Funding Schools or Financing Students:
Public Subsidies and the Market for Two-Year College Education

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ABSTRACT

Both public and private two-year colleges rely on public subsidies to make their education affordable for students. Public community colleges receive government support directly in the form of subsidies, while private for-profit colleges or proprietary schools receive government support indirectly in the form of grants or vouchers given to students. This study analyzes the impact of these two funding schemes on the entry decisions of proprietary schools and enrollments in community colleges. I use a new administrative data set of for-profit colleges in California, panel data methods, and a unique regression discontinuity design.

I find that an increase in public funding for a local community college diverts students from the private to the public sector and causes a corresponding decline in the number of proprietary schools in the county. Raising student financial aid awards, on the other hand, expands the overall pool of sub-baccalaureate students and causes proprietary schools to enter the market. This effect is particularly strong in counties with high poverty rates where more students are eligible for aid.

1. Introduction

Two-year colleges in the United States enroll more than 6.6 million students every year (National Center for Education Statistics (NCES) 2003).[1] Some of these institutions are public and some are private—but most benefit from substantial public support. In the case of public institutions—commonly known as community colleges—government support comes directly in the form of subsidies to institutions to close the gap between their low tuition and the true cost of educating students. In the case of private institutions—often referred to as for-profit colleges, trade schools, vocational institutes, or proprietary schools—government support comes indirectly in the form of grants or vouchers given to students to subsidize a portion of their tuition. With almost $22 billion in federal, state, and local taxpayer dollars going directly to community colleges (NCES 2003) and $2 billion paid out to proprietary school students through the federal Pell Grant program alone (U.S. Department of Education 2004a) it is natural to ask which use of public funds best facilitates access to education.

This study analyzes the impact of these two types of public subsidies on the entry decisions of proprietary schools and enrollments in community colleges. Drawing on a new administrative data set of California proprietary schools that I obtained from the state's Bureau of Private Postsecondary and Vocational Education, I use panel data methods and a unique regression discontinuity design to estimate the effects of the direct provision of education and student financial aid on the market for sub-baccalaureate education.

I exploit variation from two sources—the laws governing community college bond measure votes and the margin of vote passage—to identify the causal relationship between the direct provision of public education and proprietary school entry. In some California counties, bond measures passed purely because of a change in state law that lowered the threshold of "yes" votes required for bond

[1] As I show in another paper (Cellini 2005), this figure, based on data from the Integrated Postsecondary Education Data System (IPEDS), is likely to underestimate of the number of sub-baccalaureate students in the country.

passage from two-thirds before the year 2000 to just 55 percent after. In other counties, bonds passed or failed by exceedingly narrow margins. In both of these cases, bond passage was due to chance, creating a situation akin to random assignment and allowing me to control for unobservable characteristics of markets that are likely to bias the results of cross-sectional estimates.

I find that an increase of $100 million in direct public funding for a local community college causes approximately 700 students per county, or about two percent of sub-baccalaureate students, to switch from the private to the public sector, crowding out two proprietary schools in that county. These results suggest that students consider public community colleges and proprietary schools substitutes, particularly in vocational fields where course offerings exhibit the greatest overlap. Marginal increases in community college funding simply divert students from the private to the public sector, without generating an overall increase in college attendance.

Changes in the federal Pell Grant program are also shown to have a profound effect on the market for two-year college education. A $1,000 increase in the maximum per-student award sparks a 16 percent increase in the net number of proprietary schools per county. The effect is even stronger in counties with higher adult poverty rates, where more students qualify for these grants. Though more research is needed to determine the reasons for this relationship, it may be the case that large financial aid awards open access to private sector education among low-income students, or that for-profit entrepreneurs respond to the funding increase by stepping-up recruiting efforts in low-income neighborhoods.

The article concludes with a comparison of the merits of each funding scheme. If the quality of sub-baccalaureate education is equal at the margin in the two sectors, then increasing the share of taxpayer dollars spent on student financial aid would result in increased efficiency and cost-effectiveness in the provision of vocational education. Money spent on the direct provision of public

education, on the other hand, should be directed toward enhancing academic programs at community colleges, as these programs are not well represented in the private sector.

This study is among the first to focus on the market for two-year college education. With few reliable data sources, research on for-profit colleges is almost non-existent. And while direct public funding and student voucher schemes have been extensively studied in the primary, secondary, and four-year college markets, little research has extended to sub-baccalaureate education. The studies that do exist typically consider community colleges in isolation. This study also contributes to the literature on firm entry, using a new panel data set and a unique identification strategy to explore patterns of firm entry in a market with substantial government involvement.

The rest of the paper is organized as follows: section 2 provides background information on community colleges, proprietary schools, and public finance in the two-year college market; section 3 presents a model of student and school behavior; section 4 describes the data; section 5 outlines the estimation strategies I employ; section 6 examines the effects of public school funding on the market; section 7 does the same for student financing; and section 8 concludes.

2. Background

Community Colleges: Public Providers of Sub-Baccalaureate Education

Community colleges are public institutions that offer a two-year associate's degree as their highest degree. There are over 1,100 community colleges in the United States serving over five million students each year (NCES 2003). Though each state's community college system has its own mission statement, virtually all community colleges share two common goals. One goal is to promote the transfer option, where students move seamlessly into their junior year at a four-year college upon the completion of the first two years in a community college. This is the traditional role that community colleges were designed to fulfill when the first so-called "junior college" opened its doors

in 1901 (Brint and Karabel 1989). In the 1970s, however, community colleges sought to increase their vocational offerings to compete with the growing proprietary school sector, establish a niche for themselves outside of the four-year college market, and promote economic growth through increased worker productivity (Brint and Karabel 1989, Honick 1995). Today, a second goal of the colleges is to provide vocational training and re-training for the state's labor force, through an array of short-term certificate programs (Kane and Rouse 1999).

This study focuses specifically on the market for sub-baccalaureate education in the state of California. While the size and diversity of the state make it an ideal place to undertake a study of this type, it should also be noted that California is distinctive in many ways. Most importantly, California's community college system is by far the strongest in the country. The state's 1960 Master Plan for Higher Education stipulated an important role for community colleges in opening access to postsecondary education, and few other states rely on community colleges to the same extent (Murphy 2004, Cellini 2005). The state is home to 109 community colleges serving 1.1 million full-time equivalent students (or about 2.5 million students total)—with an average of about 10,000 full-time equivalent students at each college (California Community Colleges Chancellor's Office (CCCCO) 2005). Tuition at the colleges for a full-time full-year student at a California community college is the lowest in the country at just $330 per year in the 2002-03 academic year (Murphy 2004), reflecting the state's commitment to affordable education.

Proprietary Schools: Private Providers of Sub-Baccalaureate Education

In contrast to community colleges, private sub-baccalaureate institutions are generally much smaller, more expensive, and more focused on vocational training (Cellini 2005). No publicly available national or state-level data set has claimed to have a random sample—much less the entire universe of these schools—making research on these institutions difficult at best. Due to this lack of data, classifying these schools is also a daunting task. This study follows the definition of proprietary

schools used by California's Bureau of Private Postsecondary and Vocational Education (BPPVE), the department in charge of licensing these institutions and the primary source of data for this study. The universe of schools includes for-profit and non-profit postsecondary institutions that offer any degrees or certificates lasting two years or less, though they may also offer more advanced degrees.[2]

Very little is known about proprietary schools. Most studies that describe the sector are based on non-random sub-samples of schools in the 1980s.[3] In Cellini (2005) I survey the literature, assess existing data sources, and compare proprietary schools with community colleges along dimensions where data is available. I find that California's 3,827 proprietary schools are generally quite small, with an average enrollment of just 350 students. Moreover, tuition is typically at least an order of magnitude greater than California's public community colleges with charges generally running between $3,000 and $10,000 per year.

Public Subsidies for Sub-Baccalaureate Education

There are two methods by which taxpayer dollars are spent on education—the direct provision of education (e.g. public schools) and vouchers given to students (e.g. financial aid). These two funding schemes are employed at virtually every level of the American education system and have been closely studied in other contexts, such as the elementary school and four-year college markets. In discussions of both types of funding schemes, economists justify government intervention in the market for education on the basis of the positive externalities generated by an individual's investment in human capital. The societal benefits of education (such as productivity gains, reduced crime, and increased civic involvement) are generally greater than the benefits (such as higher wages) realized by

[2] I exclude religious schools from the sample since these schools are subject to different rules and regulations than other proprietary schools. About six percent of the remaining (non-religious) proprietary schools are considered not-for-profit by the BPPVE. Research on mixed-ownership industries (namely health care), shows that for-profits and non-profits behave similarly on most dimensions—including efficiency, pricing, and quality (see Sloan 2000 for an excellent review of this literature). Moreover, Duggan (2000) finds that non-profits that operate in markets with a large share of for-profits behave like pure profit maximizers. In light of these findings, I assume that non-profit proprietary schools behave the same as their for-profit counterparts in the discussion that follows.

[3] See for example Apling (1993), Cheng and Levin (1995), and Moore (1995).

the individual. For this reason, in the absence of government intervention, individuals would under-invest in human capital relative to the socially-optimal level. Policymakers therefore justify spending public funds on public schools and student aid to compensate for these spillovers and encourage investment in education.[4]

Direct Public Provision of Education

The difference in tuition charges between public and private institutions speaks volumes about the nature of public support going to each sector. The remarkably low tuition at community colleges opens access to education for millions of Californians, but it also means that community colleges must rely heavily on public funding, as the cost of education is estimated to be about $4,419 per full-time student (California Postsecondary Education Commission (CPEC) 2003). The fees generated by a full-time student paying full tuition cover just 7.5 percent of this cost. Overall, however, net of school-based financial aid, student fees generate an even lower percentage of revenue—just 3.4 percent in 2002-03. The bulk of the cost of education covered primarily by state funds (55 percent) and local property taxes (39 percent) (CPEC 2003).

Community college districts can supplement these sources of funding by passing bond measures to provide a stream of income to local colleges over a specified period of time. The bond measures are put on the ballot by local community college boards and voted on by the residents of the county. Funds can range from a few million to several hundred million dollars and all bonds in California are earmarked for capital improvements. The text of one typical bond measure reads:

> To provide greater access to the College of the Sequoias' educational opportunities by building two full-service educational centers including a Center for Agricultural Science and Technology, repair and renovate classrooms and facilities, provide handicapped access, give students increased access to computers for job training, build and acquire new classrooms and facilities, build a new Science Center and expand support facilities, shall the College of the Sequoias issue $49.2 million of bonds at interest rates below the legal limit? (Institute for Social Research 2005)

[4] See Moretti (2003) for an excellent review of the literature on the social benefits of education.

As the text of the bond reveals, its passage would increase the quality of the community college's facilities, expand the college's capacity, and perhaps enhance course offerings and career services. At the same time, the bond money frees resources to be used for other services and therefore can be treated as a general increase in the college's budget. In the sections that follow, I draw on the laws governing bond measure votes and the votes themselves to implement a regression discontinuity approach to examine the impact of community college funding on the market for sub-baccalaureate education.

