UNLIMITED BUS ACCESS: AN EVALUATION OF THE UCLA BRUINGO PROGRAM AND ITS LESSONS FOR CALIFORNIA

Donald Shoup, Department of Urban Planning, UCLA
Jeffrey Brown, PhD candidate, Department of Urban Planning, UCLA
Daniel Baldwin Hess, Department of Urban Planning, SUNY-Buffalo

Despite increases in federal, state, and local government aid to public transit, the share of commuters taking public transit fell from 5.3 percent in 1990 to 4.7 percent in 2000. Transit now serves less than 2 percent of all trips, and passengers occupy only 27 percent of the seats available on public transit buses.[1] At the same time, auto use is increasing, and American motor vehicles now consume one-eighth of the world's total oil production.[2] But there is also some good news. A small, but growing, number of transit agencies and universities have joined forces to offer a new program that provides fare-free transit for more than a million people. This program is generically known as Unlimited Access, and it has spread rapidly during the past decade.[3] Unlimited Access programs do not provide costless transit; instead, they offer a new way to pay for transit. The university pays the transit agency, and all members of the university community ride free.

Rapid spread of Unlimited Access suggests that it is meeting a market test; universities are willing to pay for it. Nevertheless, there have been few evaluations of its performance. Studies of the programs at the University of Washington and at the University of Wisconsin-Milwaukee found that bus ridership increased substantially after their program began.[4] Both studies focused more on program operations than how they affected travel choices, and the data available for evaluating the programs was limited. A new program at UCLA provides the data required to conduct a more detailed evaluation of Unlimited Access.

This chapter evaluates the pilot program, called BruinGO, which was designed to evaluate the effects of introducing fare-free transit at UCLA (the Bruin is UCLA's mascot). The pilot program was offered with one of the three transit agencies that serve UCLA, but not with the other two agencies. This experimental design allows us to compare the travel behavior of the faculty, staff, and students who live inside the area served by BruinGO, and those who live outside it, both before and after BruinGO began.

BruinGO

UCLA is located on the west side of Los Angeles. Three major transit agencies serve the campus, but BruinGO includes only the Santa Monica Municipal Bus Lines (the "Big Blue Bus"), which serves all of Santa Monica and much of West Los Angeles. Students, staff, and faculty swipe their university ID card through an electronic reader when they board any Blue Bus, and the university pays the fare of 45¢ per ride. The total fare payment for the eight-month pilot program (October 2000 to June 2001) was $640,000 for 62,700 eligible riders (36,900 students + 26,800 staff and faculty), or $1.27 per person per month.[5]

BruinGO ridership during the pilot program was 1.4 million rides, or 6 percent of the 23 million rides made on the Blue Bus in 2000. Because fare-free transit was offered to only a small percentage of Blue Bus riders, overcrowding did not become a problem. This sets BruinGO apart from traditional proposals to make transit free for *all* riders. If a transit agency offers free rides to everyone, total ridership can increase substantially. Beyond the resulting overcrowding, the agency loses all its existing fare revenue from current riders, and receives no revenue from the new riders. With BruinGO, the Blue Bus continues to receive all the revenue from its current riders, and gains additional revenue from the new riders. From the transit agency's point of view, the main effect of BruinGO is that UCLA pays its riders' fares.

Five of the Blue Bus's 13 lines come directly to UCLA. The added demand and fare revenue created by BruinGO allowed the Blue Bus to schedule 16 new buses on two of these lines, while the new riders on the other lines were carried with the existing capacity. With the added service, 304 scheduled Blue Buses arrive on campus every weekday.[6]

Because BruinGO includes only the Blue Bus, it is a natural experiment. UCLA faculty, staff, and students who live *outside* the Blue Bus service area are not offered an equivalent program, and they therefore serve as a control group for our analysis. We can estimate BruinGO's effects on travel by comparing the commuting behavior of those who live *inside* and *outside* the Blue Bus service area. For our analysis, we define the Blue Bus service area as all of the zip codes that include a Blue Bus route to UCLA.[7] About 35 percent of all faculty and staff, and 46 percent of students, live inside the Blue Bus service area.

Evaluation Methodology

UCLA conducted transportation surveys of employees (faculty and staff) and of students before BruinGO began, and again after it had operated for six months. The total number of respondents was 4,565 faculty, staff, and students in 2000, and 3,614 in 2001. The respondents provided their addresses, so they can be divided into two sub-groups: (1) those who live *inside* the Blue Bus service area, who serve as the experimental group, and (2) those who live *outside*, who serve as the control group.[8] We can therefore compare the commute mode shares before and with BruinGO, and between the experimental group and the control group.

BruinGO's effects can be estimated in three ways. For the high estimate, we assume that BruinGO caused all the mode changes for commuting to campus after the Blue Bus became free. For the medium estimate, we assume that BruinGO caused only the mode changes by those who live inside the Blue Bus service area. For the low estimate, we assume that the mode changes made by those who live outside the Blue Bus service area would have occurred inside the Blue Bus service area even if BruinGO had not been in place, and subtract them from the mode changes inside the service area.

The "medium" and "low" estimates are both conservative. By focusing only on those who live inside the Blue Bus service area, both estimates ignore mode changes made by those commuters who drive from outside the Blue Bus service area for part of their trip, park off campus, and ride the Blue Bus for the rest of their commute (an informal park-and-ride arrangement). For the medium estimate, we simply ignore these new riders who live outside the

Blue Bus service area. For the low estimate, we penalize BruinGO for the new riders by subtracting them from the medium estimate.[9]

UCLA set three goals for BruinGO: (1) increase bus ridership to campus, (2) reduce vehicle trips to campus, and (3) reduce parking demand on campus.[10] We examine whether BruinGO met these goals for two groups: employees (faculty and staff) and students.

How did BruinGo affect staff/faculty commuting?

Southern California has the worst air quality in the nation, and as part of its air quality management plan the South Coast Air Quality Management District (SCAQMD) requires employers of 250 or more employees to reduce vehicle commuting to work. In fulfilling this requirement, employers conduct annual surveys of their commute choices, and report the results in a standard format, similar to an income-tax return.[11] We can use these surveys to examine how BruinGO changed faculty/staff commuting behavior.

Appendix Figure 1 shows the recent history of faculty/staff bus ridership. Between 1995 and 2000, the bus share for faculty/staff commuting declined in every year but one, and it fell from 9.2 percent in 1995 to 7.6 percent in 2000. The share of *all* faculty and staff (both inside and outside the Blue Bus service area) who commute by bus jumped from 7.6 percent in 2000 to 13.1 percent in 2001—a 73-percent increase in just one year.[12]

Do regional factors (such as gasoline prices) explain the large increase in bus ridership to UCLA between 2000 and 2001? Bus ridership was relatively unchanged at three nearby California State Universities (CSU) and a community college, while it increased substantially at UCLA, as can be seen on Appendix Figure 2. The decline in bus ridership at Santa Monica College (SMC), a 29,000-student entity also located in the Blue Bus service area, is particularly striking. These comparisons suggest that BruinGO caused the large increase in bus ridership.

Because the bus share for commuting to UCLA increased by 5.5 percentage points between 2000 and 2001, and because 21,149 employees reported to work during the survey period in 2001, there were about 1,163 new bus riders to campus in 2001 (21,149 x 5.5%). This is the high estimate of BruinGO's effects: it attributes all of the bus ridership increase to BruinGO. BruinGO does induce some commuters who live outside the service area to park off campus and take the Blue Bus the rest of the way, but ridership to campus on non-Blue-Bus lines may also have increased. To be conservative, we will not consider this high estimate further. For the medium and low estimates of BruinGO's effects, we will examine only the increase in ridership *inside* the Blue Bus service area.

Faculty/staff bus share for commuting

	Blue Bus Service Area	
	Inside	*Outside*
Before BruinGO	8.6%	7.2%
With BruinGO	20.1%	7.6%
Difference	11.5%	0.4%
Percent change	134%	6%

Source: Crain & Associates (2002, Tables 3 & 4)

For UCLA faculty/staff commuters who live *inside* the Blue Bus service, the bus mode share rose from 8.6 percent to 20.1 percent (see Box). The total number of faculty/staff bus riders increased by 134 percent (11.5 ÷ 8.6), and 57 percent were new riders (11.5 ÷ 20.1). This figure is our medium estimate of BruinGO's effects.

