Economics of College Tuition and Financial Aid

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This paper investigates the economics of college tuition and financial aid[1]. In the United States, colleges set their tuition rates before each academic year. Most students, however, do not pay the full tuition rate, with 62.2% of full-time undergraduates receiving some type of financial aid in 2007-2008 (*Fast Facts*, 2009). Colleges price discriminate, attempting to figure out how much each particular student would be willing to pay, and charging that rate. College financial aid offices meet the difference between the full tuition rate and what the student is deemed able to pay with institutional loans, government-subsidized loans, and grants. This type of aid is based on financial need. Colleges also sometimes offer aid based on merit to provide an incentive for talented students to attend the institution. Table 1 details some national financial aid statistics.

When high school students apply to colleges, they fill out a government form called the Free Application for Federal Student Age (FAFSA). After the Department of Education processes the form, students receive a Student Aid Report (SAR). The SAR includes a number called the Expected Family Contribution (EFC). "The Expected Family Contribution (EFC) is a measure of your family's financial strength and is calculated according to a formula established by law. Your family's taxed and untaxed income, assets, and benefits (such as unemployment or Social Security) are all considered in the formula. Also considered are your family size and the number of family members who will attend college or career school during the year" (*Expected Family Contribution (EFC)*, 2009). The EFC is the most important factor college financial aid offices use to determine how much financial aid a student receives.

The goal of providing financial aid to students is to ensure that lower-income students have an opportunity to attend college. In addition to this goal, colleges use price discrimination as a way to increase their revenue. This paper will explore the economic theory behind price discrimination and how the behavior of the college fits that of a profit-maximizing firm.

Different cohorts of colleges have different ways of structuring their financial aid sys-

[1]In this paper, the term financial aid refers to need-based financial aid as opposed to merit-based aid.

Student Characteristic	Any aid	Any grants	Any student loans	Work study	Veterans benefits	Parent PLUS loans	Any financial aid	Federal		
								Any grants	Any loans	Work study
All undergraduates	65.6	51.7	38.5	7.4	2.1	3.8	47.0	27.6	34.7	5.6
Full-time and full-year	79.5	64.4	52.9	13.5	2.0	7.2	62.2	33.0	49.1	10.3
Dependent	77.1	62.1	49.4	15.3	0.7	9.6	57.5	25.1	45.5	11.6
Independent	86.9	71.7	63.8	7.6	6.1		76.9	57.9	60.3	6.1
Part-time or part-year	56.6	43.5	29.2	3.5	2.2	1.5	37.1	24.0	25.3	2.7
Average Amount of Financial Aid										
All undergraduates		$9,100	$4,900	$7,100	$2,400	$5,400	$10,800	$6,600	$2,800	$5,100	$2,300
Full-time/full-year		12,700	7,100	8,000	2,300	6,600	11,400	7,900	3,700	5,400	2,200
Dependent	13,100	7,800	7.600	2,200	4,700	11,400	7,700	3,700	4,800	2,100	
Independent	11,700	5,200	8,900	2,500	7,300	†	8,400	3,600	7,000	2,400	
Part-time or part-year		5,800	2,700	6,100	2,700	4,600	8,700	5,100	2,100	4,700	2,800

Table 1: Percentage of undergraduates receiving financial aid and the average amount received, by type and source of aid and selected student characteristics: 2007–08; source: http://nces.ed.gov/FastFacts/display.asp?id=31

tems. Ivy League institutions, for example, offer no merit aid, only financial aid. Many public schools, on the other hand, offer little financial aid since their tuition prices are generally lower because they receive money from their state government. This paper will analyze what a student could expect to pay as a percentage of total income at different income levels and the effects of the financial aid system on the labor market and retirement saving. It will discuss the government's role in helping students finance an education. Merit aid is another component of aid given to students based the strength of their application to a particular school, without regard to income. Finally, this paper will investigate whether merit aid is an efficient use of a college's financial aid budget. The efficacy of merit aid depends on the elasticity of demand for a college's services.

Under the current system, higher-income students subsidize the financial aid for lower-income students by paying the full tuition rate. If a college eliminated financial aid, its administrative costs would fall, but it would struggle to attract lower-income students. This paper explores what the outcomes of such a policy could be. Perhaps the elimination of financial aid would transform the college into a luxury brand and would make students willing to pay even more to attend.

The body of the paper is organized as follows. Section 1 describes how colleges calculate how much a student is able to pay for tuition. Section 2 develops a model for the financial aid formula. Section 3 discusses some alternative financial aid systems. Section 4 analyzes the effectiveness of merit-based aid. Section 5 concludes.

1. How do colleges decide how much financial aid a student should receive?

Students who wish to apply for financial aid fill out a form called the Free Application for Federal Student Aid (FAFSA). The information they provide on the form is plugged into a government-mandated formula. The methodology is found in Part F of Title IV of the Higher Education Act of 1965 (*The EFC Formula, 2009-2010*, 2009). The result of this formula is the Expected Family Contribution (EFC).

The EFC formula takes into account a variety of factors. The most important factor is the parents' total income. Allowances for United States income tax, Social Security tax, and income protection are made based upon income and the number of parents are subtracted from the parents' total income. In addition, an expense allowance of 35% for the parent who earns the lesser income is made only if both parents work. Subtract the allowances from the total income to calculate available income and add 12% of the parents' assets (not including the family home) to calculate adjusted available income (AAI). Look up the parents' AAI value on a table to ascertain the parents' contribution. For example, if the parents' AAI is more than $28,601, the parents' EFC is $7,732 plus 47% of the AAI over $28,601.