Vouchers

Funding for sub-baccalaureate education also comes in the form of financial aid. Although public community college students receive a substantial portion of aid, this form of financing is particularly important to proprietary school students. Lacking the subsidies provided to community colleges, tuition charges at proprietary schools must be greater than or equal to the cost of education. In fact, an estimated 81 percent of proprietary schools' current fund revenues are generated by student tuition payments and financial aid (NCES 2003), a stark contrast to the 7.5 percent covered by California community college student fees.

Most financial aid programs for sub-baccalaureate students are run by the federal government. The Pell Grant program is the largest federal student aid program, giving out over $12 billion in grants in 2003-04 (U.S. Department of Education 2004a). The program provides grants for students who demonstrate financial need to attend a Title IV-eligible school of their choosing.[5]

[5] Title IV refers to the section of the Higher Education Acts of 1965 that established federal student financial aid programs. Interestingly, not all proprietary schools are eligible. As I discuss in another paper (Cellini 2005), the federal government specifies several requirements that apply solely to for-profit or vocational non-profit schools. The most important is the "two-year rule" that schools must have been legally providing postsecondary instruction for at least two consecutive years. They also must derive no more than 90 percent of their revenues from federal student aid, and they are required to offer at least one program of a specified week and hour length (the "12-hour rule") (U.S. Department of Education 2001). While there is currently no accurate estimate of the percentage of proprietary schools eligible for Title IV programs, it seems reasonable to assume that most proprietary schools will respond to changes in the Pell Grant, since those that are not eligible are likely to believe that they will become eligible after two years.

According to the federal government's enrollment counts, 95 percent of students in Title IV-eligible proprietary schools received Pell Grants in 2001, compared to just 27 percent of community college students (U.S. Department of Education 2002 and NCES 2003).[6] Proprietary school students also receive larger awards that their counterparts in public institutions. In 2002, California community college students received an average grant of $2,224 (CCCCO 2005) compared to $2,467 for proprietary school students in the state (U.S. Department of Education 2004a).

The differences in Pell Grant receipt are largely due to the design of the program. Since a student's eligibility and award size are determined by comparing the maximum award amount ($4,050 in 2003-04) to a student's cost of attendance (including tuition, fees, books, and sometimes room and board), minus an expected family contribution, all else equal, students attending more expensive private schools receive greater benefits than students in public institutions. For the 70 percent of sub-baccalaureate students attending part-time (NCES 2003), the cost of attendance calculation particularly favors proprietary education: room and board allowances are prorated based on students' hours of attendance and left out of the calculation completely for students attending less than half-time (U.S. Department of Education 2003a). Under these rules, tuition charges are an important determinant of a student's eligibility and the size of his or her award. At least for part-time students, the cost of attendance becomes binding and the Pell Grant reduces the public-private price differential.

Other aid programs such as federal student loans and California's CalGrant program also play a role in making two-year college education affordable.[7] For the purposes of this paper, however, I restrict my attention to the Pell Grant program for several reasons. First, the Pell Grant program is the

[6] The proprietary school enrollment figures used here are again based on IPEDS data and therefore severely undercount the number of students in these institutions (see Cellini 2005). However, in recent years the IPEDS has made an effort to track down all Title-IV eligible proprietary schools, so these numbers may be fairly accurate insofar as they represent point-in-time full-time-equivalent fall enrollment in eligible institutions.

[7] The CalGrant program is California's own grant program for low-income students. Sub-baccalaureate students attending one-year programs are eligible for awards of $1,551. Students in short-term vocational programs lasting at least four months are eligible for $576 (California Student Aid Commission Wesbsite http://www.calgrants.org. Accessed August 19, 2005).

largest student aid program in the country. It not only provides aid to the greatest number of students, but it also provides students with the largest average grant amounts. It follows that the burden on taxpayers is greater for the Pell Grant program than for any other student aid program. Second, because Pell Grants are not repaid by the student, they are likely to have a greater impact on student behavior and market dynamics than loans. Finally, estimates of the effects of the CalGrant program on the market for sub-baccalaureate education were not significant at conventional levels, suggesting that this program has little effect on the market.[8]

3. Model

Student Demand

I begin by assuming that potential consumers of two-year college education are distributed according to some function $f(j)$ across any number of types j. For the purposes of exposition and without loss of generality, I assume that there are just two types of students. For example, let students of "type 1" be those with a low probability of pursuing education in proprietary schools and students of "type 2" be those with high probability of pursuing their education in these institutions. As long as there are some students, of any type, who can pursue their education at both community colleges and proprietary schools, then the following conceptual framework applies.

Potential consumers of sub-baccalaureate education have three basic choices. They can enroll in a community college, enroll in a proprietary school, or choose not to pursue a two-year college education (hereafter I refer to this choice as "non-attendance"). These individuals sort themselves across both the extensive margin—between attendance and non-attendance—and the intensive

[8] Literature on public subsidies in the two-year college market has focused primarily on community colleges and their students. Kane (1995), Rouse (1994), and Manski and Wise (1983) explore demand elasticities of community college enrollment with respect to tuition, finding in general that community college students are highly sensitive to tuition changes. In one of the few studies to consider for-profit college students in conjunction with students in other sectors, Turner (2005) looks at the enrollment responses of Pell Grant recipients to cyclical labor market fluctuations.

margin—between the private and public sector—according to the relative costs and benefits of each choice. Characteristics of the individual and the market (represented by the vector X) largely determine these costs and benefits. Student financial aid (denoted F), such as the Pell Grant, impacts the out-of-pocket cost of the educational options, while the direct public funding of community colleges (denoted D) influences the students' perceived benefits of attending a community college. I call the ratio of benefits to costs R, where the benefit-cost ratio of community college enrollment for student i of type j is: $\mathrm{R}_{\mathrm{CC}_{ij}} = \dfrac{\mathrm{Benefit}_{\mathrm{CC}}(D,X)_{ij}}{\mathrm{Cost}_{\mathrm{CC}}(F,X)_{ij}}$. Similarly, the benefit-cost ratio of attending the local proprietary school is: $\mathrm{R}_{\mathrm{Prop}_{ij}} = \dfrac{\mathrm{Benefit}_{\mathrm{Prop}}(X)_{ij}}{\mathrm{Cost}_{\mathrm{Prop}}(F,X)_{ij}}$. For non-attendance: $\mathrm{R}_{\mathrm{Non}_{ij}} = \dfrac{\mathrm{Benefit}_{\mathrm{Non}}(X)_{ij}}{\mathrm{Cost}_{\mathrm{Non}}(X)_{ij}}$. Individuals will pursue the option with the highest ratio R.[9]

Students for whom $\mathrm{R}_{\mathrm{Prop}_{ij}} > \mathrm{R}_{\mathrm{CC}_{ij}}, \mathrm{R}_{\mathrm{Non}_{ij}}$ will choose to attend a proprietary school. Market demand for proprietary school education is then the sum over the indicator function:

$$Q(F,D,X) = \sum_{j=1}^{2}\sum_{i=1}^{I_j}[\mathbf{1}\left(\mathrm{R}_{\mathrm{Prop}_{ij}} > \mathrm{R}_{\mathrm{CC}_{ij}}, \mathrm{R}_{\mathrm{Non}_{ij}}\right)], \tag{1}$$

where $i = 1,2,...,I_j$ for students of types $j = 1,2$ and $I_1 + I_2 = I$ represents the total pool of sub-baccalaureate students.

Proprietary School Supply

Student choices across the extensive and intensive margins will have a much greater influence on the supply of proprietary schools than community colleges. Indeed, the supply of California community colleges is not likely to respond to short-term fluctuations in enrollment at all, since the creation of a new college must be planned more than five years in advance. The process requires the agreement of state voters, legislators, the California Department of Education, and the Board of

[9] It is also possible that students sort themselves across sectors based on the net present value of benefits – costs. Characterizing the student's choice in this manner would not change the implications of the model.

Governors, making the addition of a new college rare (California State Department of Education 1960).[10]

In contrast, student choices between the private and public sectors and between attendance and non-attendance are likely to have a profound influence on the profit functions of proprietary schools, as these small profit-maximizing schools are relatively unencumbered by bureaucratic red tape.[11] Since the true student demand for proprietary schools (Q) is not known to potential market entrants, proprietary school entrepreneurs calculate the expectation of market demand,

$$\begin{aligned} E(Q) &= E\left[\sum_{j=1}^{2}\sum_{i=1}^{I}\left[\mathbf{1}\left(\mathrm{R}_{\mathrm{Prop}_{ij}} > \mathrm{R}_{\mathrm{CC}_{ij}}, \mathrm{R}_{\mathrm{Non}_{ij}}\right)\right]\right] \\ &= \sum_{j=1}^{2}\sum_{i=1}^{I} E\left[\mathbf{1}\left(\mathrm{R}_{\mathrm{Prop}_{ij}} > \mathrm{R}_{\mathrm{CC}_{ij}}, \mathrm{R}_{\mathrm{Non}_{ij}}\right)\right] \\ &= E(Q_1) + E(Q_2), \end{aligned} \tag{2}$$

where Q_1 and Q_2 are market demands of students of type 1 and type 2, respectively. Drawing loosely on work by Bresnahan and Reiss (1987, 1991), potential market entrants calculate the expected market demand of each student type according to:

$$E(Q_j) = S_j(Y)d_j(D,F,X) \tag{3}$$

where $d_j(D,F,X)$ is the demand function of representative consumer of type j. $S_j(Y)$ represents what the firm perceives to be number of consumers of proprietary education of each type in the population, since the size and composition of the pool of sub-baccalaureate students is unknown to the firm. Y is a vector of demographic variables influencing the number of consumers in the market. It follows then that potential market entrants estimate total market demand according to:

$$E(Q) = E(Q_1) + E(Q_2) = S_1(Y)d_1(D,F,X) + S_2(Y)d_2(D,F,X), \tag{4}$$

[10] The addition of new programs in an existing community college is more frequent, but colleges must still follow regulations set out in a 35-page book and get approval from the state Chancellor's office, making this process quite lengthy as well (CCCCO 2003).

[11] According to Patrick Dorais at the BPPVE, the licensing process for new schools is generally completed in just four to eight weeks (phone interview on September 14, 2005).

where the total number of consumers is $S_1(Y) + S_2(Y) = S(Y)$. In equilibrium, the firm's expectation of market size equals the true market size.

With market demand specified, costs remain to be accounted for in the profit function of a proprietary school. Assuming constant marginal cost,[12] the total costs of the N^{th} firm are:

$$TC_N = MC_N(W)q + F_N(W) = AVC_N(W) + F_N(W) \quad (5)$$

where $F(W) =$ fixed costs, $MC(W)$ = marginal costs, $AVC(q,W) =$ average variable costs, $q =$ firm output, and W is a vector of exogenous variables affecting the costs of the firm. Calculating profits for the N^{th} firm yields:

$$\prod_N = [P - AVC_N(q,W)][E(Q(D,F,X))] - F_N(W). \quad (6)$$

Under free entry, if we observe N proprietary schools in a competitive equilibrium, it must be the case that the N^{th} entrant into the market makes zero economic profits, and the $N+1^{th}$ school would make negative profits. The number of proprietary schools observed in each market (N) can therefore be represented as a function of D, F, W, X, Y, P, and q.