For every 100 commuters who live inside the Blue Bus service area, 11 began to ride the bus after BruinGO began; four of them switched from solo driving, four from carpools, two from vanpools, and one from bike or walk. (Details appear on Appendix Table A1.) The net result was a large shift from private vehicles to public transit for commuting to campus: 37 percent of the new bus riders were former solo drivers, and the number of solo drivers fell by 9 percent. In 2000, there was one bus rider for every five solo drivers, and in 2001 there was one bus rider every two solo drivers. In contrast, the mode shares for faculty and staff who live *outside* the Blue Bus service area remained within 1 percentage point of their 2000 values. This suggests that BruinGO caused almost all of the mode changes that occurred inside the Blue Bus service area.

Perhaps some of these mode changes inside the Blue Bus service area would have occurred without BruinGO. Mode shares for those who live outside the Blue Bus service area changed slightly, and we can subtract these "outside" changes to develop a low estimate of the changes caused by BruinGO. Doing so produces our low estimate that BruinGO increased faculty/staff bus ridership by 128 percent, and reduced solo driving by 8 percent.[13]

How did BruinGO affect student commuting?

UCLA Transportation Services surveyed students about their commuting choices in May 2000 (before BruinGO began) and again in May 2001, after BruinGO had operated for seven months. We can use the results to estimate how BruinGO changed students' commuting behavior. The bus share for students who live inside the Blue Bus service area rose from 17 percent to 24 percent, while the drive-alone share fell from 17 percent to 12 percent. For every 100 students who live inside the Blue Bus service area, seven began to ride the bus and two began to walk; five switched from solo driving, two from bicycles, and one from carpools. The net result was a shift from private vehicles to public transit and walking. In 2001, 29 percent of student bus riders were new riders, and 71 percent of these new riders were former solo drivers. The number of student bus riders increased 43 percent, and the number of solo drivers fell 33 percent.[14] This is our medium estimate of BruinGO's effects. In 2000, there was one bus rider for every solo driver; in 2001, there were two bus riders for every solo driver.

Some of the mode changes by students who live inside the Blue Bus service area might have occurred without BruinGO. The mode shares for students who live outside the Blue Bus service area also changed, and we subtract these "outside" changes to develop a low estimate equivalent to our low estimate for faculty and staff. Bus ridership increased 13 percent, and solo driving declined 26 percent (see Appendix Table A1).[15] Our low estimate is therefore that BruinGO increased student bus ridership inside the Blue Bus service area by 13 percent, and reduced student solo driving by 26 percent.

Fare Elasticities

The large increases in bus ridership and decreases in solo driving during BruinGO's first year are consistent with what happened at other universities with Unlimited Access programs. For example, consider what happened at the University of Washington, which is very similar to UCLA in its urban location, size, and range of functions. When the university began its U-Pass program in 1991, the number of commuters who rode the bus to campus increased by 57 percent,

and the number who drove alone fell by 30 percent.[16]

We can use the ridership increases at UCLA to estimate the fare elasticity of demand for transit commuting. Among those who live *inside* the Blue Bus service area, the fare elasticity of transit demand is between –0.67 and –0.64 for faculty and staff, and between –0.22 and –0.07 for students.[17] The lower initial bus share for faculty/staff commuters before BruinGO began—only 9 percent—may help explain their higher fare elasticity.

The number of drive-alone trips decreased by between 8 and 9 percent for faculty and staff, and by between 26 and 33 percent for students (see Appendix Table A2). We can use these data to calculate the cross-elasticity between the fare for public transit and the number of drive-alone trips to campus. The cross-elasticity is between +0.04 and +0.5 for faculty and staff, and between +0.13 and +0.17 for students.[18] These values may seem low, but they lead to large absolute changes in the number of drive-alone trips because both the fare change and the initial number of vehicle trips are large. Lowering the transit fare to zero increased bus ridership by at least 33 percent, and reduced drive-alone trips by at least 16 percent.[19]

Before BruinGO began, 3,400 faculty and staff, and 3,000 students drove to campus alone from within the Blue Bus service area. With BruinGO, 3,100 faculty and staff, and 2,000 students drove to campus alone. Therefore, more than 1,000 solo drivers gave up their parking spaces after BruinGO began. These spaces do not remain vacant, of course, because UCLA can sell them to daily visitors or to students on the wait list for a permit.[20]

BruinGO Also Serves Many Non-commute Trips

Our evaluation has focused on commute trips, but riders also use BruinGO for many non-commute trips. For example, faculty and staff ride the Blue Bus to off-campus worksites, an option that is especially useful for the many vanpool commuters who do not have a car available during the day. Even for those who do have cars available, riding the bus saves the time for parking and unparking at both ends of a trip, and this can make the bus faster than driving for short trips. As part of the pilot program evaluation, UCLA Transportation Services requested comments on BruinGO from the university community. More than 2,500 students, staff, and faculty responded, and we can use their own words to explain why they ride the Blue Bus for university business trips.[21]

> *My job requires a lot of travel around campus and Westwood in general. Since the BruinGO program started, my job has been made easier.*
>
> *When I travel between offices, taking the Blue Bus for free saves my time and UCLA's time.*
>
> *I use the Blue Bus for meetings in the Wilshire Center at least 3 days a week. BruinGO saves a lot of time since I don't have to find parking and also saves UCLA money because I don't need validation. Not to mention the Wilshire traffic!!*

Students also use BruinGO for many non-commute trips. Students report that they ride free to the Getty Museum, their internships, volunteer work, the beach, or anywhere else they want to go. Whole classes take the bus to museums or public meetings. Again, we can use representative comments sent to UCLA Transportation Services to explain how BruinGO gives students access to many valuable social, educational, and job opportunities in Los Angeles.

> *I am more likely to attend cultural events, concerts, and club meetings since I know that transportation will be so easy. BruinGO allows me to get much more out of my education besides simply taking classes.*
>
> *I feel like the whole city is laid out before me. I use my Bruin Card to go to my internship at Loyola Marymount University.*
>
> *As a teaching assistant, I believe that expanding learning outside the classroom (to museums) has always been a worthwhile experience. Now, with BruinGO, it is a great deal easier for students to expand their horizons beyond campus and Westwood.*
>
> *As an international student at UCLA, I have found it extremely reassuring and welcoming to be able to negotiate the landscape of Los Angeles with the help of BruinGO. I arrived in LA without a car, and BruinGO facilitated the process of getting to know the city and the UCLA campus.*

These comments by students, staff, and faculty show that BruinGO does much more than change the way they commute to campus.

Is BruinGO worthwhile?

BruinGO increased transit ridership, reduced solo driving, and caused more than 1,000 solo drivers to give up their parking spaces. Are these benefits sufficient to justify BruinGO's cost?

Some costs and benefits of BruinGO are borne by the university, some by the transit agency, and some by society as a whole. We have estimated the costs and benefits of BruinGO from the perspective of the campus community, because this is the population being asked to decide whether or not to continue the program.[22] We allocated the costs and benefits among four groups within the campus community: students, faculty and staff, university departments, and campus visitors.

The Cost of BruinGO

BruinGO is funded entirely from parking revenue, which is derived from both daily parking fees and the sale of monthly parking permits. Of the total parking revenue, students pay 17 percent, faculty and staff pay 25 percent, university departments pay 4 percent (for university guests), and campus visitors pay 54 percent.[23] We multiply these percentages times BruinGO's $810,000 total cost to allocate this cost, and the top panel of Appendix Table A3 shows the distribution.[24]

The Benefits of BruinGO

BruinGO provides many benefits to the campus community, but some are difficult to measure and value. For example, BruinGO helps the university recruit and retain employees and students, and it enhances the educational experience of students by providing access to local educational and cultural sites. BruinGO also provides two benefits that we *can* measure and value: reduced fare payments for riders, and reduced parking demand.