A similar calculation is used to calculate the student's contribution. Begin with the student's income and subtract the allowances against student income (basically taxes). This calculation yields the student's available income (AI). Take 50% of the student's AI to calculate the student's contribution from AI. Add 20% of the student's assets to get the student's contribution. Add the student's contribution to the parents' contribution to calculate the expected family contribution.

How do colleges act as profit-maximizing firms?

Colleges, like businesses, try to maximize their profits. "A business firm chooses the price that maximizes its net revenues, irrespective of fluctuations in income; and increasingly the outlook of universities in the United States is indistinguishable from that of business firms" (Posner, 2002). Paradoxically, financial aid is one tool colleges use to increase profits.

Financial aid is the vehicle through which colleges are able to use price discrimination. Price discrimination, selling the same good or service at different prices, is common. Sports teams, for example, use price discrimination in their ticket promotions. The National Hockey League's Detroit Red Wings have a promotion called Student Rush. This promotion allows students to purchase tickets on game days for $15. These students sit in the same section as other fans who pay about four times more for the same type of seat. Selling discounted tickets is not meant as a service to the community; the Red Wings are able to earn $15 for

tickets that they otherwise would not have sold. Each ticket has a marginal cost near zero because all the players and staff must be paid for the game regardless of how many tickets are sold. Therefore, as game time approaches, there is an incentive for a team to sell tickets at a lower price, rather than receiving nothing at all. Price discrimination works somewhat differently for college tuition.

Before delving into the details of how colleges price discriminate, it is important to understand why colleges are able to price discriminate and the economic goals of price discrimination. For a firm to be able to price discriminate, it must meet two conditions: "Identify and separate different buyer types" and "sell a product that cannot be resold" (Parkin, 2005). Colleges meet the first condition by separating buyers by income. Colleges meet the second condition because students cannot resell a college education or the experiences they have had at school.

The goal of price discrimination is to convert consumer surplus into economic profit. When a firm sells a product at a single price, some consumers are willing to pay more than that price. The difference between what the consumer is willing to pay and the price is called consumer surplus. If a firm charges each customer exactly what he is willing to pay, consumer surplus would be zero. This situation is called perfect price discrimination. In general, it is unrealistic for a firm to achieve perfect price discrimination because firms do not have enough information about the demand curve for each particular consumer (Parkin, 2005). Firms may conduct market research to learn some aggregate information about consumers, but it is not enough for perfect price discrimination. Colleges, however, do have information about every applicant's family income, which has a large effect on the student's willingness to pay.

There are two ways for firms to price discriminate: "among units of a good" or "among groups of buyers" (Parkin, 2005). Colleges discriminate among groups of buyers. Financial aid offices use the information about an applicant's financial position from the FAFSA form to determine what a student should pay to attend the school. As a result of this process, colleges can charge high-income students the full tuition rate and use some of the proceeds

to subsidize the financial aid for lower-income students. Colleges do not discriminate among units of a good. Every student is provided access to the same classes, regardless of whether the student receives financial aid.

Economist Thomas Sowell criticizes the system of price discrimination. Sowell writes, "The media may be gullible enough to believe that college financial aid is about 'needy students,' but the brutal reality is that it is about price discrimination, to extract all that the traffic will bear, both from students' families and from the government" (Sowell, 1991). Sowell also asserts that commercial businesses would be prosecuted under the Robinson-Patman Act if they engaged in the same price-discrimination colleges do. The Robinson-Patman Act, passed in 1936, prohibits price discrimination. United States Code Title 15, Chapter 1, § 13, Part A states, "It shall be unlawful for any person engaged in commerce, in the course of such commerce, either directly or indirectly, to discriminate in price between different purchasers of commodities of like grade and quality…" (*US CODE: Title 15,13. Discrimination in price, services, or facilities*). Even though some critics denounce the current system of price discrimination as illegal, no movement exists to scrap this aspect of the current financial aid system.

McPherson & Schapiro (1998) describe that schools devise their financial aid strategies with the goals of "admitting the best students and gaining as much revenue from them as possible." McPherson and Schapiro call this strategic maximization. Price discrimination is at the center of this strategy because it allows schools to extract extra revenue from some students and using a portion of this extra revenue to discount the tuition for other students.

Economists have studied the price discrimination of colleges. Price discrimination is linked to the demand curve. Economist James L. Doti uses a quantitative approach to explain price discrimination. The college in Doti's example has a tuition price of $20,000. At this tuition level, however, only 100 students are willing to come to the school, so the school's tuition revenue would be $2 million ($20,000/student * 100 students). If the school decided it wanted to enroll 500 students, it would have tuition revenue of $4 million ($8,000/student * 500 students). Figure 1 captures graphically the revenue for a school that charges a single