The Role of Public Finance

Public subsidies to education influence the number of proprietary schools in the market through their impact on student demand. If students do indeed sort themselves according to their assessments of the benefit-cost ratio of the three options, then for some students on the intensive margin, the benefit-cost ratios of the private and public sectors are approximately equal (and less than $\mathrm{R}_{\mathrm{Non}}$). That is, $\mathrm{R}_{\mathrm{Prop}_{ij}} \approx \mathrm{R}_{\mathrm{CC}_{ij}} > \mathrm{R}_{\mathrm{Non}_{ij}}$, or more explicitly:

$$\frac{\mathrm{Benefit}_{\mathrm{Prop}}(X)_{ij}}{\mathrm{Cost}_{\mathrm{Prop}}(F,X)_{ij}} \approx \frac{\mathrm{Benefit}_{\mathrm{CC}}(D,X)_{ij}}{\mathrm{Cost}_{\mathrm{CC}}(F,X)_{ij}} > \frac{\mathrm{Benefit}_{\mathrm{Non}}(X)_{ij}}{\mathrm{Cost}_{\mathrm{Non}}(X)_{ij}}. \quad (7)$$

[12] The assumption of constant marginal cost makes sense in this context if, for example, teaching comprises a large portion of the cost of education. I use it here for simplicity following Bresnahan and Reiss (1987). See Bresnahan and Reiss (1991) for a similar model assuming U-shaped marginal costs.

These marginal students are roughly indifferent between the two types of schools, but a change in direct funding (D) or financial aid (F) that impacts out-of-pocket costs or perceived benefits may cause them to switch sectors.

The passage of a local bond measure, with its focus on capital improvements, will increase a marginal student's assessment of the quality and perhaps the returns of a community college education. The result is that the relative benefit-cost ratio of a community college education (R_{CC}) increases, making community college education more attractive and causing students on the intensive margin to enroll in public, rather than private, institutions. On the supply side, the increase in community college quality signals to proprietary schools to expect a decrease in student demand for private education on the part of the representative consumer of type 1 (and to a lesser extent consumers of type 2). Firms expect (and later experience) a decrease in market demand and less profitability according to equation (6)—prompting proprietary schools to exit the market.

In contrast to the impact of direct funding of public schools, changes in student financial aid awards will have the opposite effect on the market. Since, as described in the previous section, the Pell Grant program accounts for the cost of attendance in determining student eligibility and award size, it reduces the price differential between private and public schools—sometimes making the difference in out-of-pocket costs negligible for low-income students.

As a consequence, if the federal government increases the maximum per-student award allowed under the Pell Grant program (for example raising the maximum award from $4,050 to $4,500), the change will further decrease the cost of attending a proprietary school and have little effect on the cost of a community college education, causing students on the intensive margin to shift to the private sector. On the supply side, the increase in the Pell Grant maximum signals an increase in demand for proprietary schools among certain types of consumers—particularly students of type 2—and greater profitability according to equation (6), prompting firms to enter the market.

Similar arguments can be made in predicting the impact of public subsidies on student choices at the extensive margin between attendance and non-attendance. Students indifferent between non-attendance and community college schooling for whom $R_{Non_{ij}} \approx R_{CC_{ij}} \geq R_{Prop_{ij}}$, will respond to the passage of a bond measure by enrolling in their local community college, while students for whom $R_{Non_{ij}} \approx R_{Prop_{ij}} \geq R_{CC_{ij}}$ are likely to respond more strongly to changes in the Pell Grant. At this margin, both types of funding have the potential to increase access to education and expand the overall pool of sub-baccalaureate students.

4. Data

This study draws on a new and unique data set of all legally-operating proprietary schools in California from 1993 to 2003 to estimate the effects of public subsidies on the market for sub-baccalaureate education. I obtained the data from California's Bureau of Private Postsecondary and Vocational Education (BPPVE), an arm of the Bureau of Consumer Affairs charged with registering all private postsecondary institutions that offer degrees or certificates lasting two years or less. The data include detailed information on each institution's opening (the date it received initial approval to operate), closing, location, accreditations, and programs offered, as well as information on religious and other exemptions.

To this data I add comprehensive data on the location, enrollment, and tuition of California's public community colleges obtained through the California Postsecondary Education Commission and the California Community Colleges Chancellor's Office. Pell Grant data comes from the U.S. Department of Education's Office of Postsecondary Education. Demographic information is taken from the California Department of Finance's Statistical Abstract, the Rand Corporation's California

Statistics, and the U.S. Census Small Area Estimates. Information on local bond measures comes from the Institute for Social Research at California State University, Sacramento.

Table 1 displays summary statistics of the data. There are on average 52 proprietary schools in a county and two community colleges. Pell Grants ranged from $2,300 to $4,050 over the period and community college tuition ranged from $330 to $540. Also, note that poverty data is not yet available for about half of California counties in 2003.

Defining the Product Market

The data on proprietary schools from the BPPVE can be directly compared to California community college data to support the implications of the model and provide evidence that these schools do in fact operate in the same product market. First, the fields of study offered at these institutions are remarkably similar—particularly in vocational areas. Table 2 lists the average number of programs offered by proprietary schools and community colleges per county in California. In 10 out of 14 fields of study, such as administrative and support, finance and insurance, and technical trades, the difference between the number of programs provided by public and private institutions is indistinguishable from zero—suggesting that neither sector dominates the market in these fields. In two fields, computers and real estate, proprietary schools seem to offer significantly more programs, while community colleges dominate the food and bar field and the humanities and arts. These differences speak to the role of each type of institution. Since community colleges offer the option to transfer to four-year colleges, their relative specialization in the humanities and arts is expected. Similarly, because of the small size and for-profit nature of proprietary schools, these institutions are likely to respond quickly to demand for training in new technologies. Nevertheless, the substantial overlap in all ten other program areas suggests that these schools do in fact operate and compete in the same product market.

Second, the content of the programs offered at each type of school is often quite similar. While there is no comprehensive data on course offerings and content, a comparison of three popular programs in three California counties yielded Table 3. Comparing Alan Hancock Community College's Office Software Support Certificate to Atlas Computer Centers' Office Technician Certificate in the top rows, for example, reveals that both certificates require five courses, three of them with almost identical titles. The other two classes, despite their slightly different names, could easily contain similar content. This similarity is not unique to office support certificates. In Stanislaus county, both the community college and arbitrarily chosen proprietary school offer courses required to qualify for the state real estate salesman and broker licensing examinations. The pattern continues in other fields, with many, like real estate and information technology, geared towards the same examinations or industry certifications. At the very least it seems likely that students on the margin in these overlapping vocational fields will switch sectors in response to changes in out-of-pocket costs or perceived benefits according to the model.

A third and final reason why we might believe that community colleges and proprietary schools operate in the same product market is that both offer flexibly-scheduled part-time and part-year programs. Weekend, evening, and distance-learning courses are essential elements of both types of institutions. About 72 percent of California community college students and 67 percent of proprietary school students enroll part-time or part-year, suggesting that both types of institutions offer flexibly-scheduled classes to meet the needs of working students. In contrast, only about 27 percent of four-year college students enroll part-time (NCES 2003).[13]

Defining the Geographic Market

While the product market is easily defined, determining the geographic market for two-year college education is more elusive. For simplicity and because of the nature of the data, I assume that

[13] Again, this information is based on the IPEDS, but it is the only data available on student characteristics.

each county constitutes a separate geographical market. This introduces some measurement error since students may well attend a school outside of their county, especially if they live near a county border. However, data from the 2000 National Postsecondary Student Aid Study (NPSAS) indicates that at the median, public community college students attend schools just nine miles from home. Students attending private for-profit institutions typically travel a bit farther, but remain on average 14 miles from home (NPSAS 2000).[14] Moreover, changes that impact local sub-baccalaureate markets will undoubtedly spillover to neighboring counties. To the extent that spillovers occur, the effects will bias my estimates toward zero, underestimating the impact of any changes.

5. Estimation

The model of firm behavior derived above has the advantage of allowing investigation into the factors that determine firm entry in the absence of data on prices and profits. To see this, equation (6) can be rewritten in terms of average variable profits. Letting average variable profits,

$$V_N(D,F,W,X_1) = [P - AVC(q,W)]d(D,F,X_1), \tag{8}$$

where $X_1 \subset X$, the profit function in equation (6) can be written as:

$$\prod_N = V_N(D,F,W,X)S(Y) - F_N(W), \tag{9}$$

where the price (P) of a proprietary school education is instrumented with characteristics of the market. Because firms enter the market until economic profits are zero, the profit equation can be linearized and rearranged to predict the number of proprietary schools observed in equilibrium as follows:

$$N_{\text{Prop}_{ct}} = \alpha D_c + \beta F_t + \lambda Y_{ct} + \eta X_{ct} + \gamma W_{ct} + \varepsilon_{ct}, \tag{10}$$

where $N_{\text{Prop}_{ct}}$ is the number of proprietary schools in county c and year t.

[14] This is an especially small distance when compared to the average size of a California county. Tabulations of data from the California Department of Finance show that average county area is 2,689 miles, or about 52 miles in each direction.

D and F are the variables of interest, representing the direct provision of education and student financial aid, respectively. In cross-sectional estimates, I use average community college revenues (that is, revenues from all federal, state, and local sources averaged over time) to represent the level of direct community college funding in the county. Later, I use bond values to examine changes in community college funding. I use the maximum per-student Pell Grant award examine the impact of financial aid.

Following Bresnahan and Reiss' (1987, 1991) determinants of firm entry, Y is a vector of variables that determine market size. These include the population of the county, population growth, and the population of neighboring counties (in this case, the county that shares the largest border).

X includes county-level demographic and market characteristics such as the number of community colleges in the county, the maximum enrollment of all community colleges over ten years, community college tuition, the adult poverty rate, the unemployment rate, per capita income, percent minority, and percent of the population in age groups 0-14, 15-29, and 30-49.

Finally, W represents costs for the proprietary school entrepreneur. Lacking data on rental rates and instructor salaries, I again follow Bresnahan and Reiss (1991) by including the median home price in the county to reflect the price of real property.