Reduced fare payments

BruinGO subsidizes individual riders, not the Blue Bus. The university pays the Blue Bus for each BruinGO ride, but students, staff, and faculty receive the money.[25] That is, riders do not reach into their own pocket to pay the fare when they board the bus, but into the university's pocket. For those who were riding the bus before BruinGO began, the fare payment is a transfer payment to students, staff, and faculty, because it replaces expenditures they would have made without the program. These existing riders made 909,000 rides, and we valued their fare reduction benefit at 45¢ per ride.[26] The riders' benefit for the existing rides is thus $409,000 (909,000 rides x 45¢ per ride). For the new rides induced by BruinGO, the value to the riders is presumably less than 45¢ a ride, because they were unwilling to pay the fare before the program began. If we assume that the demand curve is linear - as shown in Appendix Figure 3 - the value to riders is the area under the demand curve (the consumer surplus) for the 512,000 new rides, and the average value per ride is one-half the fare payment, or 22.5¢ per ride. The total value of the new rides is therefore $115,000 (512,000 rides x 22.5¢ per ride).[27] The combined fare reduction benefit, or increase in consumer surplus, for the existing and new riders is worth $524,000 ($409,000 + $115,000). Because students made 73 percent of the BruinGO rides, while faculty and staff made 27 percent, we allocate 73 percent of the fare reduction benefit to students, and 27 percent to faculty and staff.

Most of the university's spending for BruinGO is direct financial aid for students or a tax-exempt fringe benefit for staff and faculty. Because we count UCLA's fare payment to the Blue Bus as a cost, we must also count the fare savings for UCLA's riders as a benefit. Students sent many comments to UCLA Transportation Services describing this benefit.

> *I love the BruinGO program. I have like 700 bucks total . . . no kidding, and the BruinGO program is like my lifeline.*
>
> *I save about $10 weekly, getting back and forth from school. $40 a month buys a lot of groceries.*
>
> *I know $1 a day doesn't seem like a lot, but being able to ride free means I can spend the $25 I save per month on other things . . . like schoolbooks.*

A survey of student BruinGO riders in April 2002 found that 76 percent of them received financial aid from the university, so their fare subsidy increases their financial aid packages.[28]

BruinGO saves some riders far more than their bus fares. A survey of BruinGO riders found that 56 percent own a car. When asked why they did not drive to campus, most of them said that they did not receive a parking permit or that a permit costs too much, but several

volunteered that another person in the household had the car. One said: "BruinGO is our second car." If BruinGO convinces a family that they can live with only one car, the money saved by forgoing a second car can amount to several thousand dollars a year for fuel, maintenance, insurance, parking, and other ownership costs avoided.

Reduced parking demand

BruinGO riders save money, but they are also led, as if by an invisible hand, to promote another goal: reduce parking demand. Paying the fare for a bus rider to campus costs far less than building a parking space on campus, so avoiding the expense of new parking spaces is one of BruinGO's major benefits. BruinGO allows the university to satisfy parking demand with a smaller parking supply.

Former solo drivers who began to ride the bus after BruinGO began vacated the parking spaces they previously occupied, and these spaces are made available to new users. For these new users, the parking spaces vacated by former solo drivers are perfect substitutes for newly constructed spaces. We can therefore value the benefit of reducing parking demand by comparing it with the cost of increasing the parking supply. A new 1,500-space parking structure being built on campus will cost $47.3 million, or $31,500 per space.[29] Because UCLA is willing to pay $31,500 per new parking space, we can use this figure to represent value of making another space available. BruinGO buys back parking spaces from existing users, as opposed to building new spaces. BruinGO reduced the demand for parking by at least 1,020 spaces. At a value of $31,500 per space, this reduction in parking demand is worth $32.1 million (1,020 spaces x $31,500 per space).

The debt service on the capital borrowed to finance the parking structure shows the annual value of the one-time capital cost of a new parking space: $2,414 per year. When the operating cost is added, the annual capital and operating cost per new parking space is $2,673 per year ($223 per month).[30] At this rate, the cost of 1,020 new parking spaces is $2.7 million per year (1,020 spaces x $2,673 per space). Because UCLA is willing to pay $2.7 million per year to increase the campus parking supply by 1,020 new parking spaces, we assume that reducing campus parking demand by 1,020 spaces is also worth $2.7 million per year. And because UCLA increases campus parking fees to finance new campus parking spaces, we allocate the avoided cost of new spaces according to the sources of campus parking revenue.

Even those who pay for parking receive a net benefit because BruinGO avoids the high cost of increasing the parking supply. Drivers enjoy the financial benefit of reduced parking demand in the form of lower parking fees. This benefit is worth $2.7 million, while BruinGO cost $810,000. Therefore, the benefit-cost ratio for drivers who pay to park is 3.4 to 1 ($2.7 million ÷ $810,000). Because BruinGO is financed entirely by parking fees, drivers pay for bus riders, but *both* drivers and bus riders are better off.

Many students, staff, and faculty members wrote to UCLA Transportation Services to report that BruinGO reduced their demand for parking:

I LOVE the BruinGO system. I gave up my parking permit because of it.

Because of BruinGO, I have mothballed my car and take the bus to school every day, so BruinGO has been a tremendous benefit to me (and has stopped me from applying for a parking permit).

I never plan to apply for a parking permit again.

By reducing the demand for parking, the university avoids building new parking structures on campus, makes parking more affordable for those who must commute to campus by car, and can use the land that might have been devoted to new parking for other purposes. By encouraging some students, staff, and faculty to give up their spaces, BruinGO also makes more parking available for campus visitors, and helps counter UCLA's image as an ivory tower with parking as its moat.

External benefits

Beyond its direct benefits to UCLA, BruinGO also produces benefits to all of Los Angeles. By diverting trips from cars to public transportation, BruinGO reduces vehicle trips and vehicle emissions. This is an important byproduct of fare-free transit, because Los Angeles has the worst traffic congestion and air pollution in the US. We have not attempted to put a dollar value on the social benefits of reduced traffic congestion and air pollution, but we can suggest their magnitude by comparing BruinGO with the alternative strategy of building new parking structures. The Environmental Impact Report for UCLA's new 1,500-space, $47-million parking structure shows that it will generate 1.5 million vehicle trips to and from UCLA every year. A parking structure does not, by itself, generate vehicle trips; rather, where there is a shortage of parking, a new parking structure will enable more vehicle trips. These additional vehicle trips will exhaust 87 tons of carbon dioxide, 9 tons of nitrogen oxide, 14 tons of reactive organic gases, and 7 tons of particulates into the air every year.[31] By reducing the demand for vehicle trips, BruinGO can create substantial environmental benefits for the entire region.

Comparing the Benefits and Costs of BruinGO

We can now compare the measured benefits and costs of BruinGO. BruinGO's benefit/cost ratio exceeds 1.0 for every group considered. The students' exceptionally high benefit/cost ratio of 6.3 to 1 helps explain the many enthusiastic comments that students have sent to UCLA Transportation Services about BruinGO:

BruinGO is one of the smartest things UCLA has done in years. With this program, I feel UCLA is finally showing it cares for students.

I am a first year graduate student and I do not have the words to adequately describe how wonderful it is to have a free transportation system available to me.

BruinGO makes me feel proud to be a Bruin.

Appendix Table A3 shows that BruinGO's benefits are $3.25 million a year (for fare savings and reduced parking demand), and its costs are $810,000 a year (for fare payments and administration). The net benefit is thus $2.44 million a year, and the overall benefit/cost ratio is 4 to 1.

Difficulty in Predicting Ridership and Cost

The pilot program for BruinGO proved to be a success. But until a university offers an Unlimited Access program, many people have difficulty understanding how it will work, and predicting the ridership and cost is difficult. We can show this difficulty on Appendix Table A4 by comparing the predictions made before BruinGO began with the results observed during the pilot program in 2000-2001.

In 1998, UCLA hired a consultant to predict the ridership and cost of a transit-pass program for faculty and staff. The consultant predicted that fare-free transit for faculty and staff would cost $170,000 per month (exclusive of administrative costs), but BruinGO's actual cost for faculty and staff amounted to only $19,200 per month in 2000-2001, or 11 percent of the predicted cost.[32]

Why did the consultant overestimate BruinGO's cost? The main reason seems to be a misunderstanding of how a university transit-pass program works. The consultant assumed that UCLA would buy a regular transit pass (at a cost of $42 per month) for all employees who do not have a UCLA parking permit. The consultant also assumed that most employees who receive these transit passes would not use them. This misunderstanding helps to explain why the consultant overestimated BruinGO's actual cost by 885 percent. Although BruinGO gives free transit to all commuters (not just those without a parking permit), it costs 89 percent less than the consultant calculated.[33]

The consultant also predicted that fare-free transit would attract only 315 new faculty/staff riders, but BruinGO attracted at least 800 new riders, or more than 260 percent of what was predicted.[34] What explains this error? The consultant assumed that the fare elasticity of demand for transit ridership would be only –0.18, which is extremely low. In reality, the fare elasticity for faculty and staff turned out to be between –0.67 and –0.64, more than three times greater.[35] The consultant also used the *point* elasticity rather than the *arc* elasticity that economists recommend for predicting the effects of large fare changes (in this case a 100-percent reduction); this arithmetic error reduced the predicted ridership by another 50 percent.