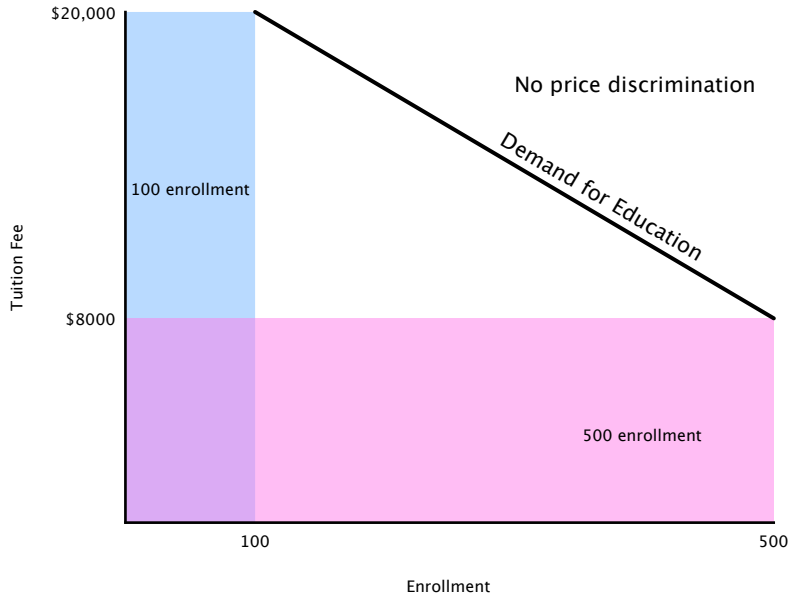

Figure 1. Tuition revenue when a college charges all students a single price

tuition price. Suppose the college uses price discrimination and charges each student the exact amount she is willing to pay. The college's new revenue is \$7.6 million ($\int_0^{767}(-30x + 23000)dx$). Thus, as shown in Figure 2, it is obvious that price discrimination allows colleges to increase their revenue (Doti, 2004).

Price discrimination, an important ingredient in the current financial aid system, helps schools maximize their revenue, while also allowing low-income students to attend high-tuition colleges.

How well does the present aid system work?

The primary goal of the present financial aid system is to provide opportunities for lower-income students to attend high-tuition colleges. The means the colleges use to increase their accessibility to lower-income students, however, have some consequences for the colleges themselves and for middle-class families.

The structure of the financial aid system has financial consequences for the colleges themselves. Over the past twenty-five years, the average college tuition and fee rate has increased 440 percent. This increase is almost twice the rate medical costs have increased

Figure 2. Tuition revenue when a college uses price discrimination

and four times the rate of inflation (Cronin & Horton, 2009). The current financial aid system has allowed colleges to raise tuition every year. Since what students pay is based upon their EFC and not the average cost of providing an education at a particular school, a tuition increase only affects those students whose EFC is above the old tuition rate. Students whose EFC is below the old tuition rate will continue paying the same amount as before. As a result, the revenue the college earns by increasing tuition by one dollar increases at a decreasing rate. In other words, the marginal revenue earned by increasing tuition decreases as tuition increases. Hence, eventually colleges will not be able to increase their revenue simply by raising the tuition price because the price increase will be offset by an increase in financial aid.

Colleges have used tuition increases to finance additional spending. An expanding administrative bureaucracy is one area of expanding costs for colleges. Between 1975 and 1985, student enrollment at United States colleges increased by less than ten percent, but professional support staffs increased by over sixty percent (Sowell, 1992). An economic study of American colleges concluded, "the cost of any institution is largely determined by

the amount of revenues it can raise" (qtd. in Sowell, 1992). Sowell asserts that the schools blame rising costs for increasing tuition, but in reality the higher tuition is the cause of the rising costs.

Gillen (2009) uses a methaphor of "ravenous cookie monsters engaged in an arms race" to explain why the current financial aid system leads to ever-increasing tuition levels for students. Colleges raise tuition each year in order to keep up with their competition in terms of spending. Colleges' constant need for money is described by Bowen's Rule: "All universities, and in particular major institutions with or seeking elite status, will use any and all funds they receive for the pursuit of perceivced excellence and improvement (Douglass & Keeling, 2008)." Also, colleges "increased their prices and general spending because they could get away with it, not to make money, but to buy the best of nearly everything" (Wilkinson, 2005). Price discrimination, an integral part of the current financial aid system, allows schools to accumulate additional money. As a result of Bowen's Rule, the college spend the additional money, which leads to higher costs for students.

The current college financial aid system creates incentives for families to engage in behaviors that seem irrational, but in fact are a rational way of circumventing the system. For example, the current financial aid system discourages saving. When families have less cash in the bank, their EFC decreases. As a result, parents who have sacrificed to save for their child's college tuition will be expected to pay more than another student's parents who have the same income, but did not save for tuition. The government's EFC formula calls for twelve percent of the parents' and twenty percent of the student's discretionary net worth to be included in the total EFC. "Thus, by awarding more aid to those with lower assets, the financial aid system creates an implicit tax on assets, as high as 29%. This tax could certainly present a substantial deterrent to saving or a powerful incentive to reallocate assets" (Reyes, 2008). The "powerful incentive to reallocate assets" refers to allocating savings into retirement accounts. Retirement savings is not taken into account in the EFC calculation, so parents face an incentive to put the maximum amount of income into a retirement account rather than other assets. Edlin (1993) focuses on the financial

aid tax on asset accumulation. This asset tax comes from two areas: interest and dividend income from assets are directly added into available income and also the value of assets is converted at the rate of twelve percent into available income.

The financial aid system encourages individuals to make decisions that reduce the labor supply, but help lower their EFC. Novack & Fitch (2009) outlined an illustrative example of how the financial aid system discourages work and creates distorted incentives for income. A fifty-year-old divorced woman was laid off from a job that paid her $120,000 per year. She now is willing to take a $60,000 per year job that is less stressful than her old job because her second $60,000 of a $120,000 income would be taxed at a seventy-nine percent marginal rate. This high effective tax rate is partially a result of a $19,000 difference in EFC (Novack & Fitch, 2009). A similar situation could occur in a two-parent family. If one parent has a relatively high salary and the other parent has a lower salary, a very high percentage of the second parent's salary goes to pay for college tuition. For every extra dollar the second parent earns, the EFC increases. This disincentive to work has implications throughout the economy.

