% at EFC of $10,000 for private institutions. This decreasing marginal tax rate unwinds the progressivity that was purposefully built into the federal EFC formulas. Federal formulas construct a measure of what a family will be able to pay for college imagining that families with higher means can spend a larger fraction of each extra dollar on college. However, this progressive goal is confounded by the actual allocation of aid: in response

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[26]For public schools, the likelihood ratio statistics are 150.8 and 148.0 for the OLS and tobit models, respectively. For private schools, the likelihood ratio statistics are 154.0 and 153.0 for the OLS and tobit models, respectively. Each of these statistics is distributed chi-squared with 5 degrees of freedom. Therefore, we easily reject the restrictions implied by the model in (1).

[27] The EFC^2 term dominates the EFC^3 term in the public school specification, and it dominates the EFC^2*COST term in the private school specification.

[28]The average cost at public schools in our sample is $5,070. For private schools it is $10,783.

to a one dollar increase in EFC, the value of aid awards falls by more for families with little financial means than for those with substantial means. Thus, while conventional notions of vertical equity were built into the formulas determining financial need, the aid award process tends to be regressive.

These findings must be taken into account to properly estimate the impact of aid taxes. For instance, Edlin [1992, 1993] assumed in his simulations that TOTAL AID fell by one dollar as EFC rose by one dollar, and that AID VALUE fell by 83 cents. Our results indicate that the tax rates are significantly lower, and so Edlin's simulations substantially overestimated the savings impact of these taxes. Now consider Feldstein [1995]. He estimated the impact of aid taxes on asset holdings by comparing the holdings of families facing different marginal tax rates. Families who he identified as having lower marginal tax rates tended to have higher asset holdings, so he concludes that aid taxes reduce asset holdings. He calculated tax rates using the federal need determination formula, however, so he assumed that for families with positive financial need, higher means implies higher marginal tax rates. Yet if higher means families in fact face lower marginal tax rates, as we estimate, then this could significantly change the results of his regressions. It would seem to imply that higher aid taxes actually increase asset holdings. However, there is a complication. Families with very high means in Feldstein's study have no financial need; these families pay full tuition and so have no marginal taxes. If his results stemmed from the different savings patterns between low means families and very high means families, then changing the marginal tax rates in his regressions could actually accentuate his results.

5. Taxes Outside Federal Formulas

The previous section maintained the hypothesis that EFC contains all the information about a student and her family that is relevant for predicting the aid she receives. Thus, the specifications in Section 4 controlled only for EFC, COST, and

whether the college or university was public or private. Such an assumption need not hold, of course. Colleges know the financial standing of the student's family and can create their own aid formulas.

Therefore in this section we include parental income and parental assets separately (apart from their implicit inclusion in EFC). We estimate a specification of the form

$$\text{AID VALUE} = C + \beta_1 EFC + \beta_2 COST + \beta_3 EFC*COST + \beta_4 EFC^2 + \beta_5 COST^2 + \beta_6 EFC^2*COST + \beta_7 EFC*COST^2 + \beta_8 EFC^3 + \beta_9 COST^3 + \gamma X + \varepsilon, \quad (2')$$

where γ is a vector of coefficients and X is a matrix of covariates that includes parental assets, parental income, a student's race, residence, ethnicity and sex. Because parental asset information contains missing values, our samples are restricted to 3,180 observations and 1,668 observations for private and public schools, respectively. Table 1 contains summary statistics for the sample.[29]

As above, to account for those students who received no aid, we estimate tobit specifications of the form

$$\text{AID VALUE}^* = C + \beta_1 EFC + \beta_2 COST + \beta_3 EFC*COST + \beta_4 EFC^2 + \beta_5 COST^2 + \beta_6 EFC^2*COST + \beta_7 EFC*COST^2 + \beta_8 EFC^3 + \beta_9 COST^3 + \gamma X + \varepsilon \quad (3')$$

$$\text{AID VALUE} = \text{AID VALUE}^* \text{ if AID VALUE}^* > 0 \text{ and}$$

$$\text{AID VALUE} = 0 \text{ otherwise.}$$

Again, to allow for different relationships in public and private institutions, we estimate (2') and (3') separately for public and private institutions. This raises selection issues identical to those we discussed in Section 3, when we considered the choice of whether to attend a 4-year or 2-year school. For reasons parallel to those we gave there, we do not expect self-selection to bias our tax estimates much, and to the extent that it does, we