The term ε_{ct} contains unobservable characteristics that vary across markets and over time. If these are correlated with the explanatory variables, estimates of the impact of the effects of public subsidies on the number of proprietary schools in the market will be biased. Examples of such unobservables include proprietary school profits, local tax codes, the area's industry mix, or the average education level of the population. Due to this omitted variable bias, cross-county estimates can only provide a measure of the correlation between the number of proprietary schools and the explanatory variables—they cannot prove causation. Nonetheless, as Table 4 shows, these basic cross-sectional estimates suggest that there is a strong correlation between public subsidies and the number

of proprietary schools in a county. Community college revenues are positively correlated with the number of proprietary schools in the county, perhaps reflecting higher demand for sub-baccalaureate education in counties with high funding levels. Interestingly, the number of community colleges in the county is strongly negatively correlated with the number of proprietary schools—the addition of one more public community college is associated with about ten fewer proprietary schools. The results bolster the claim that public and private two-year colleges are indeed substitutes—a strong public sector may drive private institutions out of the sub-baccalaureate market.

Pell Grants also appear to influence the number of proprietary schools in the market according to the cross-sectional estimates. An increase of $1,000 in the per-student maximum award amount is associated with about four additional proprietary schools in the market and year, a result that is significant at the ten percent level in all four specifications.

Still, unless we are willing to assume that there are no unobservables that are correlated with the explanatory variables, these numbers can show no more than a conditional correlation. Unlike previous studies of firm entry using cross-sectional data,[15] however, the panel nature of proprietary school and community college data used in this analysis allows me to correct this potential endogeneity with unique difference-in-difference and regression discontinuity strategies.

6. Community College Bond Measures and the Direct Provision of Education

To understand the causal relationship between the direct provision of public education and proprietary school entry, I exploit variation in vote margins and laws governing votes on local community college bond measures. According to the model, the passage of a bond measure in a county should increase the perceived benefits of a community college education, shift student demand toward public schools, and cause proprietary schools to exit the market.

[15] See for example Bresnahan and Reiss (1991) and Mazzeo (2002).

One-hundred and one community college bond measures were voted on in California counties between 1995 and 2002. The amount of the bonds ranged from $8 million to $658 million and, as described above, they were always earmarked for capital improvements for the local community colleges. The timing of the bonds, the flow of money into the community colleges, and the reaction time of proprietary school owners and students are crucial components in estimating the effect of a bond passage on the sub-baccalaureate postsecondary education market. While individual bond measures may differ in wording, case studies of five bonds reveal consistent patterns in community college bond outlays.[16] Bond money is generally scheduled to be used over ten years, though one college planned to have projects completed in eight years, and another in 12 years. Moreover, each college spends the money on multiple projects of varying sizes, and these appear to be spread evenly throughout the ten-year timeframe. In all cases, projects ranged from a few thousand dollars (e.g. a winery equipment pad cover) to several million (e.g. a new performing arts center), with larger bond measures resulting in more projects of all types and sizes. Rough calculations based on project reports and budgets suggest that the colleges spend between five and fifteen percent of their bond funding each year, regardless of the size of the bond.

To capture these patterns, I generate a variable "BondValue" that represents the sum of the discounted value of all the community college bonds currently in place in each county and year. I use a discount rate of ten percent to reflect the patterns of bond spending found in the case studies.[17] For example, a $100 million bond is worth just $62 million five years later. If a second or third bond is also in place in the county, its present discounted value is added to this sum. Measuring the effects of community college bond measures in this manner also captures the likely reaction of a proprietary

[16] The colleges were Shasta, Butte, Napa Valley, College of the Desert, and Contra Costa College. All of these colleges provided public information on their websites detailing the nature of the bond measure and outlining project budgets and timelines. The amount of the bonds passed in these districts ranged from $34 million to $133 million.
[17] Discount rates of 5, 15, 20, and 25 percent yield very similar results, with the coefficient on BondValue varying by only 0.002 and never changing in sign or significance.

school entrepreneur. Because the initial passage of a bond signals a long-term pattern of increased community college quality and capacity, I expect the effect of the bond on the proprietary school market to be strongest initially and diminish over the course of the decade. The effect will be stronger in counties with larger bond amounts.

The timing of the reaction of students and proprietary schools also deserves consideration. Sub-baccalaureate students are likely to respond fairly quickly to the passage of a bond measure. Since roughly 70 percent of students attend part-time at both public and private institutions, it seems reasonable to expect that at least some students who are currently enrolled will switch sectors in a matter of months in response to the bond measure. Students on the margin who have not yet enrolled may react even sooner. In both cases, even though many of the changes in the community college infrastructure may not have taken place in the first year, students on the margin are likely to anticipate the change in college quality and switch sectors accordingly.

If the impact of bond measures on the market for proprietary school education works through its impact on student demand, as the model predicts, then we would expect proprietary schools to take a bit longer than students to react to this shift in community college quality. It undoubtedly takes several months for a school to notice the reduction in student demand. Moreover, even if the decrease in demand is realized (or anticipated) as soon as the bond passes, it is likely that a proprietary school owner would wait to finish out the current semester, school year, or calendar year due to the high costs of closing and/or moving. For this reason, when gauging the reaction of proprietary schools to bond passage, I consider the net number of schools in the calendar year following the year of bond passage. For example, if the bond passes in 2000, I expect to see an impact on the net number of schools in 2001. Figure 1 shows that this one-year lag is supported in the data. The figure stacks all passed bonds in the data, setting $t = 0$ to the year of passage. The vertical axis displays the average number of proprietary schools per capita per county five years before and after bond passage. As the figure

shows, the number of proprietary schools per capita appears to grow in the years before bond passage—perhaps reflecting an increase in demand for sub-baccalaureate education. What is more striking, however, is that the number of proprietary schools begins a downward trend exactly one year after the passage of a bond measure—suggesting a strong proprietary school response that begins about one year after bond passage. Reflecting this pattern, the dependent variable of these regressions is the number of proprietary schools in county c at time $t+1$.

Difference-in-Difference

I first implement a type of difference-in-difference model comparing the change over time in the number of proprietary schools in counties where a bond was passed to the change in the number of proprietary schools in counties which did not pass bonds. I estimate:

$$\mathrm{N}_{\mathrm{Prop}_{c(t+1)}} = \alpha \mathrm{BondValue}_{ct} + \lambda Y_{ct} + \eta X_{ct} + \gamma W_{ct} + d_c + d_t + \varepsilon_{ct} \ , \qquad (11)$$

where d_c are dummy variables for each county and d_t are dummy variables for each year. As described above, the variable "BondValue" is the decayed sum of all the bonds in county c in year t. Y is a vector of variables that determine market size, X includes characteristics of the market, and W represents proprietary school costs. With the addition of the fixed effects, variables that are constant within markets (such as the number of community colleges, the maximum enrollment over ten years, tuition, and the Pell Grant maximum) drop from the analysis.

The model is identified off of differences in the timing and amount of bonds in each county and the fact that some did not pass bonds at all. Additional exogenous variation comes from the passage of Proposition 39 in 2000. The proposition altered the laws governing community college bond measure votes, lowering the percentage of "yes" votes needed to pass a bond from two-thirds to 55 percent. Some counties that would not have been able to pass bond measures before Proposition 39 were able to pass them in later years. I return to this issue in the next section.

By adding fixed effects for each county and year, the difference-in-difference approach can control for some of the omitted variables that would bias the results of cross-sectional estimates. Any potentially endogenous county characteristics that are constant over time will be eliminated with the addition of the county dummies, while time trends that are experienced by all counties are wiped out with the year dummies. However, time-varying unobservable characteristics of the sub-baccalaureate market may remain, potentially biasing the results of difference-in-difference estimates. If within-county variation in community college enrollments, proprietary school enrollments, local tax codes, or other policy changes are correlated with the timing or amount of bond passage and the number of proprietary schools in the market, estimates of the impact of bond passage will be biased, though the direction of bias is unclear.[18]

Given the nature of community college funding, state apportionments to community colleges are the most problematic in this regard. If the state's allocations to colleges are correlated both with bond passage and the number of proprietary schools in the market, difference-in-difference estimates will be biased. Fortunately, this does not appear to be a problem. State apportionments to the colleges are based on a complicated funding formula that takes into account projected student enrollments and local property tax revenues, but it specifically excludes any voter-approved debt in the accounting.[19] Figure 2 confirms this lack of correlation visually using apportionment data from 2000 to 2003 for a handful of counties. Comparing the left-hand panels to those on the right reveals no discernable differences in the patterns of state apportionments for counties that passed bonds during this period and those that did not.

Regression Discontinuity

[18] Though data on community college enrollments is available, it is simultaneously determined with the number of proprietary schools in the market and therefore endogenous. I use it as a separate dependent variable in the analysis that follows and I exclude it from regressions that use the number of proprietary schools as the dependent variable.
[19] This information is based on funding formula instructions issued to as a memo to county auditors by the California Community College's Chancellor's Office on March 26, 2002 (CCCCO 2005).

I can further reduce the likelihood of any bias from omitted variables by exploiting a discontinuity that occurs within two specific groups of counties. The first group consists of those counties with bond measure vote counts that fell between the pre- and post-Proposition 39 thresholds necessary for passage. For this group of counties, the passage or failure of the bond measure was based purely on the state-wide law that mandated a 66.7 percent "yes" vote for bond passage in the 1990s, and Proposition 39, which shifted the threshold down to 55 percent in 2000—making the fate of the bond measure exogenous to the characteristics of the county and the nature of its sub-baccalaureate education market.

The second group of counties that exhibit a discontinuity are those in which a bond measure passed or failed within a narrow margin, say, within five percentage points of the applicable threshold.[20] I argue that among these counties, ultimate passage of the bond measure was based on luck. The voting patterns in these counties were close enough to indicate that the public could have gone either way.[21] Unlike counties with "extreme" vote counts (e.g. 90 percent in favor of the bond) where voters are likely to have strong opinions about community colleges and proprietary schools, in close counties, the narrow margin of victory or defeat could have been caused by almost anything—such as low voter turnout on a rainy day or the miscounting of ballots. There is no compelling reason to believe that in these cases, bond passage is related to the characteristics of the sub-baccalaureate education market, making the fate of the bond arguably exogenous.

For the counties in both of these groups, the result of the bond measure vote is akin to random assignment or the result of a coin toss. When the sample is limited to what I will call "threshold" and "close" counties respectively, the passage of a bond can be treated as an exogenous positive shock to the budget of the local community college. The model is then identified off of a discontinuity in the

[20] A margin of five percent allows a reasonable sample size while at the same time maintaining a plausibly exogenous vote outcome. A margin of three percent yielded very similar, but less stable results. I report these results in footnote 23.
[21] See Lee, Moretti, and Butler (2004) for a similar identification strategy based on vote margins.

number of proprietary schools that results from a sudden increase in community college funding for those counties within these two groups that arbitrarily pass the bond.