Ivy League institutions use a slightly different financial aid scheme. In general, Ivy League schools have large endowments and can afford to engage in generous tuition discounting practices. Also, Ivy League schools have colluded by agreeing not to award merit scholarships, limiting competition for the best students. This is analagous to a business deciding not to give a discount to its best customers (Posner, 2002). Yale, for example, has decided that families with an income below $60,000 will not pay anything for tuition. Families with incomes below $200,000 are expected to pay about ten percent of their income for tuition. For middle- and upper-middle-income students, the price of going to Harvard or Yale is similar to the price of attending a state university ("Affording Ivy", 2008). Several Ivy League schools have followed Princeton's lead in not requiring students to take out loans to pay for tuition. These Ivy League schools have structured their high tuition rates in a way to make wealthy students subsidize the attendance of lower-income students.

2. Model of Expected Parents' Contribution

A simplified model of the government's EFC formula lends some important insight into the current financial aid system. This model will represent only the parents' contribution to their child's education[2]. Attempting to model the family's contribution would involve introducing the student's contribution, which would add unnecessary complication and decrease accuracy. In addition, in most cases the student's contribution to his education is small in comparison to the parents'. The model also assumes that the student's school will meet all of the student's financial need as determined by the EFC formula[3]. At most public schools the school meets some, but not all, financial need[4]. Also, the model will assume the family has one student in college. The conclusions drawn from the model are still valid for families with more than one student. The parents' contribution to each child's education is the parents' contribution divided by the number of children in college.

Let Y = total income, t = average tax rate (income tax, state tax allowance, and Social Security tax allowance based in Tables A1 and A2 of the EFC formula worksheet), and A_I = income protection allowance and employment expense allowance (based on Table A3). Then total allowances = $tY + A_I$ and available income = $Y - tY - A_I$. Let W = net worth of cash, savings, and checking accounts, investments, and adjusted value of family business or farm (Table A4). Also let A_A = asset protection allowance (Table A5). Hence, a family's discretionary net worth = $W - A_A$. Using the mandated asset conversion rate of 12%, contribution from assets = $0.12(W - A_A)$. Hence, adjusted available income is $AAI = (1 - t)Y - A_I + .012(W - A_A)$. Let α = the ratio of AAI parents are expected to contribute to the child's education (based on Table A6), called the education tax rate. Thus the parents' contribution, which is the same as EFC in this model, is

$$EFC = \alpha[(1 - t)Y - A_I + 0.12(W - A_A)]. \quad (1)$$

[2]According to Edlin (1993), the student's contribution would be $3,000 if the student has no assets.

[3]In other words, students pay their EFC or the school's tuition rate, whichever is less.

[4]Public schools charge all in-state students a lower tuition price than out-of-state students, so in-state students receive financial aid in the form of lower tuition, regardless of income.

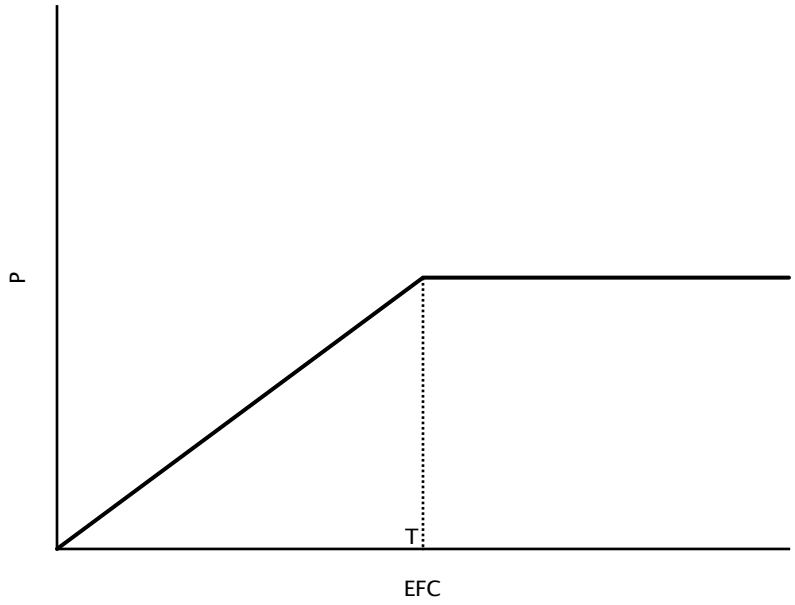

Figure 3. The amount a family pays, P, is $\min(T, EFC)$

Let T = tuition price. The actual amount the family pays for tuition, P, is $\min(T, EFC)$. In other words: If $EFC \geq T$, then $P = T$. If $EFC < T$, then $P = EFC$. Figure 3 shows how much a family would actually pay as their EFC increases.

Parents are interested in how much their EFC will increase when their income increases by one dollar. Differentiating Equation 1 with respect to Y yields

$$\frac{d(EFC)}{dY} = \alpha(1-t). \tag{2}$$

As a result, according to this model, the increase in EFC when total income increases by one dollar depends only on α and t. This result is represented graphically in Figure 4. Assuming α and t are constant, EFC increases at a constant rate, $\alpha(1-t)$, as income increases.

The education tax rate α and the government tax rate t create a disincentive to work. Understanding the disincentives to work found in the current financial aid system becomes easier when one considers net income, y, the amount of income a family gets to keep after tuition and taxes. When $EFC < T$, $y = (1-t)Y - \alpha[(1-t)Y - A_I + .012(W - A_A)]$. If