[29]We estimated the specifications from Section 4 with this sample and compared the results to those from Section 4. The results were similar, suggesting that the missing data does not cause a large selection effect.

expect tax rates at private schools to look somewhat high and those at public schools somewhat low.[30]

5.1. Results

Table 3 presents parameter estimates for (2') and (3'). The first two columns contain the results for private institutions and the last two, the results for public institutions. As in Section 4, we test down to eliminate regressors that are not significantly different from zero at the 5% level, although, for the sake of comparison, we retain regressors that were significantly different from zero in Section 4. The OLS and tobit results are quite similar. As in Table 2, the EFC terms are important predictors of aid; however, the coefficients on many asset categories and income are also significantly different from zero. Likelihood ratio tests strongly rejecting the models in the previous section.[31] Most of the improved fit is due to the financial variables, so we are confident that these variables enter the aid determination process apart from their entry in the federal formula's ability-to-pay measure, EFC.

In the present formulation, an increase in a family's assets may affect aid in two ways: through a particular asset's direct entry into the regression equation, and through its effect upon EFC. The same is true of income. Figure 1 shows the rate at which increases in money asset holdings reduce the value of aid for typical families in our samples. We

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[30]Naturally, students with unusually high aid awards from a private school tend to attend private colleges, and those with unusually high awards from a public college attend public colleges. This effect does not bias our tax rate estimates, just our intercept. However, the biases will be as we suggest above if most poor students attend public colleges, except for the few with unusually high awards at private colleges, and if most middle class students attend private colleges, except for the few with unusually high awards from public colleges. Then the aid awards for poor students at public colleges and for middle class students at private colleges will be fairly representative, while awards will be unusually high for middle class students at public colleges and poor students at private colleges. Such differential selection would bias tax rates up at private colleges and down at public colleges.

[31]We calculate the likelihood ratio statistics using the models of Section 4 (re-estimated with the sample from Section 5) as the restricted models and the models of Section 5 the unrestricted models. For the OLS and tobit specifications at public schools, the likelihood ratio statistic equals 160.4 and 156.0, respectively. The likelihood ratio statistics for private schools, calculated in an analogous manner to those for public schools, are 136.0 and 145.6 for the OLS and tobit models, respectively.

calculate the change in aid if the family decides to take an extra dollar in savings through eight years of the college financial aid process, while sending two children to school in sequence. The rates depicted for public (respectively, private) institutions assume income and holdings of other assets equal to the averages for families sending children to public (respectively, private) institutions.[32] The saw-tooth pattern in the marginal tax rates results from the tension between the progressivity in the federal formula that determines EFC and the regressivity from the way marginal need is met with aid.[33] Estimates of the coefficients on the EFC terms indicate that families with higher means (but who are still eligible for need-based aid) tend to face lower marginal tax rates. Algebraically, this effect stems from the positive coefficient on EFC^2. In terms of financial aid policy, it probably stems from federal aid programs meeting a larger share of need when need is large, or equivalently offering a larger share of grants in any given aid package. This produces the tendencies at both public and private institutions for the marginal tax rates to fall as assets increase and ultimately for average rates to fall as well. The upward spikes result from switching "tax" brackets in the federal need determination formulas. By design, these switches tend to make the tax system progressive.

The standard errors associated with the predicted marginal tax rates are small and relatively constant over the range of assets depicted in Figure 1. For public colleges (respectively private) a 90% confidence interval for the marginal tax rate is given by the depicted level plus or minus approximately 6.5% (5.5%).