The key identifying assumption of the regression discontinuity approach is that, within the limited sample, there are no mean differences between the group of counties that passed bonds and those that did not. If bond passage is truly exogenous then given a large enough sample, the characteristics of the county and its sub-baccalaureate education market should be similar across close and threshold counties regardless of bond passage or failure. Table 5a tests this assumption by comparing counties with bond passages and failures within the limited sample. The far left hand column lists the means of the group of counties for which all bond votes passed in the time period we observe. The right hand column lists the means for those counties that had at least one bond vote fail. Interestingly, these counties appear to be similar to each other on almost all observable dimensions, strengthening the claim that community college bond passage may have been arbitrary for these counties, and providing evidence that the primary identifying assumption for the regression discontinuity holds. In contrast, Table 5b compares the characteristics of all counties in the limited sample (close or threshold counties) to those that are left out of the sample in the regression discontinuity approach (the extreme counties). On most dimensions, including community college enrollments and completions, the two groups do seem to be significantly different from each other, suggesting that the regression discontinuity does indeed decrease the bias over the difference-in-difference approach.

Results: The Impact of the Direct Provision of Public Education

The cross-sectional estimation discussed in the previous section and displayed in Table 4 suggests that there is indeed a correlation between the public subsidies for sub-baccalaureate education and the entry decisions of proprietary school entrepreneurs. The difference-in-difference goes one step further in proving causation, while the regression discontinuity further reduces the bias of the

estimates. The results of both of the latter two estimation strategies lend support to the contention that the public provision of sub-baccalaureate education has a profound effect on the market. The first column of Table 6 displays estimates of the impact of community college funding on the number of proprietary schools in year $t+1$. All of the estimates reveal a significant negative impact of community college bond measure funding on proprietary school entry. The difference-in-difference results in the top row are smallest in magnitude suggesting that just one proprietary school per county is forced out of the market with the passage of a $100 million bond measure.[22] The regression discontinuity results reveal that roughly two schools are forced out of the market, when rounded to the nearest whole number. Despite the smaller sample sizes in the regression discontinuity approach, the results are still significant at conventional levels, even when the sample includes only close or threshold counties as displayed in the bottom rows of the table. Moreover, the larger size of the discontinuity results suggests a slight downward bias in the difference-in-difference estimates.

To assess the extent to which the proprietary school response is driven by changes in student demand, the right hand column of Table 6 displays the result of regressions using community college enrollments as the dependent variable. The difference-in-difference estimates in the top row reveal a positive and significant relationship between community college bonds and enrollments. For every $100 million in bonds that pass in a county, about 730 more students enroll in community colleges. The regression discontinuity results for the same dependent variable reveal estimates of a similar magnitude (revealing a change of 500-860 students) but only one set of estimates can be shown to be different from zero at conventional levels.[23]

[22] Note that the average size of a bond is actually larger—around $145 million—as reported in Table 1.

[23] The regression discontinuity results based on a three percent vote margin were very similar to those reported here based on a five percent margin. In all cases estimates were of the same sign and significance. Specifications including both close and threshold counties (25 counties) yielded estimates of -0.015 on the number of schools and 0.067 on enrollments. Limiting the sample to close counties only (14 counties) yielded slightly different results of -0.024 and 0.011 on schools and enrollments, respectively.

Interestingly, the enrollment figures are remarkably consistent with the reaction of proprietary schools. Accounting for the fact that the average enrollment in proprietary schools is about 350 students (Cellini 2005), a net loss of two proprietary schools (resulting from the passage of a $100 million bond) would mean that roughly 700 students had shifted away from the private sector. It is certainly noteworthy that the net gain in community college enrollments from a $100 million bond is also around 700 students. Based on rough estimates of community college and proprietary school enrollments that I report in Cellini (2005), these 700 students account for about two percent of all two-year college students in the average California county.

The estimates presented above support the notion that these two types of institutions do in fact compete in the same market and draw on an overlapping consumer base. More importantly, a marginal increase in direct public funding for sub-baccalaureate education does indeed appear to increase student demand for public sector education and crowd-out private enterprise. The correspondence between the demand- and supply-side results suggests that this type of policy change causes a shift in student demand at the intensive margin between the private and public sector—among students for whom $R_{CC_{ij}} \approx R_{Prop_{ij}} > R_{Non_{ij}}$. The direct provision of public education appears to divert students from private institutions, rather than promoting an overall increase in enrollment at the extensive margin between attendance and non-attendance. In practical terms, the students most likely to experience this shift are those of type 2, who can find programs to meet their needs in both community colleges and proprietary schools—for example, those interested in vocational fields that are offered in both types of institutions.

7. The Pell Grant Program and Financial Aid Vouchers

It is clear that public school funding has a considerable impact on proprietary school entry, but what happens to the market when we finance students instead? The cross-sectional estimates in Table

4 suggested that financial aid did indeed alter the market for sub-baccalaureate education as the maximum per-student Pell Grant was positively correlated with the number of private schools in the market.

To estimate the causal effect of financial aid on the entry decisions of proprietary schools and student demand, I again add county and year fixed effects to the model in equation (10), as in the difference-in-difference strategy examining bond measures. While this strategy eliminates the bias due to any omitted variables that are common within counties and over time, it also wipes out the effects of the Pell grant maximum, since the maximum award is set at the national level.

However, it is reasonable to suspect that the impact of financial aid awards will differ within counties over time according to the percent of eligible students. Pell Grant eligibility varies according to family income, assets, and household size (as these are used to determine the expected family contribution) (U.S. Department of Education 2001), making Pell Grant eligibility thresholds quite similar to poverty thresholds. In fact, in 2002, the average family income of a Pell Grant recipient was $18,333 (U.S. Department of Education 2003a), a figure remarkably similar to the $18,392 poverty line for a family of four (U.S. Census Bureau 2002). I therefore use each county's adult poverty rate as a proxy for Pell Grant eligibility. If the percentage of adults in households below the poverty line increases, we would expect the Pell Grant maximum to have a greater impact on student demand and the entry decisions of proprietary schools. For this reason, I include an interaction between the Pell Grant maximum and the adult poverty rate in the fixed effects models. I estimate:

$$N_{\text{Prop}_{ct}} = \beta(\text{Pell}_t * \text{Poverty}_{ct}) + \lambda Y_{ct} + \eta X_{ct} + \gamma W_{ct} + d_c + d_t + \varepsilon_{ct} \qquad (12)$$

The effect of the Pell Grant Program is then identified off of changes over time in the policy and the shifting proportion of the population eligible for the awards within the county.

Finally, since changes to the Pell Grant program for each academic year (running from July 1 to June 30 of the following year) are announced in the preceding January or February (U.S.

Department of Education 2003b, 2004b), I expect proprietary schools to react in the same calendar year as the announcement. Students will likely react in the same academic year that the award goes into effect. However, I also report results for dependent variables measured one year after the change to capture any lags in student and school responses. Moreover, since 2003 poverty data is missing for about half of the California counties, I also estimate the model omitting data from that year, to be sure that the results are not driven by the change in the sample.

Results: The Impact of Financial Aid

Table 7 displays the results of the fixed effects estimation. In the left-hand columns, the effect of the Pell Grant maximum interacted with the poverty rate is significant and positive with a coefficient of roughly 0.6 in both specifications: the higher the poverty rate, the greater the effect of the Pell Grant maximum on the number proprietary schools in the county. The effect is smaller in magnitude, but still significant one year later. To better assess the policy implications of these estimates, Table 8 calculates the marginal effect of the Pell Grant maximum on the number of proprietary schools in year t, holding constant the poverty rate. At the median poverty rate, raising the Pell Grant maximum by $1,000 (the maximum in 2003 was $4,050) induces eight new proprietary schools to enter the market—an increase of 16 percent for counties with the mean number of proprietary schools. Even in the wealthiest counties, increasing the Pell Grant by $1,000 would result in a ten percent increase, while the poorest counties would see the number of private schools increase by 24 percent. It is also worth noting that these predictions actually underestimate the marginal effect of increasing the Pell Grant maximum, since part of the effect is subsumed in the year dummies. Clearly, the Pell Grant program has a strong influence on proprietary school entrepreneurs.

It is unclear, however, what these patterns of firm entry reveal about student demand. The two right-hand columns of Table 7 display the results of regressions using community college enrollments in year t and $t+1$ as the dependent variable. The coefficients on the Pell Grant maximum interacted

with poverty are positive, but not significantly different from zero. It may be that the fixed effects wipe out a small enrollment response in either direction or there may be no enrollment response at all.

Considered in conjunction with the strong impact of the Pell Grant on proprietary school entry, the lack of a demand-side effect suggests that marginal increases in this type of financial aid open access to education. That is, the Pell Grant has a greater influence on students at the extensive margin between attendance and non-attendance, than at the intensive margin between sectors. According to the model developed in previous sections, students for whom $R_{Prop_{ij}} \approx R_{Non_{ij}} \geq R_{CC_{ij}}$ enter the sub-baccalaureate market—and the private sector specifically—when the Pell Grant increases.

There are at least two possible mechanisms that could drive this result. The most obvious possibility is that when the size of financial aid awards increase, more students can afford a college education—particularly a private education. Low-income students on the extensive margin would experience a reduction in the out-of-pocket cost of sub-baccalaureate education and would be therefore be more likely to pursue training. However, because the Pell Grant maximum already exceeds the cost of attendance at a California community college for many students, an increase in the maximum size of the award would not affect enrollment in public institutions at the extensive margin. The low-income students who could pursue education at community colleges would enroll in these institutions even without the increase in the maximum award. It is those students whose needs are not met by the public sector that are most affected by the increase in the maximum financial aid voucher. These students are likely to be low-income vocational students in fields that are dominated by proprietary schools, such as computers and real estate. They may also be students who are looking to enter very specialized certificate programs that are only offered by a few private institutions. For example, a student wishing to obtain the Le Cordon Bleu Patisserie and Baking Diploma has only two schools to choose from in

California.[24] An increase in the maximum amount of financial aid available might make this program affordable enough to outweigh the opportunity costs associated with attendance.

A second possible explanation for the strong reaction of proprietary schools to the Pell Grant is that rather than responding to enrollment per se, proprietary schools may respond to the Pell Grant program itself. With more money available through the program, entrepreneurs open schools—particularly in low-income areas—then actively recruit eligible students. Anecdotal evidence supports this contention and raises concerns that proprietary schools may be taking advantage of low-income students (Moore 1995). On the other hand, as long as proprietary school education is of sufficient quality for students to gain from attending, then active recruitment of low-income students is desirable.

A related concern alluded to in qualitative research, is that proprietary schools respond to financial aid maxima by raising tuition above the cost of education simply to extract greater profits at the expense of the federal government (Honick 1995). However, if the presumed tuition increases were large enough to offset the increase in the Pell Grant maximum, one would expect to see community college enrollments increase in response, as the out-of-pocket cost of a proprietary school education would have increased. The lack of response in community college enrollments in Table 7 suggests that to the extent that proprietary schools raise their tuition in response to higher Pell Grant awards, the fee hikes generally remain below the maximum award amount.

8. Discussion and Conclusions

This study assesses the impact of public subsidies on the market for two-year college education using a new data set of California proprietary schools, panel data methods, and a unique regression discontinuity approach. Two types of public subsidies are considered—the direct provision of public education and student financial aid vouchers.

[24] www.collegeanduniveristy.net accessed May 21, 2005.