These difficulties in predicting the effects of BruinGO show the value of UCLA's decision to offer a pilot program. UCLA, the Big Blue Bus, and the riders themselves could not fully understand how a transit-pass program works without the actual trial run. BruinGO's high ridership and low cost are a welcome departure from many transportation investments that attract fewer riders and cost more than consultants predicted.

Paying for Unlimited Access

The pilot program showed that BruinGO is worth doing, but if it is to continue, UCLA must devise a permanent way to pay for it. Similarly, if another California university, employer, or agency wished to implement an unlimited transit access program, it would have to develop a funding mechanism. Opportunities for such funding would obviously vary from sponsor to sponsor. In the UCLA case, however, we were able to suggest funding sources. These sources may be indicative of the opportunities that could be available to other potential sponsors of unlimited access.

In the UCLA case, we suggest three possible ways to pay for BruinGO: (1) use some of the released permit parking spaces for daily sales; (2) use BruinGO to replace more expensive transportation programs; or (3) use the savings from avoided new parking construction. Each of the three are discussed below.

Use Some Released Parking Spaces for Daily Sales

BruinGO reduced at least 1,000 solo-driver trips a day for commuting to campus, and therefore made at least 1,000 parking spaces available for other drivers. Even commuters with parking permits occasionally rode the bus: among permit holders who live within the Blue Bus service area, 19 percent reported that they used BruinGO, and that they rode the bus to campus an average of two days a week.[36] Because BruinGO releases parking spaces occupied by former solo drivers who shift to the Blue Bus, making these spaces available for meters and daily sales is an appropriate way to finance BruinGO. There is a chronic shortage of parking spaces available to daily users, and the spaces released by BruinGO would not have been available to new users without BruinGO, so the additional daily-sales revenue can be used to pay for BruinGO without raising permit prices or imposing student fees.

Although UCLA now allocates only 384 spaces to meters and 1,400 spaces to daily sales, the meters and daily sales earn about 50 percent of total parking revenue of $30 million a year. This occurs because visitors pay $2 per hour or $7 per day for parking on campus, but most students, staff, and faculty pay only $54 per month for permits.[37] UCLA can therefore pay at least part of the cost for BruinGO by using the reduction in commuter parking demand to increase the number of spaces available for meters and daily sales. And because the daily sales revenue was $14.8 million in FY 2001-2002, an increase of only 5 percent would yield $740,000 a year.

The UCLA Parking Service estimates that each daily-sales parking space generates $1,200 per year more than a permit space.[38] If only half the 1,000 spaces released by commuters who shifted from solo driving to transit were used for daily sales rather than permits, they would generate an additional $600,000 a year. Beyond paying for BruinGO, increasing the number of spaces available for visitors will enable the university to welcome more people to its museums, libraries, concerts, lectures, plays, conferences, and athletic events. In addition, faculty, staff, and students who regularly commute by bus will find it easier to pay for parking on campus on days when they need their cars.

Use BruinGO to Replace Other Transportation Programs

UCLA can also shift money from other campus transportation programs to pay for BruinGO. The University currently funds five campus transportation programs, in addition to BruinGO: the on-campus shuttle called Campus Express, vanpools, two shuttles to off-campus housing (and, of course, the construction of new parking spaces). UCLA pays less than $20 a month for each commuter who rides the Blue Bus to campus every day. The monthly costs for commuters who use the other transportation programs every day are much higher, as shown on Appendix Figure 4: $62 per rider for the Campus Express, $65 per rider for the vanpool program, $169 per driver for new parking spaces, and $193 and $394 per rider for the two off-

campus housing shuttles.[39] BruinGO is more cost-effective than other campus-operated transportation programs.

In FY 2000-2001, UCLA paid the Blue Bus $640,000 to carry 1.4 million BruinGO riders to and from campus, while it paid $1.9 million to transport 1.3 million riders for much shorter trips around campus on the Campus Express. BruinGO therefore carries 6 percent more riders than the Campus Express, but at less than half the cost. Government subsidies to the Blue Bus help explain why the cost of a public transit trip from home to campus (45 cents) is only a third of UCLA's cost for a short shuttle trip on campus ($1.41). The Campus Express often runs empty during vacations, and this also helps explain its higher cost. UCLA pays to operate the Campus Express whether people ride it or not, and also pays for parking structures whether people park in them or not, but it pays for BruinGO only when students, staff, and faculty ride the Blue Bus. UCLA also suspends BruinGO during the summer when there is no shortage of campus parking, and this further reduces its cost.

UCLA could use BruinGO to replace the Campus Express. Doing so would save UCLA $1.9 million a year and provide better transit service for the campus. The Blue Bus could reroute one or two of the five lines that serve the campus to follow the Westwood Village-to-McGowan Hall route of the Campus Express. The Culver City Bus line to UCLA duplicates the Westwood Village-to-Ackerman Union route of the Campus Express, so including Culver City in BruinGO could replace that route. Because most shuttle rides would be very short, and would occupy otherwise empty seats on existing buses, the transit agencies could charge an extremely low fare per boarding compared with UCLA's cost of $1.41 per ride on the Campus Express. The transit agencies operate their service on weekends, in the evenings, and on holidays, so riders would enjoy more frequent service with extended hours—all at a much lower cost than the Campus Express, which shuts down on evenings and weekends. This strategy will also improve BruinGO itself, because bus riders could travel directly to the center of campus, rather than only to the edge of campus. The $1.9 million savings should be more than enough to pay for the Blue Bus, and to expand the program to include the Culver City Bus.

Use BruinGO to Replace Future Parking Construction

UCLA paid the Blue Bus $71,000 per month for student, staff, and faculty rides, and BruinGO reduced daily parking demand by at least 1,000 spaces. Therefore BruinGO costs $71 per month to reduce parking demand by one space ($71,000 ÷ 1,000 spaces). The cost of a parking space in the new IM Field parking structure is $223 per space per month (see Table 4), so BruinGO's cost is only 32 percent of the annualized cost of building a new parking space.[40]

One reason for BruinGO's low cost in comparison with a new parking structure is that UCLA pays for BruinGO only when riders use it. Ridership falls sharply at night, on weekends, and during holidays and vacations, so UCLA pays almost nothing at those times. In contrast, UCLA pays for parking structures 24 hours a day, 365 days a year, even when they are empty. A parking structure is completely filled for only a few hours each weekday, and the high cost of substantial unused off-peak capacity drives up the average cost per user.

Because the parking supply is fixed in the short run, the spaces freed by BruinGO are released to provide additional permits for students or daily sales to visitors. In the long run,

however, BruinGO can substitute for new construction. UCLA plans to build 2,368 spaces in three new structures over the next decade at a cost of $55 million. Because BruinGO is cheaper than new parking spaces, it can be paid for with the money saved by building fewer or smaller parking structures.

Conclusion

The substantial mode shifts caused by BruinGO refute the common assumption that fare-free transit cannot entice commuters from their cars in California. Among UCLA faculty and staff who live in the Blue Bus service area, bus ridership for commuting to campus increased by 134 percent, and solo driving fell by 9 percent. Among students, bus ridership increased by 43 percent, and solo driving fell by 33 percent. Because these results were achieved in a California city famous for its addiction to cars, they suggest that unlimited access programs would also work at many other universities in California and elsewhere. About 60 universities now offer fare-free transit, and their programs cover only 6 percent of the 14 million students enrolled in U.S. universities, so the opportunity for growth in transit ridership is enormous.