At public institutions, the regressive tendencies take effect fairly early. The marginal tax rate reaches a peak of almost 26% at assets of $9,300, and declines steadily

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[32] We also hold costs at mean values. At public schools, the mean earned income is $21,150; the mean levels of home equity, other assets, and business assets are $22,841, $3,059, and $4,246, respectively; and the mean level of cost is $5,043. At private schools, the mean earned income in our sample is $30,752; mean levels of home equity, other assets, and business assets are $35,152, $7,326, and $4,211, respectively; and the mean level of cost is $10,783.

[33] The derivative of AID VALUE with respect to EFC is similar for the specification here as for the specification in Section 4.

thereafter causing the average rate to peak at 22% at assets of $23,600. At $80,000 of assets, the average and marginal rates fall to 19% and 10% respectively.

At private institutions, in contrast, the progressive tendencies dominate for longer. Marginal tax rates generally rise until parents hold approximately $31,000 in cash assets, when the top marginal asset tax is reached (roughly 26%). After this asset level, the marginal tax rate begins to fall steadily, eventually causing the asset tax to become regressive at $40,000 when the average tax rate begins to fall. As with the public institutions, the pattern is created by the estimated coefficients on the EFC terms, and thus holds for each of the assets and for income. At $100,000 in cash assets, the marginal asset levy is only about 7%.

The "additional tax" resulting from the coefficient estimates on the asset or income terms simply shifts the marginal tax level up or down depending upon the magnitude of the particular assets coefficient. If an asset does not bear explicit interest, the tax through the EFC terms will also decrease somewhat (in the figure, approximately one quarter of the tax from the EFC terms comes from an assumed 5% rate of interest).

These taxes can lead to substantial variation in the prices families pay for college. Consider, for instance, two families as depicted in Figure 1, who differ only in the amount of cash assets they have accumulated. If both families send children to average-priced private schools costing $10,000, but one accumulates no cash assets, while the other accumulates $50,000 in cash assets, they will receive aid worth approximately $5,400 and $3,900, respectively. Over four years this $1,500 difference in aid would amount to $6,000, and over eight years it would total $12,000. For families who send their children to average-priced public schools costing $5,000, the difference is similar. Again, for two typical families who send children to public schools, one who accumulates zero assets and one who accumulates $50,000 in cash assets, the difference in the value of aid they receive would be $5,300 over four years and $10,600 over eight years. These tax rates are substantially larger than the unconditional tax rates calculated in Section 3.2.

The implicit tax rates are higher at more expensive institutions (both public and private), due in large part to the negative coefficients on EFC*COST. Consequently, by accumulating $50,000 in assets, a family that sends children to an expensive private institution costing $15,000 loses aid worth approximately $15,000. This lost aid is $3,000 more than it was at the average-priced institution considered above.

Figure 2 contains plots of the estimated marginal and average tax rates on income for families with characteristics identical to those in Figure 1.[34] The characteristics of the income tax are similar to those of the asset tax. For the families depicted in the figure, the federal need determination formulas disregard income below about $12,000. This explains why the marginal tax rate is flat at 2% (the value of the coefficient on income), when income is low. At public schools, as these families' income exceeds $12,000, the marginal tax rate jumps to over 16% and then gradually falls to less than 2% as income approaches $40,000. Average tax rates increase progressively until income reaches $27,000, when they begin to fall from their peak value of 7%. The unconditional income tax levy, which in Section 3.2 we estimated to be 3.7%, is at the low end of the marginal tax rates in our estimated schedule for public institutions.

For private institutions, the progressive component, represented by the upward spikes in the saw-tooth pattern, keeps the marginal income tax rate between 9% and 12% until family income reaches $40,000. At that point, however, family income has reached the highest tax bracket as defined by the federal need determination formulas. Beyond $40,000, the regressive component of the tax, which results from the use of EFC in practice, dominates. The marginal tax rate falls from about 10% at $40,000 of income to about 1% at $60,000 of income. At incomes exceeding $43,500, marginal rates become so low that average rates begin to fall, and the aid system becomes regressive.

[34]In addition to those characteristics held constant in Figure 1, we set cash assets at mean levels in Figure 2. The mean values of cash assets were $4,476 and $2,536 for private and public schools, respectively.