Close votes on local community college bond measures and a change in the threshold needed for vote passage create a discontinuity that I use to estimate the impact of the direct provision of education on the market. With this method, I find that an exogenous positive shock to the budget of a California community college elicits an increase in public sector enrollment and the crowding out of private institutions. The magnitude of the effects of the funding on community college enrollments and proprietary school entry are remarkably similar, suggesting that about 700 sub-baccalaureate students per county, or about two percent, are diverted from the private sector to the public sector for every $100 million increase in direct funding to community colleges. The results confirm that public and private sub-baccalaureate institutions are indeed competitors and draw from an overlapping student base. Moreover, the students who switch sectors are likely to be vocational students who can find programs to fit their needs at both types of institutions.

Financial aid vouchers for students are also shown to have a large impact on proprietary school entry. At the mean, a $1,000 increase in the maximum per-pupil Pell Grant award results in a 16 percent increase in the number of private schools in the average county, with even stronger effects in counties with higher poverty rates where more students are eligible. Interestingly, the impact of financial aid maxima on community college enrollments was indistinguishable from zero. Taken together, these patterns indicate that rather than diverting students from one sector to the other, financial aid awards actually increase the overall pool of sub-baccalaureate students, drawing in students who are on the extensive margin between attendance and non-attendance. It could be that the increase in the maximum Pell Grant award makes proprietary school education affordable for low-income vocational students, or it may be that proprietary schools step up recruitment efforts when more federal funding becomes available.

The evidence presented here suggests that community colleges and proprietary schools are strong competitors and should be considered together in determining public policy for the two-year

college market. The question remains, however, as to which type of public financing—funding schools or financing students—offers taxpayers and society as a whole the most favorable balance of costs and benefits.

While a full cost-benefit analysis of these two policy options is not possible, some very rough back-of-the-envelope calculations produce some interesting results. As detailed in Tables 9a and 9b, I am forced to make strong assumptions in assessing the private and government costs and benefits to each policy over one year.[25] According to my calculations, spending an additional $100 million on the Pell Grant program yields a much higher ratio of benefits to costs than the same amount of money spent on local community college bonds. In both cases the benefits outweigh the costs by a substantial margin, but the Pell Grant program generates a benefit-cost ratio of 12.9 compared to 3.9 for community college bonds. The calculations account for the fact that the impact of a policy change is not limited to the students on the margin. Each policy also impacts the inframarginal students who would have attended these institutions regardless of the policy change. With 2.5 million full- and part-time students attending California community colleges (CCCCO 2005) and about 1.3 million students attending proprietary schools in California (Cellini 2005), the inframarginal effects of these policies dominate the marginal effects, particularly in the case of community college bond measures.

Nonetheless, even after manipulating the assumptions in the cost-benefit analysis in favor community college bond measures, investment in the Pell Grant program still appears to offer a more favorable balance of benefits to costs. If it is indeed the case that marginal increases in the direct provision of public education divert vocational students from the private to the public sector, while student financial aid vouchers open access to education for low-income students, then it can be argued

[25] Most notably, I assume that community college bonds increase the returns to education for community college students by three percentage points. I should also note I that do not attempt to quantify the full set of costs and benefits that accrue to society in equilibrium, such as changes in migration, crime, civic participation, efficiency, and additional educational attainment that may occur as a result of either policy over an extended period of time (I discuss the latter two points in more detail below). With these limitations, the results of the cost-benefit analysis should be taken lightly.

that taxpayer dollars should be reallocated in favor of financial aid programs. However, several additional considerations, not captured in the cost-benefit analysis, are worth noting.

First, financial aid vouchers may produce even larger benefits to society than reported in the cost-benefit analysis by enhancing the efficiency of the market. The private sector undoubtedly responds more quickly than the public sector to fluctuations in student demand for education and training (Heckman 2000, Turner 2005), potentially mitigating job loss and promoting re-training during economic downturns. Moreover, student vouchers allow consumers to choose the education provider that best fits their needs, promoting competition between schools, lowering the cost of education, driving out low-quality providers, and creating incentives for innovation in education.[26]

Second, the cost-benefit analysis above assumed that community colleges and proprietary schools offered identical programs of study and generated similar returns. For vocational programs—where community colleges and proprietary schools offer overlapping programs—this may indeed be the case. In academic fields, however, the story is quite different. Public institutions play an indispensable role as the primary providers of sub-baccalaureate academic education, making the direct public provision of education essential to promoting study in the humanities, arts, social sciences, and other academic fields.

Unlike vocational fields, certificates and associate degrees in academic fields may not bring with them the same immediate rewards in the labor market. Research by Jacobson, LaLonde, and Sullivan (2005) shows that quantitative and technical vocational courses in community colleges generate earnings gains of 14 percent for men and 29 percent for women. In contrast, non-technical courses such as humanities and social sciences showed earnings gains of just four percent and were not

[26] For excellent reviews of the literature on the effects of voucher programs in elementary and secondary school markets see Hoxby (2003) and Neal (2002).

distinguishable from zero at conventional levels.[27] To the extent that vocational courses are by nature more technical than academic courses, it is likely that private investment in vocational education will be closer to the social optimum in the absence of government intervention in the market.

For this reason, the case can be made that public investment in sub-baccalaureate education should focus on promoting the transfer option in community colleges, while allowing the private sector to address the demand for vocational skills. While the immediate impacts of lower-division academic coursework on wages may not be apparent, sub-baccalaureate academic programs promote long-term gains by encouraging future enrollment in four-year institutions and the eventual attainment of a bachelor's degree. Indeed, many California community colleges offer students written guarantees of the transferability of their coursework to specific universities (CCCCO 2005). In contrast, the Wall Street Journal recently reported on the lack of transferability of credits earned in for-profit colleges (Hechinger 2005). If students who are diverted from the private sector to the public sector by community college bond measures are more likely to transfer to four-year colleges, there may be added benefits from this policy option not accounted for in the cost-benefit analysis above.

One additional reason to promote academic coursework in community colleges is that the per-student cost of education is lower in these institutions than in four-year colleges ($4,419 compared to $10,078 in the California State University system (CPEC 2003)), so educating students in community colleges for the first two years of a four-year college career would reduce the burden borne by taxpayers. On the other hand, some have argued that community college enrollment is not conducive to completing a bachelor's degree, even for students who aspire to that level of education. Interestingly, Brint and Karabel (1989) and Clark (1960) blame this problem on the fact that community colleges offer so many vocational education and terminal degree programs. But even with

[27] In Jacobson, LaLonde, and Sullivan (2005) technical courses include vocational courses in health professions, technical trades (such as air conditioner repair), technical professional courses (such as software development), and math and science academic courses. The non-technical group includes all other courses, including academic social sciences and humanities, courses in sales and service, physical education, English as a second language, and basic skills courses.

these programs, Rouse (1995) shows that high school graduates starting their college careers in community colleges experience no change in the probability of attaining a bachelor's degree compared to students starting off in four-year colleges. If both sets of claims have merit, it may be possible for community colleges to actually increase the probability that students obtain bachelor's degrees in the future if they offer fewer vocational and more academic programs. As it stands, however, only about four percent of all community college students in the state, or about 42,000 students, transfer from community colleges to California's public four-year colleges each year (CPEC 2005), suggesting that more effort should be made to encourage students in academic fields to continue their education.

Finally, the preceding discussion assumed away any differences in the quality of a proprietary school versus public education, but the question of school quality is inescapable if society is to weigh the benefits of the two types of public financing schemes and the two types of schools. Much more research—and more data—is needed to answer questions of relative school quality. For now, assuming equal school quality—at least on the margin—across sectors, the results of this study suggest that taxpayer dollars are most effectively spent on student financial aid vouchers that foster vocational education in the private sector; while public investments in the direct provision of public sub-baccalaureate education should focus on enhancing academic programs at community colleges.

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Table 1. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Regression Data 1993-2003					
Number of Prop Schools per Cnty	638	52	125.56	0	1044
CC Revenue per Cnty (in millions)	638	86.2	166.34	0	1,058
Number of CCs per Cnty	638	1.8	3.19	0	21
Max Pell Grant Award	638	3,378	447	2,856	4,091
Average CC Tuition	638	427	67	338	540
Maximum CC Enrollment Over Perioc	638	19,535	43,304	0	305,917
Population	638	573,587	1,339,037	1,130	9,979,600
Population of Neighboring County	638	603,275	1,342,625	9,325	9,979,600
Population Growth	638	1.3	1.7	-2.8	21.0
Per Capita Income	638	27,661	8,756	16,976	70,215
Unemployment Rate	638	9.1	4.54	1.6	29.4
Adult Poverty Rate	604	12.3	4.11	4.4	29.5
Percent White	638	67.5	18.2	18.9	100
Percent Black	638	3.8	3.9	0.0	18.4
Percent Hispanic	638	22.1	14.9	3.2	73.9
Percent Other	638	8.3	6.4	0.8	33.0
Percent Age 0-14	638	22.4	3.7	11.7	31.0
Percent Age 15-29	638	7.1	1.0	3.6	10.6
Percent Age 30-49	638	30.5	2.8	25.3	42.1
Median Home Price	638	227,046	97,176	125,120	558,100
Bond Vote Data 1995-2003					
Year of Bond Vote	101	2001	2	1996	2002
Bond Amount (in millions)	101	145	109	8	685
Bond Passed	101	0.52	0.50	0	1
Close Vote	101	0.38	0.49	0	1
Threshold Vote	101	0.55	0.50	0	1

Notes: Observations in top panel are county-years, while observations in the bottom panel are number of bond votes. Adult poverty rate is not available for 2003 for 34 counties. "Prop" and "CC" refer to proprietary schools and community colleges, respectively. All dollar values reported in 2003 dollars.
Source: Author's tabulations of data from the BPPVE, California Statistical Abstract, California Community College Chancellor's Office, California Postsecondary Education Commission, and the Institute for Social Research.

Table 2. Mean Number of Programs per County in California 2002

Program Name	CC	Prop	Difference	t-stat	p-value
Administrative & Support	26	21	5	0.54	0.59
Business	22	24	-2	-0.25	0.81
Computers	20	70	-50	-1.95	0.06
Construction & Contracting	8	7	1	0.52	0.61
Finance & Insurance	5	10	-5	-1.26	0.21
Food & Bar	5	2	3	2.53	0.01
Health & Medicine	24	19	5	0.50	0.62
Professional Services	15	31	-16	-1.48	0.14
Real Estate	3	18	-15	-2.80	0.01
Teaching	6	5	1	0.56	0.58
Technical Trades	16	26	-10	-1.00	0.32
Transportation	13	15	-2	-0.42	0.67
Travel & Hospitality	3	2	1	0.56	0.57
Humanities & Arts	74	15	59	2.94	0.01

Source: Author's tabulations of data from the Bureau of Private Postsecondary and Vocational Education and the California Community College Chancellor's Office.

