Chapter 10. Reduce Demand Rather than Increase Supply

The more parking spaces you provide, the more cars will come to fill them. It is like feeding pigeons.

HUGH CASSON

The logic behind off-street parking requirements is simple: development increases the demand for parking, so cities require enough off-street spaces to satisfy this new demand. Off-street parking requirements thus ensure that cars will not spill over onto the neighborhood streets. This logic suggests another potential reform within the existing system of off-street parking requirements: if developers reduce parking demand, cities should allow them to provide fewer parking spaces; that is, cities can give developers the option to reduce parking demand rather than increase the parking supply. I will illustrate this "pay or pave" option with three strategies to reduce parking demand: (1) employer-paid transit passes, (2) parking cash out, and (3) car sharing.

TRANSIT PASSES IN LIEU OF REQUIRED PARKING SPACES

Offering transit passes to commuters can significantly reduce parking demand. One survey of commuters whose employers began to offer free transit passes found that their drive-alone share fell considerably—from 76 percent before they offered transit passes to 60 percent afterward—and that their transit share more than doubled. These mode shifts reduced commuter parking demand by approximately 19 percent.[1]

Because free transit reduces parking demand, a city can reduce the parking requirements at sites providing transit passes to all commuters. Suppose, for example, that free transit passes reduce parking demand by one space per 1,000 square feet of floor area; providing free transit passes can in this case substitute for providing one required parking space per 1,000 square feet.[2]

Eco Passes

Several transit agencies—in Dallas, Denver, Salt Lake, and San Jose, for example—offer employers the option to buy "Eco Passes," which give all their employees the right to ride free on all local transit lines. This arrangement reduces to zero the employees' marginal cost of riding public transit and therefore makes transit (in terms of perceived money cost) similar to driving and parking

free. Because many commuters won't ride transit even when it is free, the transit agencies' cost per Eco Pass holder is low, and the agencies can therefore sell the Eco Passes at a surprisingly low price. In California's Silicon Valley, the Santa Clara Valley Transportation Authority (SCVTA) charges between $5 and $80 a year per employee for Eco Passes, depending on the employer's location and number of employees (see Table 10-1).[3] The passes allow unlimited free rides on any SCVTA bus or rail line, seven days a week.

Table 10-1

The price of an Eco Pass is much lower than that of a conventional pass. Because frequent riders often buy the conventional passes, transit agencies must price them on the assumption that buyers will use them frequently. The price of an Eco Pass is much lower because employers buy the Eco Passes for all commuters regardless of whether they ride transit. The SCVTA's price for its Eco Pass ranges from 1 to 19 percent of the price for its conventional pass ($420 a year).

A numerical example can help explain Eco Pass pricing. Suppose a firm with 100 employees offers conventional transit passes for all commuters who do not take a free parking space. The price of a conventional transit pass is $400 a year, and 20 commuters choose to ride public transit. In this case, the firm pays $8,000 a year for 20 conventional passes ($400 per employee x 20 employees), which amounts to $80 a year per employee ($8,000 a year ÷ 100 employees). If, however, the transit agency charges $80 a year per employee for Eco Passes for all 100 commuters, it receives the same $8,000 a year for the Eco Passes ($80 per employee x 100 employees) that it would receive from the sale of 20 conventional passes at $400 a year.

Although firms pay the same total amount for 100 Eco Passes or 20 conventional passes, Eco Passes offer a key advantage. With conventional passes, a firm offers commuters free parking *or* free transit. With Eco Passes, the firm can offer everyone free parking *and* free transit; therefore, even commuters who normally drive to work may ride transit occasionally. The firm's cost of offering Eco Passes to all commuters is no higher than the cost of offering conventional passes only to commuters who don't take a free parking space.[4] Offering Eco Passes to all commuters is also simpler than determining who qualifies for a conventional pass each month.

If an employer offers Eco Passes to everyone rather than conventional passes only to nondrivers, transit ridership should increase, and this may increase the transit agency's cost of

providing service.[5] But if the transit system has excess capacity on its buses and trains—and most American transit systems do—its costs will not increase, and the system will become more efficient, with a lower cost per rider. Only 27 percent of the seats on American public transit are regularly occupied.[6] If Eco Passes induce more commuters to ride public transit, they may be filling otherwise empty seats.

Cost-Effectiveness of Eco Passes

We can estimate the cost-effectiveness of Eco Passes by comparing their cost with what they save on parking. Two of the cities served by the SCVTA—Mountain View and Palo Alto—have in-lieu parking fees, which allow us to estimate the savings on required parking (see Chapter 9). For the cost-effectiveness comparison I will make two sets of assumptions: one conservative and the other optimistic. In the conservative case, all the assumptions are chosen to show high costs and low savings from the Eco Passes. In the optimistic case, all the assumptions are chosen to show low costs and high savings. Table 10–2 shows the two estimates.