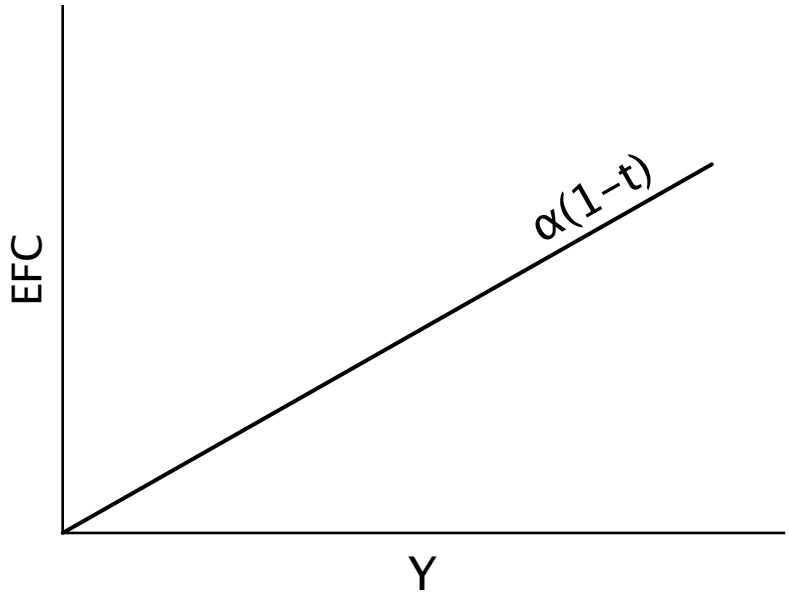

Figure 4. When Y increases by \$1, the increase in EFC depends on α and t.

$EFC > T$, then $y = (1-t)Y - T$.

Suppose $EFC < T$. Then

$$\frac{dy}{dY} = (1-\alpha)(1-t), \tag{3}$$

so for each additional dollar earned, a worker with a child in college who is receiving financial aid only keeps $(1-\alpha)(1-t)$ dollars. Since $0 < \alpha < 1$, $(1-\alpha)(1-t) < 1$. Also, as a result of the progressive tax system, t increases with income, so the amount a worker keeps from each additional dollar earned decreases as income increases. This fact makes it less advantageous for a worker to seek a promotion or a higher paying job while his child is in college.

Suppose $EFC \geq T$. Then

$$\frac{dy}{dY} = (1-t), \tag{4}$$

so for each additional dollar earned, a worker with a child in college who is not receiving financial aid keeps $(1-t)$ dollars.

Consider two parents who are married filing jointly in Pennsylvania. The family gets

Income	t_{US}
\$0-\$16,700	10%
\$16,701-\$67,900	15%
\$67,901-\$137,050	25%
\$137,051-\$208,850	28%
\$208,851-\$372,950	33%
over \$372,951	35%

Table 2: United States marginal tax rates t_{US} from US Tax Rate Schedule Y-1 (married filling jointly)

Income	t_{PA}
\$0-\$14,999	6%
\$15,000 or more	5%

Table 3: Pennsylvania state tax allowance t_{PA} from Table A1 of the EFC formula

Income	α
\$0-\$14,200	22%
\$14,201-\$17,800	25%
\$17,801-\$21,400	29%
\$21,401-\$25,000	34%
\$25,001-\$28,600	40%
over \$28,600	47%

Table 4: Implicit education tax rate α from Table A6 of the EFC formula worksheet

an allowance for taxes of 6% if the family's income is less than \$14,999 and 5% if the family's income is over \$15,000. Tables 2, 4, and 5 show how t and α change as income increases.

Table 2 shows the marginal tax rates t_{US} for the United States. The tax system is progressive, so the marginal tax rates increase as income increases. Table 3 shows the allowances the EFC formula makes for state taxes. Note $t = t_{US} + t_{PA}$.

Table 4 shows the implicit education tax rate α for families. The values for α rapidly increase as income increases, topping out at 47% of available income for all incomes over \$28,600.

Table 5 shows how much net income (y) increases when total income (Y) increases by \$1. This information is represented graphically in Figure 5. It is important to note,

Income	t	α	$(1-t)(1-\alpha)$
\$0-\$14,200	0.16	0.22	0.6552
\$14,201-\$14,999	0.16	0.25	0.63
\$15,000-\$16,700	0.15	0.25	0.6375
\$16,701-\$17,800	0.2	0.25	0.6
\$17,801-\$21,400	0.2	0.29	0.568
\$21,401-\$25,000	0.2	0.34	0.528
\$25,001-\$28,600	0.2	0.4	0.48
\$28,601-\$67,900	0.2	0.47	0.424
\$67,901-\$137,050	0.3	0.47	0.371
\$137,051-\$208,850	0.33	0.47	0.3551
\$208,851-\$372,950	0.38	0.47	0.3286
over \$372,950	0.4	0.47	0.318

Table 5: Increase in net income caused by an increase of \$1 in total income, assuming $EFC < T$ for all income levels

however, that at some income Y, $EFC = T$. At that point P does not increase any more, so increases in EFC do not have any effect on y.

Suppose $T = \$30,000$. Then $EFC = T$ when $Y = \$150,000$. Thus Figure 5 and Table 5 can be adjusted to reflect the fact that $\alpha = 0$, so $(1-\alpha)(1-t) = (1-t)$ when $Y > \$150,000$. Figure 6 and Table 6 reflect this adjustment. Edlin (1993) confirms the model's result that is shown in Table 6, stating that on an income in the range of \$45,000-\$85,000, the marginal tax rate from federal, state, payroll, and financial aid taxes can reach sixty-six percent or higher.

The result of Figure 6 is that marginal net income decreases as income increases until the income level at which $Y = EFC$. At this level of income families pay only tax to the government and extra income does not add to the family's EFC.