Table 3. Examples of Public and Proprietary Programs and Courses

PUBLIC CC	PROPRIETARY
Santa Barbara County	
Alan Hancock College	**Atlas Computer Centers**
Office Software Support Certificate	***Office Technician Certificate***
Computer Concepts and Applications	
or	Office Computer Basics
Word Processing Applications	Word Processing with Microsoft Word XP
Spreadsheet Applications	Spreadsheets with Microsoft Excel
Database Applications	Databases with Microsoft Access
Internet Business Applications	Intermediate Office Skills
Presentation Design	
Stanislaus County	
Modesto Junior College	**Central Valley Opportunity Center**
Maintenance Mechanic Certificate	***Automotive Service & Repair Certificate***
Introduction to Technical Industries	Shop safety
Basic Automotive System	Tire Repair and Maintenance
Automotive Electricity 1	Oil Change and Lubrication
Automotive Electricity 2	Tune-up Fuel Systems
Automotive Transmissions & Transaxles	Engine Diagnosis
Manual Transmissions & Drive Axles	Steering Systems Inspection and Repair
Braking Systems	Brake Service and Repair
Steering, Suspension & Alignment	Front-end Alignment/Suspension
San Bernardino County	
San Bernardino Valley College	**The Realty Institute**
Real Estate Certificate	***TRI Salesperson Licensing Courses***
Real Estate Principles	Real Estate Principles
Real Estate Practice	Real Estate Practices
Real Estate Appraisal: Residential	Real Estate Appraisal
Real Estate Finance	Real Estate Finance
Legal Aspects of Real Estate	Property Management
Real Estate Economics	Real Estate Office Administration
or	
Introduction to Accounting	
"The Real Estate program is designed to provide students with the course requirements for pre-qualification for the real estate sales or broker's examination."	"His home study courses have prepared thousands of students to enter the real estate industry, by offering salesperson and broker licensing and continuing education or license renewal courses."

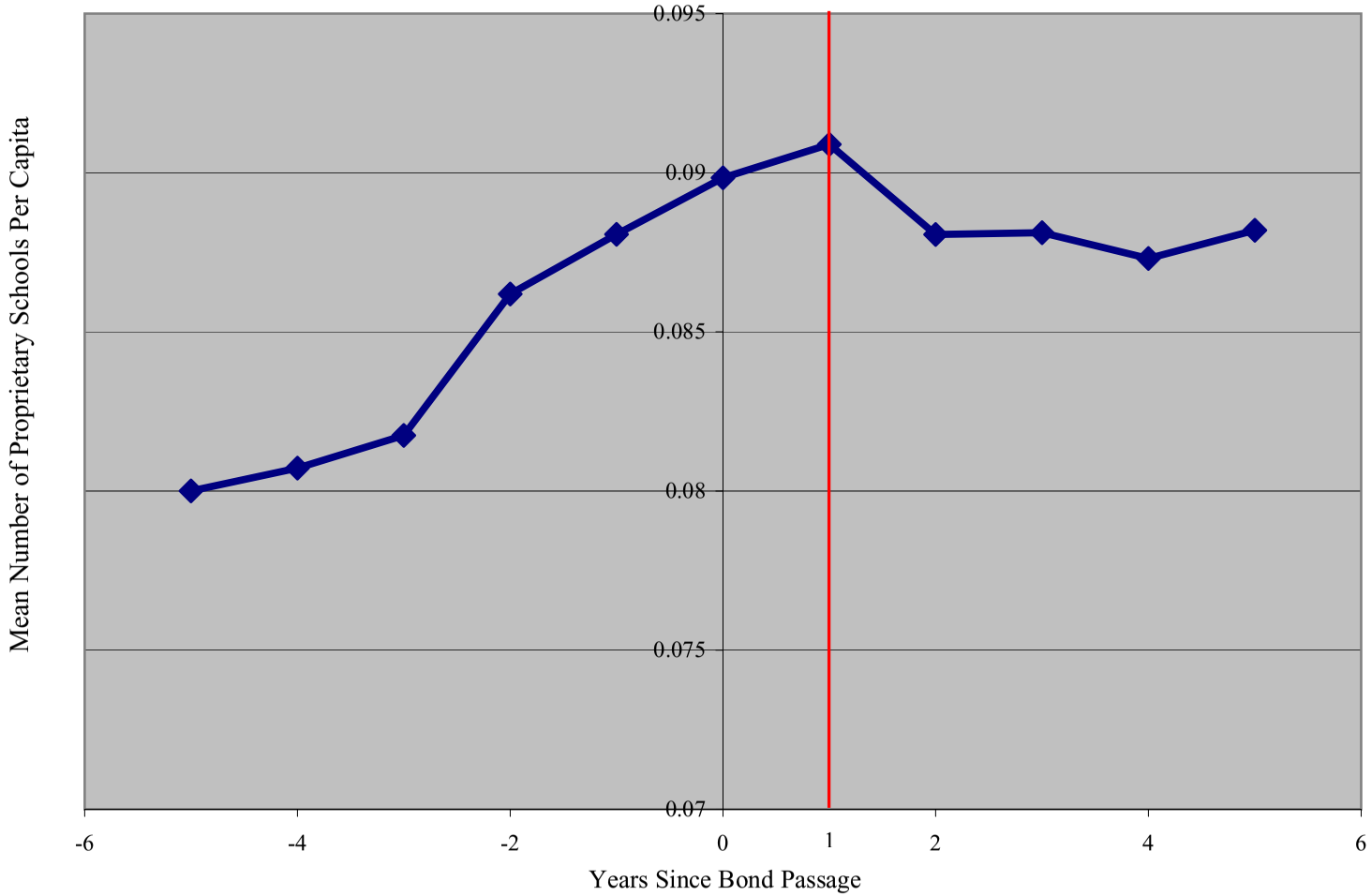
Source: Individual schools' web sites.

Table 4. Cross-Sectional Estimates of the Number of Proprietary Schools in the Market

	(1)	(2)	(3)	(4)
Community College Revenue‡	0.255***	0.224***	0.225***	0.224***
	(0.025)	(0.024)	(0.024)	(0.025)
Number of Community Colleges	-9.934***	-9.335***	-9.563***	-9.522***
	(1.073)	(1.074)	(1.104)	(1.146)
Maximum Pell Grant Award†	4.170***	3.881**	3.157*	4.083*
	(1.317)	(1.532)	(1.738)	(2.123)
Community College Tuition	-0.013	-0.019	-0.023*	-0.013
	(0.012)	(0.012)	(0.012)	(0.017)
Max CC Enrollment†	-0.143	-0.027	-0.039	-0.032
	(0.151)	(0.147)	(0.148)	(0.155)
Population†	0.089***	0.087***	0.088***	0.087***
	(0.004)	(0.004)	(0.005)	(0.005)
Population of Neighboring County†	-0.000	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Population Growth in County	-0.794*	-0.107	-0.087	-0.032
	(0.426)	(0.421)	(0.421)	(0.440)
Average Per Capita Income†	0.114	-0.360**	-0.444**	-0.444**
	(0.114)	(0.147)	(0.175)	(0.188)
Unemployment Rate	-0.314	0.115	0.123	-0.026
	(0.212)	(0.278)	(0.279)	(0.344)
Percent Black		0.583**	0.560**	0.563**
		(0.251)	(0.252)	(0.263)
Percent Hispanic		0.026	0.009	0.016
		(0.102)	(0.104)	(0.111)
Percent Other		0.822***	0.810***	0.797***
		(0.166)	(0.166)	(0.175)
Percent Age 0-14		-1.586***	-1.537***	-1.617***
		(0.327)	(0.332)	(0.357)
Percent Age 15-29		-0.492*	-0.468	-0.545*
		(0.296)	(0.297)	(0.325)
Percent Age 30-49		0.249	0.240	0.389
		(0.317)	(0.318)	(0.373)
Median Home Price†			0.013	0.013
			(0.014)	(0.016)
Adult Poverty Rate				0.292
				(0.375)
Observations (county-years)	638	638	638	604
R-squared	0.98	0.98	0.98	0.98

Standard errors in parentheses. * Denotes significance at 10% level, ** denotes significance at 5% level, *** denotes significance at 1% level. ‡ Denotes variables in millions. † Denotes variables in thousands.

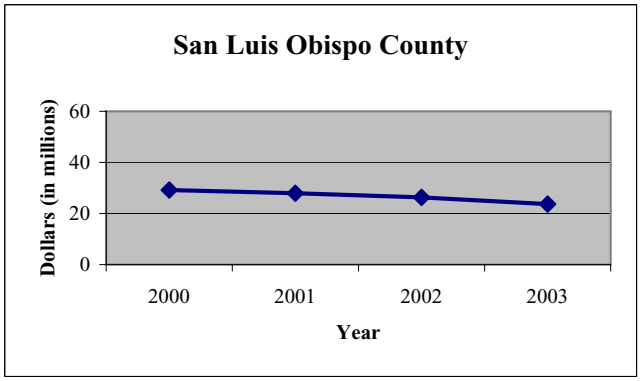
Figure 1. Mean Number of Proprietary Schools Per Capita vs. Years Since Bond Passage

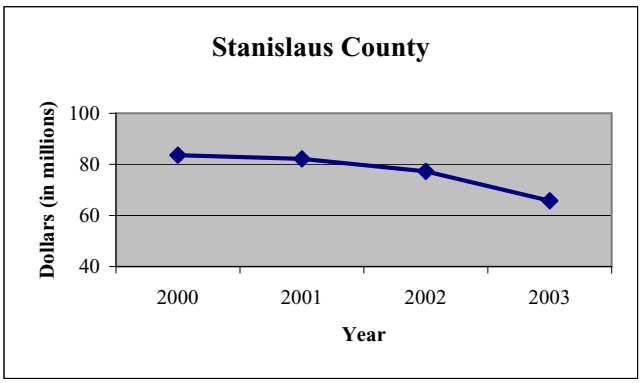


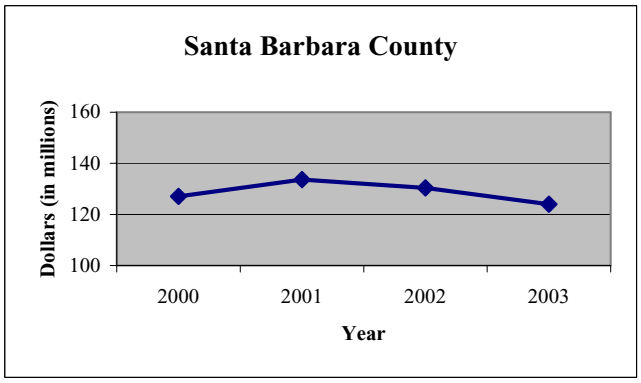
Source: BPPVE, CA Statistical Abstract, and Institute for Social Research.