The coefficients on the cost terms also merit comment. The derivative of aid with respect to cost gives the marginal subsidy for educational expenditures. Suppose a family chooses to buy $1,000 in extra education (i.e., to attend a more expensive college). The net price increases by less than the full $1,000, because the financial aid system provides a subsidy for marginal educational expenditures. For average priced private colleges (priced at $10,000), the marginal subsidy for expenditures is about 45%. For average priced public colleges (priced at $5,000), the marginal subsidy for expenditures is about 15%. If sticker prices reflect quality, then these subsidy rates could be converted into a marginal price of quality.

Combined, the coefficients on the interaction terms (EFC*COST, EFC^2*COST, and EFC*$COST^2$) result in marginal subsidies that are higher for families with low means. At average-priced public colleges, families with EFC of $5,000 will have a subsidy that is 8 cents on the dollar less than a family with an EFC of $0. At average-priced private colleges the difference is 18 cents on the dollar. This feature meets a fundamental goal of financial aid, which is to provide particular encouragement for the poor to consume extra education.

6. The Composition of Aid

This section explores the differences in the financial aid taxes implicit in institution-awarded aid from those implicit in federal aid awards. Knowledge about how these sources affect the total financial aid tax is important for two reasons. First, it may help us to assess the impact of the rules governing the allocation of federal moneys and modify them accordingly. Second, we can assess the role of institutionally provided aid, and determine whether it is confounding the goals of federal aid policies. Therefore, in this section, we investigate the characteristics of the financial aid taxes by the source of aid. We also explore the breakdown of the implicit taxes into taxes from loans and from grants.

To begin, we estimate (2') twice, first redefining the dependent variable to be the value of federal aid (Fed_Aid), and then redefining the dependent variable to be the value of institutional aid (Inst_Aid). These sources of aid are not exhaustive, and, as a result, the estimated equations do not sum to the results found in Table 3. They do, however, comprise the vast majority of aid, so summing the estimated equations does closely approximate the previous results. We then repeat the exercise by estimating (2') two more times, first redefining the dependent variable to be all grants (Grants), and then to be all loans (Loans).

Figure 3 shows the marginal asset tax rates by source, for a typical student at public schools and for a typical student at private schools.[35] The difference in the character of the marginal tax rates by source is stark. At public schools, the marginal asset tax rates from federal aid tend to be higher than those from institutional aid. This is especially true for families with low levels of cash assets, for whom the marginal federal aid tax peaks at about 23%, while the marginal institutional aid tax increases from about 0% per year to about 4% as cash assets increase from $0 to $80,000. In addition, the marginal asset tax rates resulting from federal aid fall considerably as means increase, whereas the taxes from institutional aid rise. In net, however, the falling rates from federal aid outweigh the rising rates from institutional aid, so that the overall tax rates fall.

The results are somewhat similar for private schools, though the magnitude of the taxes generated by federal aid and institutional aid are more equal. Marginal federal aid taxes peak for low levels of cash assets at over 16% per year and rapidly decline for high levels of assets, while marginal institutional aid taxes are less than 2% per year for low levels of cash assets and climb rapidly as assets increase. The upward spikes in federal aid, which are due to the progressivity built into the EFC formulas, when combined with

[35] As in figures 1 and 2, we set family characteristics and school cost at their means.

the progressive tax rates from the institutional aid, produce a total financial aid tax schedule that tends to be progressive over the first $40,000 in cash assets, and then becomes regressive because of the dramatic decline in the marginal rates due to federal aid.

When we decompose the marginal tax rates into those produced by the allocation of all grants and by the allocation of all loans, for typical families in our samples,[36] we find that it is the allocation of grants that produces most of the total financial aid tax. In part because many students borrow the maximum amount on federal loans, the marginal tax rates resulting from the allocation of loans are both small and relatively constant over wide ranges of assets holdings for typical families. Consequently, the marginal asset tax rates from grants look essentially identical to those from all aid, but shifted down by about 2% for public institutions and 4% for private institutions. The strong downward slope in the marginal tax schedule for public schools is completely due to the allocation of grants. The story is similar for private schools, although not as stark.