Figure 6 highlights an inequity in the financial aid system. Based on these results parents get to keep a higher percentage of each dollar earned at higher incomes than at lower incomes. Suppose a middle-class family earns \$70,000 per year. The worker gets a raise of \$1 per hour. He only gets to keep \$0.371 out of the \$1 raise. On the other hand, consider a family that earns \$400,000. A \$1 per hour raise for this family would mean

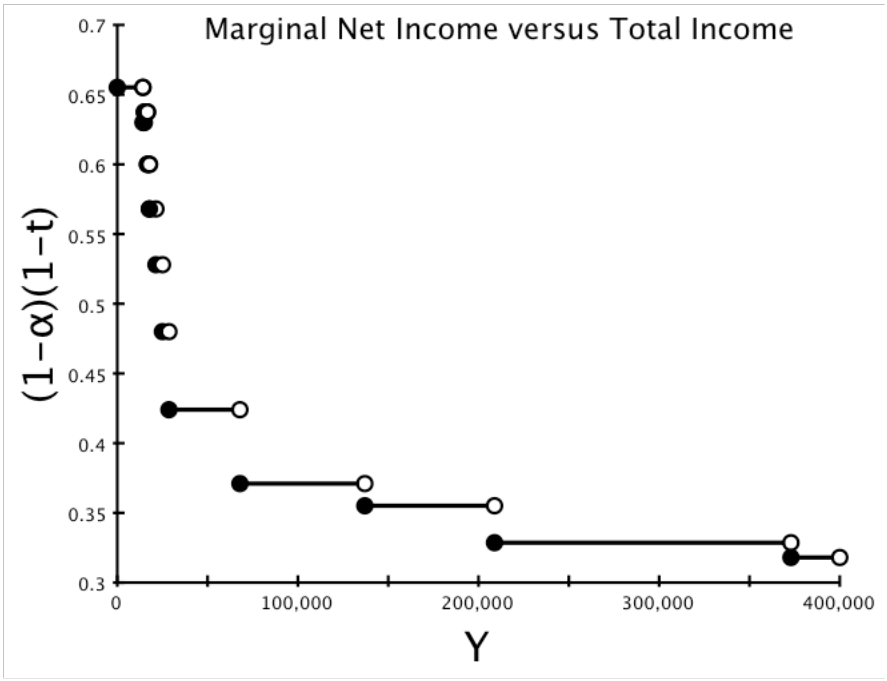

Figure 5. The graph shows the fraction of each dollar earned at various income levels that a worker keeps after tuition and taxes

Income	t	α	$(1-t)(1-\alpha)$
\$0-\$14,200	0.16	0.22	0.6552
\$14,201-\$14,999	0.16	0.25	0.63
\$15,000-\$16,700	0.15	0.25	0.6375
\$16,701-\$17,800	0.2	0.25	0.6
\$17,801-\$21,400	0.2	0.29	0.568
\$21,401-\$25,000	0.2	0.34	0.528
\$25,001-\$28,600	0.2	0.4	0.48
\$28,601-\$67,900	0.2	0.47	0.424
\$67,901-\$137,050	0.3	0.47	0.371
\$137,051-\$150,000	0.33	0.47	0.3551
\$150,001-\$208,850	0.33	0	0.67
\$208,851-\$372,950	0.38	0	0.62
over \$372,950	0.4	0	0.6

Table 6: Increase in net income caused by an increase of \$1 in total income, assuming that $T = EFC$ when $Y = \$150,000$.

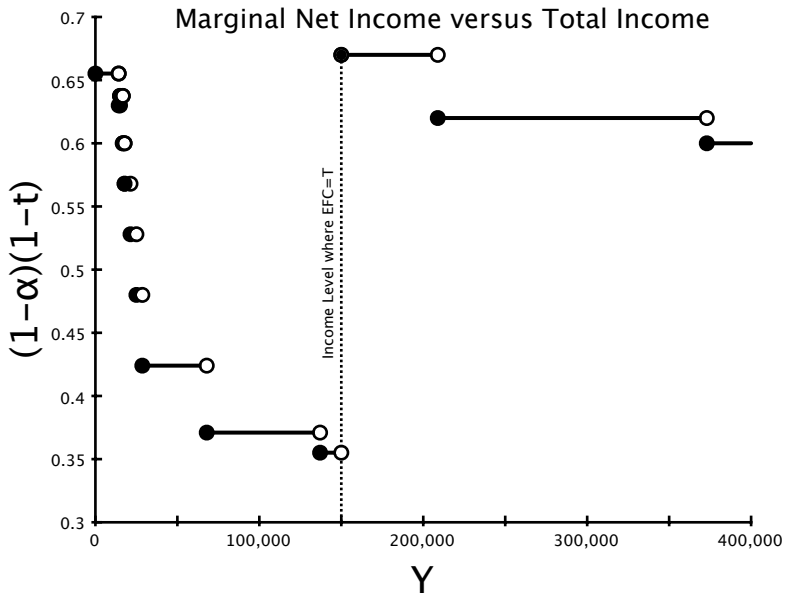

Figure 6. Once income reaches a level where $EFC > T$, marginal net income increases dramatically

the family keeps \$0.60 out of the \$1 raise. This result shows that the financial aid system is progressive at incomes up to \$150,000 in this example (or the income level at which $EFC = T$ in general) and regressive at incomes over \$150,000. This result is confirmed in Edlin (1993), which concluded that the tax is progressive at low and middle incomes. At high income levels, however, the parents' contribution is sufficiently high that no aid is received.

This result creates a disincentive to work for middle-class workers like the one seen in Novack & Fitch (2009). A worker making \$75,000 with a child in college has little incentive to look for a higher-paying job or work hard for a raise because she would only get to keep 35.51% of the difference of her new, higher salary and her old \$75,000 salary. When the tuition level is high, a larger range of incomes is affected by the disincentive to work because the dotted line representing the income level at which $EFC = T$ shifts right when tuition increases.