Figure 2. California Community College Apportionments for Selected Counties 2000-2003

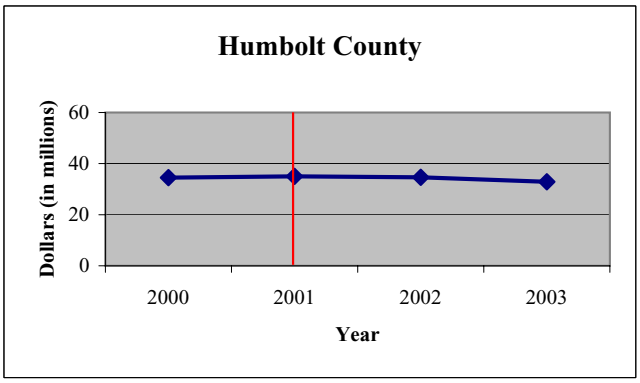
No Bonds Passed 2000-2003

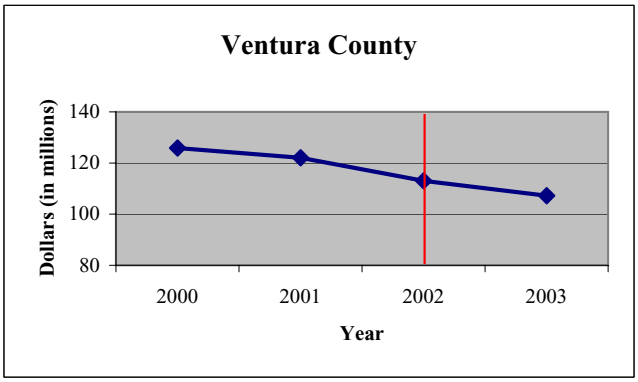


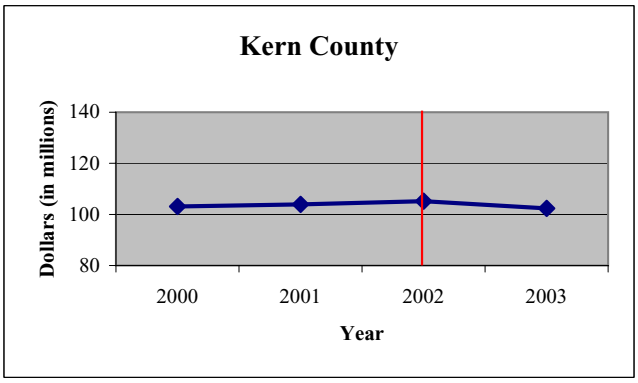




Bonds Passed 2000-2003







Note: Year of bond passage marked with vertical red line.
Source: California Community Colleges Chancellor's Office and Institute for Social Research.

Table 5a. T-Tests of Observables for Counties with at least One Failed Bond vs. Counties in which All Bonds Passed Among Close & Threshold Counties

Variable	None	Failure	t-stat	p-value
Population†	942	1,001	-0.27	0.79
Pop of Neighboring County†	1,248	742	1.58	0.12
Pop Growth	1.29	1.24	0.32	0.75
Per Capita Income†	27.11	25.69	1.36	0.17
Unemployment Rate	6.88	8.16	-2.34	0.02
Adult Poverty Rate	11.58	12.85	-2.12	0.04
Percent Black	4.5	5.5	-1.41	0.16
Percent Hispanic	25.3	25.0	0.19	0.85
Percent Other	9.4	9.5	-0.08	0.93
Percent age 0-14	23.1	23.4	-0.76	0.45
Percent age 15-29	21.0	21.1	-0.32	0.75
Percent age 30-49	30.3	30.4	-0.54	0.59
Median Home Price†	234.8	205.8	2.12	0.04
CC Enrollment	28,231	27,327	0.15	0.88
CC Completions	3,681	2,578	1.92	0.06
Average Apportionment†	148,000	201,000	-1.29	0.20

† Denotes variables in thousands.

Table 5b. T-Tests of Observables for Close and Threshold Counties vs. Extreme Vote Counties

Variable	Extreme	Close	t-stat	p-value
Population†	225	979	-5.89	0.00
Pop of Neighboring County†	325	930	-4.67	0.00
Pop Growth	1.32	1.26	0.34	0.73
Adult Poverty Rate	12.05	12.38	-0.87	0.38
Per Capita Income†	24.46	26.22	-2.21	0.03
Unemployment Rate	9.38	7.69	4.18	0.00
Percent Black	2.8	5.1	-6.65	0.00
Percent Hispanic	19.9	25.1	-3.81	0.00
Percent Other	7.5	9.4	-3.31	0.00
Percent age 0-14	21.5	23.3	-5.43	0.00
Percent age 15-29	19.0	21.1	-6.65	0.00
Percent age 30-49	30.6	30.4	1.11	0.27
Median Home Price†	187.7	216.5	-3.34	0.00
CC Enrollment	6,473	27,662	-6.00	0.00
CC Completions	711	2,988	-7.05	0.00
Average Apportionment†	73,000	178,000	-4.46	0.00

† Denotes variables in thousands.

Table 6. The Impact of Local Community College Bond Measures on the Market for Sub-Baccalaureate Education

Independent Variable:
Bond Value = Present discounted value (10% discount rate) of all bonds in place in year t (in millions).

	Number of Prop Schools in year *t+1*	CC Enrollment (in hundreds) in year *t*
(1) Diff-in-Diff (all counties)	-0.010**	0.073***
(st. error)	(0.004)	(0.025)
Number of Counties	58	58
(2) Reg. Disc. (close & threshold counties)	-0.015**	0.062
(st. error)	(0.007)	(0.042)
Number of Counties	27	27
(3) Threshold Counties Only	-0.014*	0.086*
(st. error)	(0.008)	(0.050)
Number of Counties	24	24
(4) Close Counties Only	-0.017**	0.050
(st. error)	(0.008)	(0.050)
Number of Counties	20	20

Notes: All regressions include the following variables: adult poverty rate, per capita income, unemployment rate, population, population of neighboring county, population growth, percent black, percent Hispanic, percent other race/ethnicity, percent of population age 0-14, age 15-29, and age 30-49, median home price, dummy variables for county and year. Standard errors in parentheses. * Denotes significance at the 10% level, ** denotes significance at 5% level, *** denotes significance at 1% level.

Table 7. The Impact of Financial Aid on the Market for Sub-Baccalaureate Education

Independent Variable:
*Pell*Poverty=Maximum Per-Student Pell Grant Award (in thousands) * Adult Poverty Rate*

	Number of Props in year *t*	Number of Props in year *t+1*	CC Enrollment (in hundreds) in year *t*	CC Enrollment (in hundreds) in year *t+1*
(1) Fixed Effects (all counties & years)	0.680**	0.419*	1.325	0.686
(st. error)	(0.274)	(0.254)	(1.199)	(1.247)
Number of Counties	58	58	58	58
(2) Fixed Effects (without 2003)	0.610**	0.419*	0.897	0.686
(st. error)	(0.280)	(0.254)	(1.276)	(1.247)
Number of Counties	58	58	58	58

Notes: All regressions include the following variables: adult poverty rate, per capita income, unemployment rate, population, population of neighboring county, population growth, percent black, percent Hispanic, percent other race/ethnicity, percent of population age 0-14, age 15-29, and age 30-49, median home price, dummy variables for county and year. Standard errors in parentheses.
* Denotes significance at the 10% level, ** denotes significance at 5% level, *** denotes significance at 1% level.

Table 8. Marginal Effects of Pell Grant Maximum on the Number of Proprietary Schools

Percentile Distribution	Poverty Rate	Number of Additional Proprietary Schools if Pell Grant Max is Increased by $1000	Percent Increase Over Mean Number of Schools (51)
10th Percentile	7.34	5	10%
25th Percentile	9.12	6	12%
50th Percentile	12.09	8	16%
75th Percentile	14.89	10	20%
90th Percentile	17.17	12	24%

Table 9a. Funding Schools Cost-Benefit Analysis

A rough estimate of the impact of an additional $100 million spent on local community college bonds in one year.

BENEFITS

Earnings gains for inframarginal CC students	**$384,379,926**
Rate of return to one year of college (any type)	0.08
Increase in return from improvement in quality with bond	0.03
New return to CC education	0.11
Median earnings of high school grad with no college age 21-64 in CA	31,864
Years of Earnings	30
Discount rate	0.06
PV of lifetime earnings before bond	438,603
Returns to a year of sub-bac education before bonds	35,088
PV of lifetime earnings after bond	507,868
Returns to a year of CC education after bonds	55,865
Difference in returns per student	20,777
Number of inframarginal students per county	18,500
Earnings gains for diverted students	**$15,167,424**
Difference in returns per student (see above)	20,777
Number of marginal students diverted from private to public sector	730
Decrease in private cost of education for diverted students	**$2,984,970**
Tuition at CC	330
Tuition at prop school (equal to total cost of ed at CC)	4,419
Difference in tuition from switching sectors	4,089
Number of marginal students diverted from private to public sector	730
Total Benefits	**$402,532,320**

COSTS

Bond value	**$100,000,000**
Cost to government of diverted students in CC	**$2,984,970**
Cost to government per CC student	4,089
Number of marginal students diverted from private to public sector	730
Total Cost	**$102,984,970**
Benefit/Cost Ratio of Funding Schools	**3.91**

Table 9b. Financing Students Cost-Benefit Analysis

A rough estimate of the impact of an additional $100 million spent on Pell Grants in one year.

BENEFITS

Earnings gains for new sub-bac students	**$1,332,830,809**
Rate of Return to one year of college (any type)	0.08
Median earnings of high school grad with no college age 21-64 in CA	31,864
Years of Earnings	30
Discount rate	0.06
PV of lifetime earnings	438,603
Returns to a year of sub-bac education	35,088
Number of new students that will be receiving aid	37,985
Total Benefits	**$1,332,830,809**

COSTS

Cost of Pell Grant increase for inframarginal sub-bac students	**$11,832,035**
Dollar per-student increase in Pell Grant Max needed to generate an identical cost to government of $100 million in bonds	4.29
Number of sub-bac students currently receiving aid	2,758,050
Cost of Pell Grant increase for new sub-bac students entering the market	**$91,137,392**
Coeff. on Pell (in thousands)*Poverty	0.68
Coeff. On Pell (in dollars)*Poverty	0.00068
Median adult poverty rate in CA counties	12.09
Increase in number of prop schools in median poverty cnty per dollar	0.0082
Increase in number of props per county with above increase in aid	0.0353
Number of counties in the U.S.	3086
Increase in number of props nationally	109
Number of students per prop school	349
Number of new prop students brought into market	37,985
Average grant for prop student	2,395
Total new amount of aid to each new prop student	2,399.29
***Subtotal: Aggregate cost to gov. of increasing max (designed to equal the amount spent by gov. on $100 million in CC bonds)**	**$102,969,427**
Private cost of education for new sub-bac students entering the market	**$758,525,476**
Cost of education (assume same as CC)	4,419
Median earnings of high school grad with no college age 21-24 in CA	20,734
Foregone earnings (9 months)	15,550
Number of new prop students entering market	37,985
Total Costs	**$102,969,427**

Benefit/Cost Ratio of Financing Students 12.94