The startling 134-percent increase in UCLA employees' transit ridership after BruinGO began has significant implications for the broader concept of employer-based fare-free transit (Eco Pass) programs. These Eco Pass programs allow any employer located within a transit agency's service area to purchase fare-free transit for all its employees at a bulk rate. Only six US transit agencies (Dallas, Denver, Portland, Salt Lake City, San Jose, Seattle) now offer Eco Pass programs, and the potential market for employer-based programs is much greater than for university-based programs. The ridership increases at UCLA demonstrate that fare-free transit for employees and students is a promising innovation with great potential. California, with its problems of traffic congestion, air pollution, and costs of road construction and maintenance, should look at experiments such as BruinGO for future guidance in resolving its transportation dilemma.

References

Boyd, Brent, Melissa Chow, Robert Johnson, and Alexander Smith. 2002. University Transit Passes: An Evaluation. UCLA Master's degree client project prepared for the Los Angeles County Metropolitan Transportation Authority.

Brown, Jeffrey, Daniel Baldwin Hess, and Donald Shoup. 2001. Unlimited Access. *Transportation* 28(3): 233-267.

Crain and Associates. 2002. UCLA BruinGO! Transit Pass Program. Prepared for UCLA Transportation Services, April.

Crain and Associates. 1998. UCLA Transit Subsidies/Incentives Study, Prepared for University of California at Los Angeles. January.

Davis, Stacy. 2000. *Transportation Energy Data Book: Edition 20,* ORNL-6959, prepared by the Oak Ridge National Laboratory for the U. S. Department of Energy. Available online at <http://www-cta.ornl.gov/data/tedb20/>.

Friedman, Lee. 2002. *The Microeconomics of Public Policy Analysis,* Princeton, NJ: Princeton University Press.

Institute of Transportation Studies, UCLA. 2001. Comments about BruinGO from UCLA Students, Staff, and Faculty. Available at <http://www.sppsr.ucla.edu/res_ctrs/its/bruingo.pdf>.

Meyer, J. and Edward Beimborn. 1998. "Usage, Impacts, and Benefits of an Innovative Transit Pass Program," *Transportation Research Record 1618,* pp. 131-138.

Office of the President, University of California. 2001. Memo from the University of California Office of the President to Members of the Regents' Committee on Grounds and Buildings and the Committee on Finance. January 10, 2001.

Samuelson, Paul and William Nordhaus. 1989. *Economics.* 13th Edition. New York: McGraw-Hill.

UCLA Transportation Services. 1995 - 2001. Employee Commute Reduction Program Plans submitted to the South Coast Air Quality Management District (SCAQMD).

UCLA Transportation Services. 2000. Spring 2000 Student Transportation Survey.

UCLA Transportation Services. 2001a. Spring 2001 Student Transportation Survey.

UCLA Transportation Services. 2001b. Spring 2001 Student Transportation Survey: BruinGO Data and Analysis.

UCLA Transportation Services. 2001c. Draft Environmental Impact Report for the Intramural Field Parking Structure.

UCLA Transportation Services. 2001d. UCLA Parking Five-Year Plan: Faculty Welfare Committee Consultation.

UCLA Transportation Services Advisory Board. 1999. Meeting Notes for December 13, 1999.

United States Federal Transit Administration. 2001. *National Transit Summary and Trends,* Available online through the National Transit Database at <http://www.ntdprogram.com>.

Williams, Michael E. and Kathleen L. Petrait. 1993. U-Pass: A Model Transportation Management Program That Works. *Transportation Research Record* 1404: 73-81.

Endnotes

1. The transit mode share data come from the 1990 and 2000 US census, available at <http://www.census.gov>. We calculated the average bus occupancy using data from the National Transit Database. In 2000, transit patrons traveled 18.8 billion passenger miles by bus, and transit agencies provided 1.7 billion vehicle revenue miles of service. Dividing the 18.8 billion passenger miles by the 1.7 billion vehicle revenue miles gives an average bus occupancy of 10.7 passenger miles per bus mile (18.8 ÷ 1.7 = 10.7). Dividing the average bus occupancy of 10.7 passengers by the average bus capacity of 40 seats gives an average bus occupancy of 27 percent (10.7 ÷ 40 = 27 percent). See Federal Transit Administration (2001).
2. Transportation accounted for 66.4 percent of US oil consumption in 1996, and highway transportation accounted for 78.3 percent of US oil consumption for transportation. Therefore, highway transportation accounted for 52 percent of US oil consumption (66.4% x 78.3%). The US also consumed 25.7 percent of the world's oil production

in 1996. Therefore, highway transportation in the US consumed 13.4 percent (slightly more than an eighth) of the world's total oil production (52% x 25.7%). Highway transportation refers to travel by cars, trucks, motorcycles, and buses. See Stacy Davis (2000, Tables 1.3, 2.10, and 2.7) for the data on energy consumption in the US.

3. Universities have given their programs a variety of names—such as BruinGO, ClassPass, SuperTicket, and UPass. We refer to these programs collectively as Unlimited Access. See Brown, Hess, and Shoup (2001) for a survey of 35 Unlimited Access programs. There were more than sixty programs by 2002.

4. See Williams and Petrait (1993) and Meyer and Beimborn (1998).

5. BruinGO was launched as an eight-month pilot program. UCLA paid $640,000 for student, staff, and faculty rides, and spent an additional $170,000 in administrative and marketing expenses, for a total cost of $810,000. BruinGO is funded entirely from parking revenue, which is derived from both daily parking fees and the sale of monthly parking permits. UCLA and the Blue Bus renewed the program for the 2001-2002 and 2002-2003 school years.

6. Additional unscheduled "booster" buses are also run during peak hours and days when overcrowding would otherwise occur. These booster buses are deleted during university holidays, when demand is low. Therefore, on typical days when the university is in session, more than 304 Blue Buses arrive on campus each day. The first bus arrives at 5:53 a.m., and the last at 12:08 a.m. The route structure and timetables for the Blue Bus are available online at http://www.bigbluebus.com/home/index.asp.

7. The Blue Bus service area is defined as the zip codes that include the five Blue Bus lines that serve UCLA: 90024, 90025, 90034, 90035, 90049, 90064, 90066, 90291, 90401, 90402, 90403, 90404, and 90405. Crain and Associates (2002, 21) report that 7,424 of the 21,149 employees (35%) surveyed in 2001 live inside the Blue Bus service area. Boyd et al. (2002) report that 17,102 of the 36,084 students (44%) live inside the Blue Bus service area.

8. Crain and Associates (2002, Tables 3 and 4) report the separated results for faculty and staff, while Boyd *et al* (2002) report the results for students.

9. The medium and low estimates are also conservative because, over time, people may relocate their residences to take advantage of BruinGO. Students are often new to the community, and they move often, so they can easily adjust their housing locations in response to the free public transit.

10. UCLA Transportation Services Advisory Board (1999) reports BruinGO's goals.

11. The SCAQMD requires employers of 250 or more employees to conduct employee travel surveys during the four-hour peak-arrival period of 6 a.m. to 10 a.m. from Monday to Friday. UCLA had 27,644 employees who reported to work between 6 a.m. and 10 a.m. in 2001, and 77 percent of them, or 21,419 employees, commuted to campus on an average day. The text of the SCAQMD's regulation is available online at <http://www.aqmd.gov/trans/doc/rule/index.html>.

12. The share of UCLA employees who commute by public transit rose from 7.6 percent in 2000 to 13.1 percent in 2001, a 5.5 percentage-point increase. The number of daily transit trips increased from 1,625 before BruinGO (2000) to 2,805 with BruinGO (2001), an increase of 1,180 daily transit trips. This is a 73-percent increase in transit ridership in one year. Campus parking fees increased by 11 percent in July 2000, and this may have contributed to the increase in transit ridership to campus in 2001. But the prices of campus parking permits also increased by between 22 and 66 percent in 1991, while transit ridership fell by 1 percent the following year. And the prices for permits increased by 10 percent in 1995, while transit ridership fell by 7 percent in the next year. Therefore, the 11-percent increase in parking fees in 2000 is unlikely to have caused the 73-percent increase in transit ridership in 2001.