Another way of evaluating the financial aid system is by looking at what percentage of income families pay for college. Assume that $T = \$40,000$, which is a typical tuition price

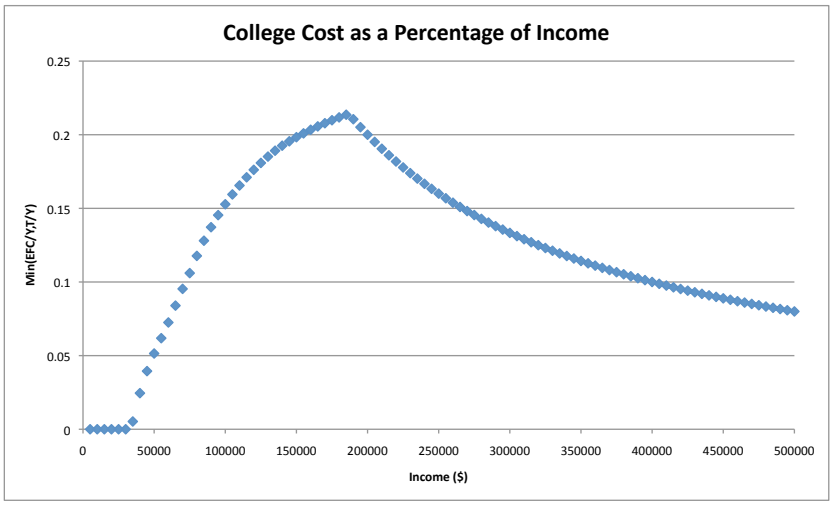

Figure 7. The graph depicts the percentage of income a family would pay for college tuition as the family's income changes, assuming $T = \$40,000$.

for a private school. Also assume the student, a resident of Pennsylvania, has two parents who make equal salaries, the older of whom is forty-eight[5]. Finally, assume that the parents have $20,000 in cash, savings, and checking and that the family has $15,000 in assets. These assumptions allow us to see how EFC changes based only on income. This exercise also takes into the marginal tax rates found in Table 2.

Inputting incomes from $0-$500,000 in increments of $5,000 into the EFC formula, holding the assumed values constant, yields Figure 7. As income increases families pay a higher percentage of their incomes for tuition until $Y = \$185,000$, which is the point at which $EFC = T = \$40,000$. At income levels above $185,000, however, the percentage of the family's income that go to college tuition decreases.

It is interesting to note that a family with an income of $75,000 and a family with an income of $400,000 both pay the same percentage (10%) of their income for college tuition. Figure 7 provides more evidence that the financial aid system is progressive at low- and middle-income levels and regressive at high-income levels. Students whose families have incomes of about $115,000-$200,000 might have more difficulty financing a college education

[5]Forty-eight was selected as the assumed age because if the parents had the child at age thirty, the parents would be about forty-eight when the child begins college.

than a student whose family makes $60,000, especially if the wealthier student's parents do not want to spend twenty percent of their income on tuition. For example, consider Betty, whose parents earn $140,000, and Martha, whose parents earn $65,000. Neither Betty's parents nor Martha's parents wish to contribute to their educations. Betty's EFC would be about $20,000 and Martha's EFC would be about $5,500. Thus Betty must pay $20,000 for the same education as Martha because her parents, who are not paying her tuition, make more than Martha's parents.

How does the EFC formula change if the model's assumptions change?

This model assumed that the student is considered dependent. If the student is independent (with no dependents other than a spouse), the EFC calculation is similar. The biggest difference is the formula uses a flat 50% assessment of student's available income and a 20% asset conversion rate. The dependent student's parents pay a variable percentage of available income (up to 47% on income over $28,601) and a 12% asset conversion rate. If the independent student has dependents other than a spouse, the formula expects the student to pay the same variable percentage of available income as a dependent student, but the asset conversion rate is 7%.

In addition, this model assumed that the student's two parents were married. If this is not the case, the EFC formula varies by school. Schools look at how long the parents have been divorced, if a parent has been negligent with child support, what assets each parent has, and whether there are other children in the family. Stepparents' incomes are also considered. If, for example, the student's mother marries a wealthy man, the student's EFC will increase, regardless of whether or not the stepparent plans on contributing money towards tuition payments. Also, the college does not give a specific amount that each parent owes. Instead, the college calculates a single EFC and it is up to the parents to agree how much each parent will contribute (*EFC Calculation for Non-Custodial Parent - Ask The Dean*, 2009).

Finally, the model assumed that the school uses the Federal Methodolgy (FM) to

calculate students' EFCs. Alternatively, the Institutional Methodology (IM) is used by some private schools to figure out how they are going to use their own financial aid dollars. IM subtracts allowances from income to find the amount of available income that can be used to pay tuition. IM does not consider the income protection allowance that FM uses. In another departure from FM, IM does take into account the value of the family's home when evaluating the family's available assets. If the parents are divorced, schools that use IM require income information for the custodial parent, the custodial parent's spouse, and the non-custodial parent. IM also allows the family to report medical expenses that exceed 3.6% of income and private school tuition for the student's younger siblings. The parents are expected to contribute 22% of the first $44,191 of adjusted available income and 46% of the adjusted available income over $44,191. IM requires parents to contribute only 3-5% of assets towards tuition, which is less than FM's 12% rate. If a familiy has more than one student attending college simultaneously, IM is less generous than FM. If a family has two students, it would pay 60% of its EFC for each under IM (for a total of 120% of EFC) and 50% for each student under FM (for a total of 100% of EFC) (*Institutional Methodology (IM)*, 2009).

3. What can the government do to make the system more fair?

Since the formula used to calculate EFC is mandated by the government, it is up to the government to reform the system. The goal of reform, however, is debatable. Making the system more progressive might not be the answer.