Since loans produce only a relatively small part of the total financial aid tax rate, our decision to value a one dollar loan at only fifty cents does not greatly affect the results of sections 4 and 5. Excluding them from AID VALUE or including them at full face value would produce similar results.

7. Implications

Previous calculations of the implicit taxes in college financial aid relied upon the assumption that aid equals financial need as determined by the federal need determination formula, or at least that decreases in need cause equal decreases in financial aid. We test and strongly reject both hypotheses.

[36] As in figures 1 and 2, we set family characteristics and school cost at their means.

The actual financial aid taxes are smaller than those suggested by the federal need determination formulas. Nevertheless, they are large. For typical families, the marginal income tax ranges from 2% to 16% and the marginal asset levy ranges from about 8% to 26%. For those attending expensive private institutions, the asset levy can climb to 33%. These rates depend on the type of school a student attends, the cost of the school, and the family's financial means. In the school year we study, most of the financial aid tax is driven by the allocation of grants rather than loans.

The magnitude of these taxes raises concerns about both the horizontal equity and efficiency of the financial aid system. Horizontal inequalities arise if two families with similar characteristics and identical streams of income wind up paying different amounts for college education. The financial aid system creates exactly this situation if one of the above families saves for college expenses while the other consumes. In Section 5, we estimate that the price differences at average-priced institutions are typically $11,000, and can reach $15,000 at expensive private institutions.[37]

Such large disparities have the potential to distort savings decisions, though the extent to which families actually recognize these incentives and adjust their behavior remains unclear. Edlin's [1992, 1993] simulations significantly overstate this potential because he assumes all need is met, and that tax rates are higher than we find here. On the other hand, it remains unclear what our findings imply about Feldstein's [1995] results, although as we discuss in Section 4, our findings do bring his methodology into question. Future research should estimate the impact of aid taxes using the actual taxes faced by families, such as we have estimated here.

The extent to which financial aid taxes discourage savings has important policy implications. For instance, consider a policy that offers a tax deduction for education costs beyond high school.[38] In effect, this policy would reduce the current financial aid

[37] These figures correspond to a $50,000 difference in asset accumulation.

[38] Such a policy was proposed by President Clinton in his State of the Union Addresses in 1995 and 1996.

tax by a fraction equal to the marginal federal income tax rate that the family faces. That is, if a family faces a 3% financial aid tax on assets for each of the eight years that it sends two children to college, then an additional dollar of savings would cause the college price to rise by nearly a quarter. Because the family's additional contribution would be tax deductible under this policy, the federal government would pay a fraction of this additional burden equal to the family's federal marginal income tax rate. Thus, making education costs tax deductible would reduce the financial aid taxes, and would be an attractive policy alternative if the savings disincentives of financial aid taxes are large. On the other hand, it must be recognized that the bulk of the marginal subsidy for educational expenditure will go to those who pay most or all of their college bill, and not those who receive a great deal of aid.

Finally, our findings raise concerns about the vertical equity of the financial aid system. The federal need determination formula, which determines a family's expected contribution, was constructed to be progressive by increasing the contribution rates for higher means families. The progressivity of this formula, however, is undone by the way financial aid is distributed, and in particular by the way federal aid is distributed. (The progressivity of the discretionary aid awarded by schools mitigates this somewhat).

In the end, the regressivity of the financial aid system is similar to that of other means-based income support programs, such as Aid to Families with Dependent Children. Because these subsidies are sharply reduced as families earn additional income, it is common in the United States that those with the greatest need face the highest marginal tax rates. Although it is difficult to imagine modifying the federal aid policy to eliminate all such features while continuing to give need-based financial aid, it may be possible to limit the horizontal inequities and minimize the savings disincentives. Ideally, need-based financial aid would be based only on permanent income, eliminating distortions. Although permanent income is not known, such an ideal could be approached if we required families to provide their full wage histories, which could then

be verified using social security data.[39] Then, aid could be based exclusively on these wage histories.[40] This proposal would eliminate the penalty for saving. Such a system would effectively tax wage income over a long period, minimizing the distortions in labor supply by broadening the base of the tax and lowering tax rates.