13. An example shows how we calculated the low estimate. Consider the case of faculty/staff bus ridership. The employee survey shows there were 638 faculty/staff bus riders before BruinGO, and 1,492 with BruinGO, an increase of 854 riders, or 134 percent. There was a 6 percent increase in faculty/staff bus riders *outside* the Blue Bus service area. We might expect that bus ridership *inside* the Blue Bus service area would have increased 6 percent without BruinGO; this would have resulted in approximately 35 new bus riders (638 x 6%= 35). Thus, we assume that BruinGO is responsible for 818 new riders (854 – 35= 818), or a 128 percent increase in bus ridership (818 ÷ 638). By contrast, the high estimate discussed earlier showed that overall bus ridership to campus increased by 1,163 new riders in 2001.

14. Parking permit holders also use BruinGO. UCLA Transportation Services surveyed a random sample of 2,473 parking permit holders during February 2002 to learn about their BruinGO use. The survey found that 9.6 percent of all parking permit holders used BruinGO for commuting to or from campus during the previous week, and they

used BruinGO for an average of 4.0 one-way commute trips per week. Among permit holders who live within any zip code served by the Blue Bus, 18.7 percent rode the bus to or from campus an average of 3.8 trips per week.
15. The bus share for students who live *outside* the Blue Bus service area rose from 11 percent to 14 percent, the drive-alone share fell from 64 percent to 59 percent, and the carpool share fell from 15 percent to 11 percent. The large increase in bus ridership could be a function of students' propensity to park off campus and ride the Blue Bus the rest of the way to campus. The large increases in walking and bicycling are probably a function of the small sample size.
16. See Figure 2 in Williams and Petrait (1993). The first-year ridership increases at other campuses that began Unlimited Access programs ranged from 71 percent to California State University, Sacramento to 200 percent at the University of Colorado at Boulder. See Brown, Hess, and Shoup (2001).
17. Elasticity measures the percent change in ridership divided by the percent change in fare. When fare changes are large, as with BruinGO, the preferred measure of elasticity of demand is the logarithmic arc elasticity. But the logarithmic arc elasticity is undefined when the fare is reduced to zero. Therefore, the fare elasticities for BruinGO are calculated as the linear arc elasticity, or "midpoint" elasticity, which approximates the average elasticity between two points along a demand curve. To calculate the midpoint elasticity, the percent change in fare is defined as the absolute change in fare divided by the average of the two fares between which elasticity is measured. Similarly, the percent change in ridership is defined as the absolute change in ridership divided by the average of the two riderships between which elasticity is measured. See Samuelson and Nordhaus (1989, 425) for an explanation of the midpoint formula. The range of fare elasticities refers to the medium and low estimates of responses to BruinGO.
18. The ranges refer to the medium and low estimates of the responses to BruinGO. The cross-elasticity is the percent change in drive-alone vehicle trips divided by the percent change in transit fare, again calculated as the arc elasticity. The cross-elasticity is positive because public transit and solo driving are substitutes.
19. We combined the student data with the faculty and staff data to calculate these numbers. The combined survey and swipe data show there were 909,000 bus riders per year before and 1.4 million bus riders per year after BruinGO, an increase of 56 percent. The survey data also show there were 6,369 solo drivers per day before and 5,072 solo drivers per day after BruinGO, a decrease of 20 percent. These results are close to those observed when the University of Washington began its U-Pass Program: a 57 percent in bus ridership and a 30 percent decrease in solo drivers.
20. UCLA's wait list for student permits suggests that BruinGO reduced campus parking demand. Students who apply for but do not receive a parking permit are put on a wait list, and UCLA considers the list an indicator of the "unmet need" for campus parking. The wait list declined from 3,969 students in Fall Quarter 1999 (before BruinGO began) to 2,637 students in Fall Quarter 2000 (during BruinGO's first year). Therefore 1,332 students left the parking wait list after BruinGO began.
21. The comments on this and the following page are taken from a survey of UCLA students, staff, and faculty. The comments are available at <http://www.sppsr.ucla.edu/its/bruingo.pdf>.
22. The program clearly provides net benefits to the transit agency, or it would not participate, and it is hard to believe that BruinGO has a net negative effect on society as a whole. For example, BruinGO reduces solo driving to UCLA and in turn reduces traffic congestion and vehicle emissions. This results in significant benefits to the community.
23. UCLA Transportation Services provided the data on the shares of total permit revenue paid by faculty, staff, and students, and on the shares of total daily sales revenue paid by faculty, staff, students, university departments, and visitors. Many visitors attend athletic events, concerts, lectures, theatrical performances, and other events on campus. Because they pay for parking by the hour or day, visitors account for a disproportionate share of total parking revenue.
24. This cost includes $640,000 for BruinGO rides and $170,000 for administration and marketing.
25. For *financing* BruinGO, both the administrative cost ($170,000) and the fare payments ($640,000) are the same: UCLA must cover both. But for *evaluating* BruinGO, these two costs are utterly different. The administrative costs represent a consumption of resources (mainly UCLA staff time), while the fare payments represent an income transfer to students, staff, and faculty.
26. Most riders paid the cash fare of 50¢ per ride before BruinGO began, so valuing the existing riders' fare reduction benefit at UCLA's price of 45¢ per ride is a conservative estimate of BruinGO's benefit to the existing riders. UCLA paid the Blue Bus for 1.4 million BruinGO rides. According to the swipe data, students made 73 percent of the rides (1.4 million x 73 percent = 1,038,222 rides) and faculty and staff made 27 percent (1.4 million x

27 percent = 384,000 rides). The swipe data do not allow us to break these numbers down into new and existing rides, but the transportation surveys do. The student survey showed that the bus mode share for those who live inside the Blue Bus service area was 17 percent before and 24 percent after BruinGO. Therefore, those who rode the bus before BruinGO made 71 percent (17 ÷ 24) of student rides and new riders made 29 percent (7 ÷ 24). Existing student riders thus made 737,138 rides (1,038,222 rides x 71 percent), and new student riders made 301,084 rides (1,038,222 rides x 29 percent). The faculty/staff survey showed that the bus mode share for those who live inside the Blue Bus service area was 9 percent before and 20 percent after BruinGO. Therefore, those who rode the bus before BruinGO made 45 percent (9 ÷ 20) of faculty/staff rides and new riders made 55 percent (11 ÷ 20). Existing faculty/staff riders thus made 172,800 rides (384,000 rides x 45 percent), and new faculty/staff riders made 211,200 rides (384,000 rides x 55 percent). Existing riders made a total of 909,938 rides (737,138 + 172,800), and new riders made a total of 512,284 (301,084 + 211,200) rides.

27. This area under the demand curve for the new rides is the consumer surplus enjoyed by the riders (Friedman 2002, 202).

29. From a parking-centered view of BruinGO, the fare payments are money down the drain (because in this view BruinGO's only purpose is to reduce parking demand). From a broader university-centered point of view, however, the spending for bus fares becomes additional income for students, staff, and faculty.

29. Memo from the UC Office of the President to the UC Regents, November 7, 2001.

30. The structure cost $47 million for 1,500 spaces, or $31,500 per space. UCLA borrowed the money to finance the structure at 6.125% for 27 years, and incurred an annual debt service of $2,414 per debt-financed space. When the annual operating cost of $259 per space is included, the annual total cost per debt-financed space is $2,673, or $223 per space per month. This high cost of structured parking is not unique to UCLA. The Parking and Transit Services department at the University of Colorado at Boulder reports that the estimated debt service for a new parking structure on campus is $227 per month for each parking space added by the structure.

31. Intramural Field Parking Structure Final Environmental Report, May 2001, Vol. I, Table IV.I-4. The EIR reports the vehicle trips and emissions per day. To obtain the annual values, the daily values are multiplied by the number of weekdays per year (excluding all trips on the weekends).

32. UCLA's fare subsidy was $640,000 for nine months (see Table 3), and faculty/staff accounted for 27 percent of all BruinGO rides, so the fare subsidy for faculty/staff was $19,200 per month ($640,000 x 0.27 ÷ 9).

33. BruinGO offers free transit only to Blue Bus riders, while the consultant estimated the cost of transit passes for all bus lines to campus. Nevertheless, the Blue Bus carries most of the transit riders to UCLA, and extending it to the other lines would not greatly increase the cost. BruinGO offers free transit to *all* of UCLA's 31,000 employees, not merely to those without a parking permit, so it is far more generous to faculty and staff than what the consultant proposed. UCLA is also undercharged for BruinGO, because some riders report the bus drivers sometimes allow UCLA riders to board without swiping their BruinCards. A more accurate record of the boardings would therefore increase UCLA's cost for BruinGO.