A more progressive system of financial aid

If the government decided it wanted to make the financial aid system more progressive, the government could mandate that at levels of income where $EFC > T$ a family must pay the same percentage of income as a family with an income level at which $EFC = T$. In the example above, this scheme would mandate that families with incomes over $185,000 must pay 20.5% of their income. The obvious problem with this scheme is that there would be no

cap on how much a family could pay for college tuition, similar to the progressive income tax system. Also, this system would effectively take away the ability of a school to set its tuition rate. Colleges would want students from wealthy families to come so they would have to pay a high percentage of a high income, which could hurt the admissions chances for students from low-income families. Making the system more progressive would actually hurt both lower-income students and higher-income students.

Eliminating price discrimination

Another option would be for the government to eliminate the EFC formula and mandate that colleges charge the same tuition rate to every student. Colleges would not give any need-based financial aid, but could give merit-based aid if they choose. Students and their families would no longer need to fill out the FAFSA each year. This mandate would give colleges an incentive to keep tuition low because they could not raise tuition knowing that the only people who will pay the higher rate are the very wealthy.

A possible consequence of eliminating price discrimination would be that low-income students would no longer be able to afford to go to a high-priced private school, instead opting for a public university. On the other hand, private schools would realize that their high price would be a deterrent to low-income students and might dip into their endowment to lower tuition. This pricing scheme would make the system more regressive than it is now, leading to lower costs for students who do not receive financial aid under the current system and higher costs for those who do. Figure 8 shows that when all students are charged a single price, the percentage of income the family spends on tuition decreases as income increases at all income levels. This is in contrast to what happens under the current financial aid system, shown in Figure 7, where the percentage of income a family spends on tuition increases as income increases when income is at a level at which $EFC < T$.

There might be room in the current market for higher education for a handful of private schools to decide not to give financial aid and charge all students a single price. For students whose families are located near the maximum of the curve in Figure 7, a non-price

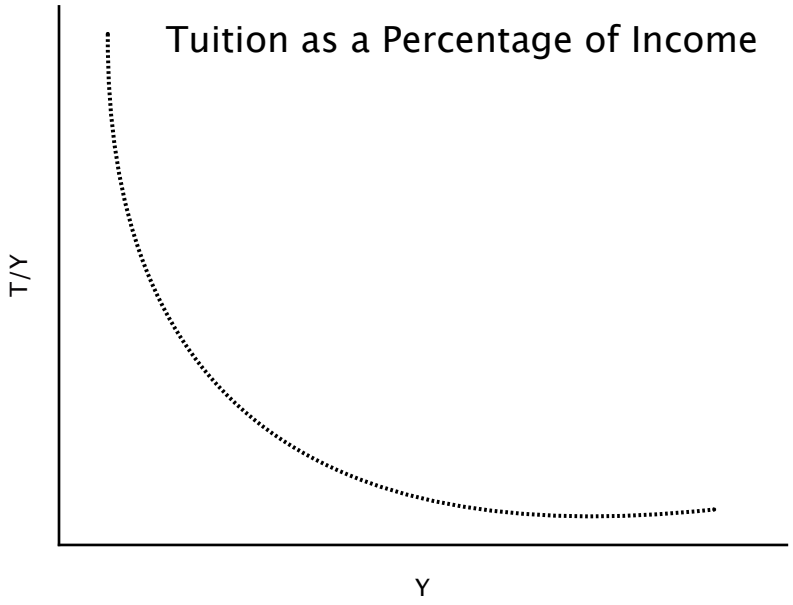

Figure 8. The graph shows the percentage of income a family would spend on tuition if all students were charged the same tuition price.

discriminating school would probably be cheaper than a price-discriminating school. In addition, using a different tuition scheme from most other schools could enhance a school's visibility and strengthen its brand.

4. How effective is merit aid in attracting top students?

Monks (2009) presents a study about whether merit aid makes students more likely to attend a school. The data was provided by a private, Mid-Atlantic liberal arts college with 3,000 undergraduate students. In 2005, the school increased its comprehensive fee from $31,910 to $40,510, an increase of twenty-seven percent. The school randomly chose 230 of its highest rated applicants that received no other need-based or merit-based aid and awarded them a $7,000 Academic Recognition Award. There were 319 remaining students who received no aid and would be forced to pay the full $40,510.

Monks performed a z-test. His null hypothesis was that an equal proportion of students from the group that received the Academic Recognition Award and the group that would pay full price would enroll at the university. He calculated a z-test statistic of 2.11, which

yields a p-value of 0.035, so he was able to reject his null hypothesis. He found that 7.1% of the students who received the merit aid attended the university, while only 3.2% of the students who would pay full price decided to attend. Monks concluded that merit aid is effective in attracting students.

This study does not consider other aspects of merit packages that make them even more attractive for students. Some schools offer students priority course registration, special research opportunities with a professor, special housing arrangements, or membership in an academic program.

5. Conclusion

The financial aid system presents families at certain income levels with a disincentive to work. As Table 5 shows, some families with incomes between $67,901 and $137,050 only get to keep 37.1% of each additional dollar they earn. For this reason, there is little reason for a worker to work harder in order to earn a promotion, or for a worker to take a higher-paying job that brings more stress along with it.

The financial aid system also gives families an incentive to reallocate savings into retirement accounts. Money in retirement accounts are not taken into account in the EFC calculation, but money in the family's savings or checking account is. Parents might be tempted to invest the maximum amount of money possible into retirement in order to increase their elibility for financial aid.

Finally, the financial aid system is progressive up until the income level at which the EFC equals tuition. At incomes above this level, however, the financial aid system becomes regressive because additional income is taxed only by the government, not as part of the EFC calculation.

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