[39]Although wage income data collected by the Social Security Administration is capped, they do retain the time of the year during which the cap was exceeded.

[40] One possibility would be to use present formulas, but to insert imputed assets instead of actual assets. Assets could be imputed from past wages taking into account any variables, such as inheritances or number of children, that seem sensible for reasons of equity.

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REFERENCES

Brimelow, P., 1994, "Taxation Without Representation," *Forbes*, January 17, 74-75.

Brown, Kathleen, 1994, "Building a New California: The Kathleen Brown Economic Plan 1994," (Campaign literature in California's 1994 gubernatorial campaign).

Case, Karl E. and Michael S. McPherson, 1986, "Student Aid Incentives and Parental Effort: The Impact of Need-Based Aid on Savings and Labor Supply," technical report prepared for the Washington Office of the College Board.

Clements, Jonathan, 1994, "Saving for Your Children's College Costs? Here's a Primer," *Wall Street Journal*, November 11, p. C1.

Dennis, Marguerite J., 1990*, Keys to Financing a College Education.* New York: Barron's.

Edlin, Aaron S., 1992, "Financing Higher Education: Inequitable and Inefficient? The Worst of All Possible Worlds," CEPR working paper, Stanford University.

Edlin, Aaron S., 1993, "Is College Financial Aid Equitable and Efficient?" *Journal of Economic Perspectives*, Spring 7:2, 143-158.

Ehrenberg, Ronald G. and Daniel R. Sherman, 1994, "Optimal Financial Aid Policies for a Selective University," *Journal of Human Resources*, Spring 19:2, 202-230.

Feldstein, Martin, 1995, "College Scholarship Rules and Private Saving," *American Economic Review*, June 85:3, 552-566.

Feldstein, Martin, 1994, "Why Capital Gains Taxes are Unfair," editorial page, *Wall Street Journal*, November 21.

Hoynes, Hilary Williamson, 1997 (forthcoming), "Work and Marriage Incentives in Welfare Programs: What Have We Learned?" in Alan Auerbach, ed., *Fiscal Policy: Lessons from Economic Research*, Cambridge: MIT Press.

Kane, Thomas J. and Cecilia Elena Rouse, 1995, "Labor-Market Returns to Two- and Four-Year College" *American Economic Review*, June 85:3, 600-614.

Kim, Taejong, 1995, "Implicit Taxes in College Financial Aid and Family Saving," Unpublished Manuscript, Massachusetts Institute of Technology, October.

McPherson, Michael S. and Morton Owen Schapiro, 1994, "Merit Aid: Students, Institutions, and Society," CPRE Research Report Series Report #30, August.

McPherson, Michael S., and Morton Owen Schapiro, 1991, *Keeping College Affordable: Government and Educational Opportunity*. Washington, D.C.: The Brookings Institution.

Peterson's 1991 College Money Handbook. 1991, Princeton: Peterson.

Richman, Louis S., 1993, "How Americans Can Save More," *Fortune*, Fall, 94-118.

Stoffel, Jennifer, 1991, "College Economics 101," *Fidelity Focus: The Magazine for Fidelity Investors*, Summer, 4-9.

Venti, Steven F., 1983, "The Allocation of Discretionary Grant Aid," in Manski, Charles F. and David A. Wise, *College Choice in America*. Cambridge: Harvard University Press.

U.S. Department of Education, National Center for Education Statistics, 1993, "Quality of Responses in the 1987 National Postsecondary Student Aid Study," NCES 93-446.

U.S. Department of Education, Office of Student Financial Assistance, 1990, "The Congressional Methodology, 1990-91."

U.S. Department of Education, "Federal Pell Grant Program Schedule for Determining Full-Time Scheduled Awards for the 1994-95 Award Period."

U.S. Department of Education, Student Financial Assistance Programs, 1994, *Counselor's Handbook for Postsecondary Schools 1994-95.*

U.S. News & World Report, 1994, "How to Pay for College," October 3, 70-73.