34. See Crain and Associates (1998, 47) for the consultant's prediction.

35. See Crain and Associates (1998, 47).

36. Permit Holders Survey of the BruinGO Transit Pass Program, UCLA Transportation Services, March 2002.

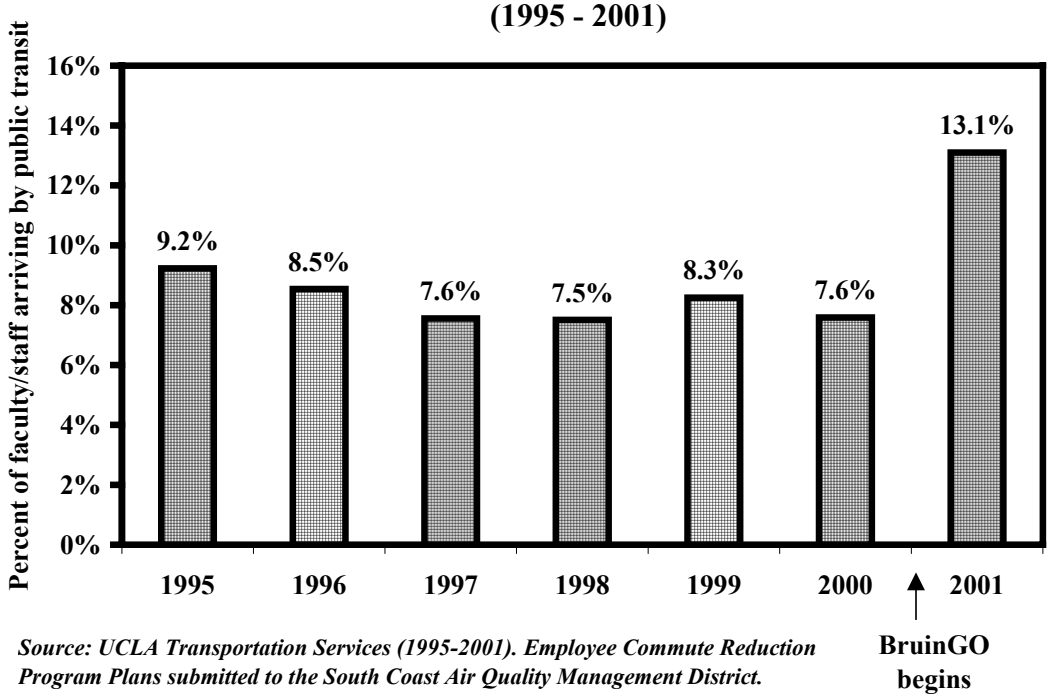
37. See UCLA Transportation Services (2001d). Daily sales revenue comes both from the 1,400 spaces reserved for daily sales, and from other spaces that are not used by permit holders in the evenings and on the weekends.

38. Each *permit* converted to daily sales generates an additional $897 in annual revenue. Because UCLA sells 1.35 permits per space, each *space* converted to daily sales generates an additional $1,211 in annual revenue. Each space converted to meters will generate an even greater increase in revenue.

39. BruinGO costs 45¢ per boarding, so the subsidy for a student, staff, or faculty member who commutes to campus 22 days a month is $20 a month ($0.45 x 2 x 22). UCLA provides an on-campus shuttle service to transport commuters from their parking spaces to their destinations on campus, and also for other trips around campus. The cost of the Campus Express is $1.41 per boarding, so the subsidy for someone who parks on campus 22 days a month and then takes the shuttle to and from the final destination is $62 a month. UCLA provides a vanpool program for commuters, and the subsidy per rider is $65 a month. The newest parking structure at UCLA will cost $223 per space per month, and the price of a permit to park in it will be $54 per month. The subsidy for a solo driver who commutes to campus 22 days a month and parks in the IM Field structure will therefore be $169 a month. UCLA provides a free shuttle service to off-campus housing for graduate students, and the cost is $4.38 per boarding, so the subsidy for a student who commutes to campus 22 days a month is $193 a month. UCLA provides a free shuttle service to the off-campus faculty housing in Beverly Glen, and the cost is $8.95 per boarding, so the

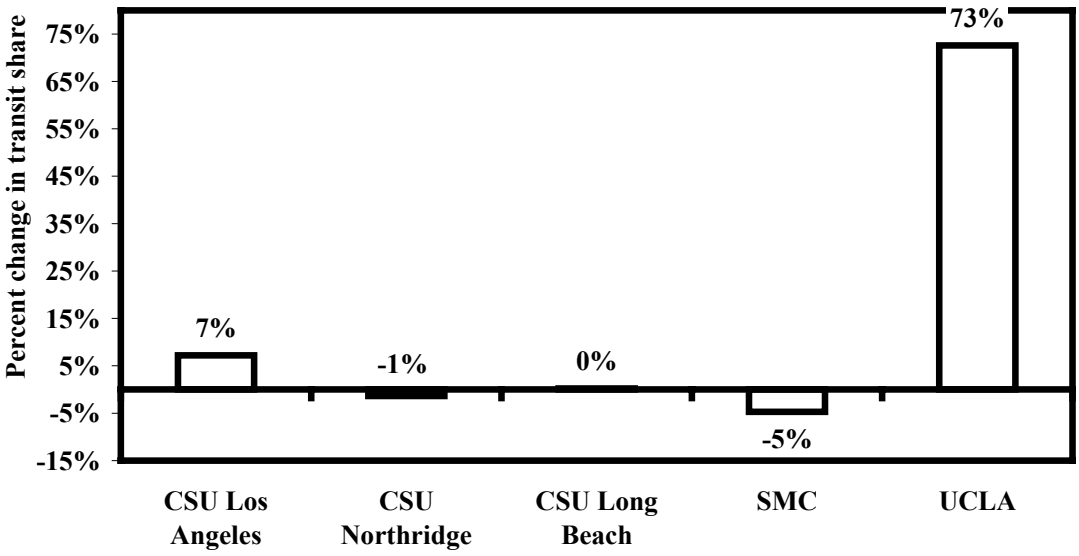
subsidy for a faculty member who commutes to campus 22 days a month is $394 a month.
40. One way to think about the choice between BruinGO and a new parking structure is to consider the cost per new parking space as a rental value. Building a parking structure is the same as renting 1,500 parking spaces at a cost of $223 per space per month. UCLA can rent parking spaces for $223 per month each, and sell permits to park in them for $54 a month, or instead use the subsidy to provide BruinGO.

Appendix Figure 1. Share of faculty and staff commuting by bus (1995 - 2001)



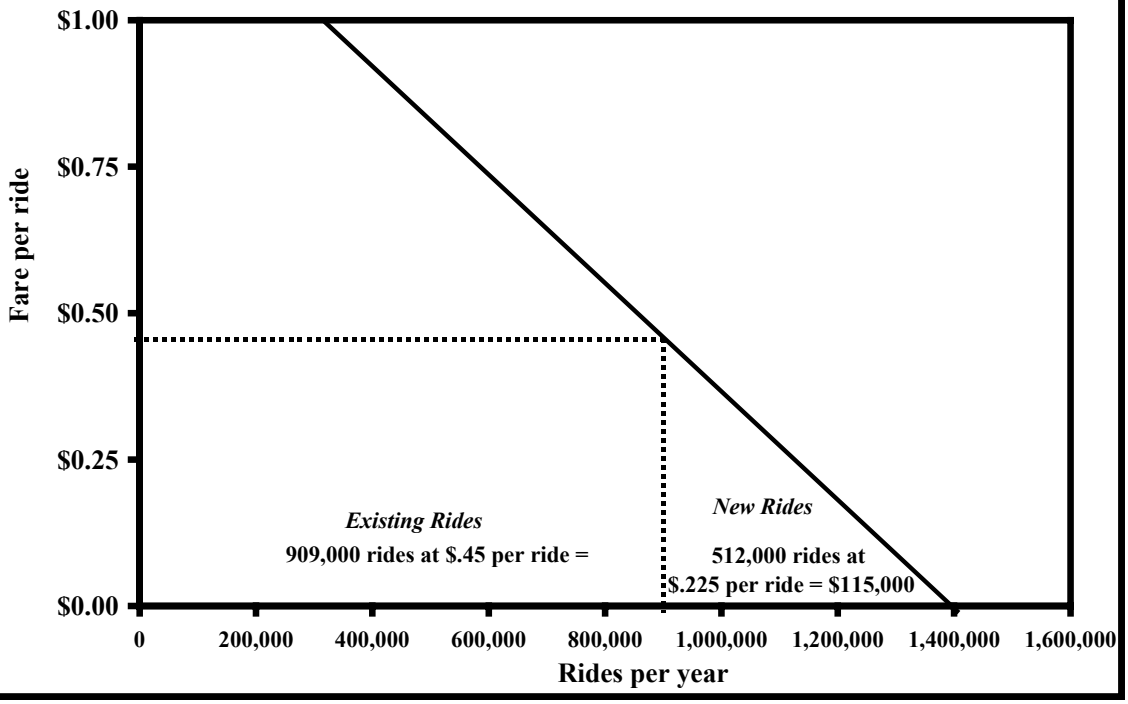
Source: UCLA Transportation Services (1995-2001). Employee Commute Reduction Program Plans submitted to the South Coast Air Quality Management District.

Appendix Figure 2. Change in faculty/staff transit share at five universities in Southern California (2000 to 2001)

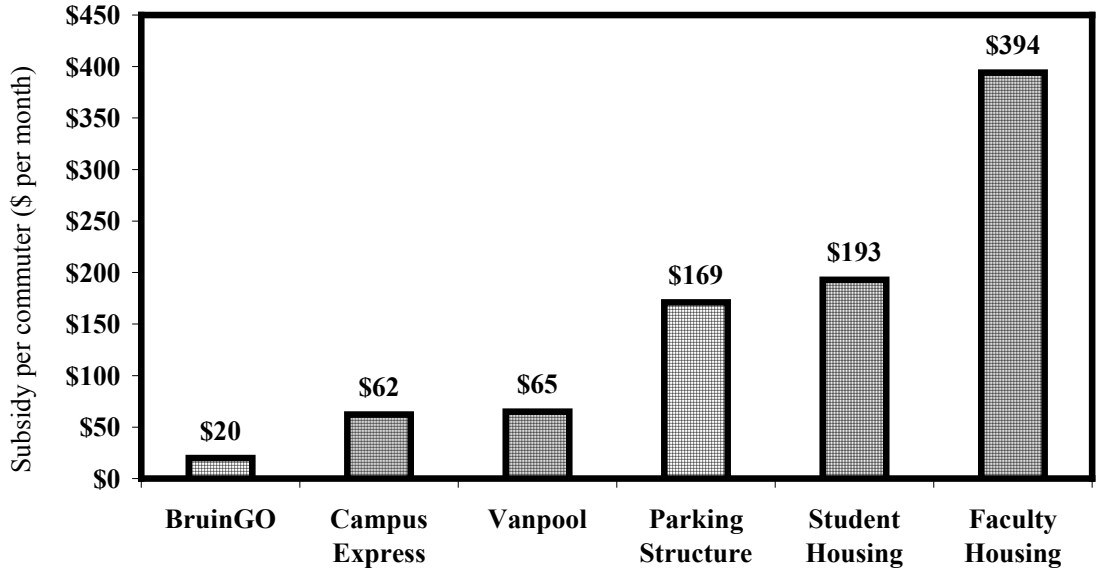


Source: Employee Commute Reduction Program Plans submitted by each university to the South Coast Air Quality Management District.

Appendix Figure 3. Benefit of fare savings for BruinGO riders



Appendix Figure 4. BruinGO compared with other transportation programs (subsidy per commuter per month)



Source: Transportation Services Advisory Board

Appendix Table A1. Effects of BruinGO on commute mode shares

	Outside Blue Bus Service Area				*Inside Blue Bus Service Area*				
								Percent change	
Mode	**Before BruinGO**	**With BruinGO**	**Difference**	**Percent change**	**Before BruinGO**	**With BruinGO**	**Difference**	**Medium estimate**	**Low estimate**
Faculty and staff									
Bus	**7%**	**8%**	**0%**	**6%**	**9%**	**20%**	**12%**	**134%**	**128%**
Drive alone	**69%**	**68%**	**-1%**	**-1%**	**46%**	**42%**	**-4%**	**-9%**	**-8%**
Carpool	**15%**	**14%**	**-1%**	**-8%**	**13%**	**9%**	**-4%**	**-28%**	**-20%**
Vanpool	**5%**	**7%**	**1%**	**25%**	**3%**	**0%**	**-2%**	**-85%**	**-100%**
Bike	**1%**	**0%**	**0%**	**-33%**	**4%**	**3%**	**0%**	**-8%**	**25%**
Walk	**2%**	**3%**	**1%**	**43%**	**26%**	**25%**	**-1%**	**-5%**	**-48%**
Students									
Bus	**11%**	**14%**	**3%**	**30%**	**17%**	**24%**	**7%**	**43%**	**13%**
Drive alone	**64%**	**59%**	**-5%**	**-8%**	**17%**	**12%**	**-6%**	**-33%**	**-26%**
Carpool	**15%**	**11%**	**-4%**	**-24%**	**5%**	**4%**	**-1%**	**-16%**	**9%**
Bike	**1%**	**1%**	**0%**	**43%**	**5%**	**3%**	**-2%**	**-42%**	**-85%**
Walk	**4%**	**5%**	**2%**	**38%**	**43%**	**45%**	**1%**	**3%**	**-35%**

Sources: The data are taken from the Spring 2000 and Spring 2001 Student Transportation and Employee Commute Reduction Program Plan surveys conducted by UCLA Transportation Services.

Appendix Table A2. Effects of BruinGO on commuting from inside the Blue Bus service area

	Medium estimate		Low estimate	
	% change	Number	% change	Number
Faculty/staff bus riders	**+134%**	**+854**	**+128%**	**+818**
Student bus riders	**+43%**	**+1,248**	**+13%**	**+384**
Total bus riders	**+56%**	**+2,102**	**+33%**	**+1,202**
Faculty/staff solo drivers	**-9%**	**-304**	**-8%**	**-260**
Student solo drivers	**-33%**	**-992**	**-26%**	**-760**
Total solo drivers	**-20%**	**-1,296**	**-16%**	**-1,020**

Appendix Table A3. Measured annual costs and benefits of BruinGO						
Distribution of costs						
Costs	**Students**	**Faculty and staff**	**University depts.**	**Campus visitors**	**Total**	**Share**
BruinGO rides	**$108,800**	**$160,000**	**$25,600**	**$345,600**	**$640,000**	**79%**
BruinGO administration	**$28,900**	**$42,500**	**$6,800**	**$91,800**	**$170,000**	**21%**
Total cost	**$137,700**	**$202,500**	**$32,400**	**$437,400**	**$810,000**	**100%**
Percent of total cost	**17%**	**25%**	**4%**	**54%**	**100%**	
Distribution of benefits						
Benefits	**Students**	**Faculty and staff**	**University depts.**	**Campus visitors**	**Total**	**Share**
Reduced fare payments	**$399,000**	**$125,000**			**$524,000**	**16%**
Reduced parking demand	**$463,000**	**$682,000**	**$109,000**	**$1,472,000**	**$2,726,000**	**84%**
Total benefits	**$862,000**	**$807,000**	**$109,000**	**$1,472,000**	**$3,250,000**	**100%**
Percent of total benefits	**27%**	**25%**	**3%**	**45%**	**100%**	
Comparing the benefits and costs						
Benefit-cost measure	**Students**	**Faculty and staff**	**University depts.**	**Campus visitors**	**Total**	
Net benefits (benefits – costs)	**$724,000**	**$605,000**	**$77,000**	**$1,035,000**	**$2,440,000**	
Benefit/cost ratio	**6.3**	**4.0**	**3.4**	**3.4**	**4.0**	

Appendix Table A4. Predicted and realized results of a transit-pass program for faculty and staff

	Consultant prediction	BruinGO result	Result as % of prediction
	(1)	(2)	(3)=(2)/(1)
Fare subsidy ($ per month)	**$170,000**	**$19,200**	**11%**
Transit ridership increase (riders per day)	**315**	**818**	**260%**
Reduction in parking demand (spaces per day)	**150**	**260**	**173%**

Source: Consultant's predictions are from Crain & Associates (1998). Results are taken from the low estimates discussed earlier.