Table 10-2

In 2002, Mountain View charged $26,000 per required parking space not provided, and Palo Alto charged $50,994 (row 1 of Table 10-2).[7] Because Mountain View requires 3 parking spaces per 1,000 square feet of office space, and Palo Alto requires 4 spaces per 1,000 square feet, developers must pay an in-lieu fee of $78 per square foot of office space in Mountain View if they do not provide the required parking and $204 per square foot in Palo Alto (row 3).

A survey of Silicon Valley commuters before and after their employers offered Eco Passes found that commuter parking demand declined by approximately 19 percent.[8] In this case a city could reduce the parking requirement by 19 percent for office developments that offer Eco Passes for all commuters (row 4). If the Eco Passes reduce parking requirements by 19 percent, they reduce the capital cost of parking by $15 per square foot of office space in Mountain View and by $39 per square foot in Palo Alto (row 5).

Firms in Silicon Valley pay between $5 and $80 a year per employee for Eco Passes (row 6). If there are 4 employees per 1,000 square feet of office space (row 7), Eco Passes therefore cost from 2¢ to 32¢ a year per square foot of office space (row 8).[9] The advantage is obvious: for every

square foot of office space, spending between 2¢ and 32¢ a year on Eco Passes will reduce the one-time capital cost of required parking by between $15 and $39.

We can convert these per-square-foot figures into the potential capital savings per annual dollar spent for Eco Passes. With the conservative assumptions, the Eco Passes cost 32¢ a year (the high annual cost) and save $15 for required parking (the low capital savings). In this case, spending $1 a year for Eco Passes will save $46 on the initial capital cost of providing the required parking (row 9). With the optimistic assumptions, Eco Passes cost only 2¢ a year and save $39. In this case, spending $1 a year for Eco Passes will save $1,938 on the cost of required parking.

These two cases suggest that a developer who spends $1 a year for in-lieu Eco Passes (after the building is constructed and is earning money) saves between $46 and $1,938 on the initial capital cost of required parking—an incredible bargain even under conservative assumptions. Although the building will supply 19 percent fewer parking spaces, the Eco Passes reduce parking demand by 19 percent, and the smaller parking supply will satisfy demand. Beyond reducing parking demand, the Eco Passes also provide a new fringe benefit to every employee in the building.

Row 10 shows the annual cost of Eco Passes as a percent of the capital cost saved for the required parking. With conservative assumptions, the annual cost for Eco Passes is 2.2 percent of the capital savings for required parking. With optimistic assumptions, the annual cost is only 0.1 percent of the capital savings. If the developer's cost of capital is above 2.2 percent a year, the Eco Passes will therefore save more on annual interest payments for parking than they cost in annual payments for transit. In-lieu Eco Passes are a good investment.

These estimates refer only to Mountain View and Palo Alto, but the low cost of reducing parking demand compared with the high cost of increasing the parking supply shows that Eco Passes can greatly reduce the cost of meeting a parking requirement. Both estimates also understate the cost-effectiveness of Eco Passes because they refer only to capital costs. Since there will be fewer parking spaces to operate and maintain, Eco Passes will also reduce operating and maintenance costs for the required parking, which average about $500 a year per space for structured parking.[10] Finally, developers who provide the in-lieu Eco Passes can still offer free parking to all commuters who want to drive, because the reduced parking supply will meet the reduced parking demand.[11] All else equal, most employees would prefer to work for a firm that offers free parking *and* free public transit than for a firm that offers only free parking, and the free transit passes are therefore a tax-exempt fringe benefit that helps attract and retain workers.

Benefits of Eco Passes in Lieu of Parking Spaces

Providing Eco Passes in lieu of required parking converts an up-front capital cost for parking spaces into an annual subsidy for transit, and many developers may want to make this trade. The Eco Passes can yield benefits for developers, property owners, employers, commuters, transit agencies, and cities. A brief description of the benefits to each party shows that everyone can win from the in-lieu Eco Pass arrangement.

Developers and property owners. Some developers may hesitate to provide fewer parking spaces than the city requires because they fear that it will make a project less desirable to tenants. Eco Passes can skirt this obstacle: by luring some commuters from cars to transit, Eco Passes should reduce parking demand, and free transit for all tenants should increase the project's marketability. Eco Passes can also help a developer to meet traffic mitigation requirements, reduce a project's environmental impacts, and perhaps lead to a speedier approval process.

Conventional in-lieu fees give developers no site-specific benefit beyond permission to build without providing the required parking. The public parking spaces financed by in-lieu fees benefit all developers in the surrounding area, not just the developers who pay for them.[12] In contrast, Eco Passes provide a site-specific benefit (free transit for all employees in the development) to the developers who buy them, and nothing to other developers. For this reason, developers may be more willing to buy in-lieu Eco Passes than to pay conventional in-lieu fees that finance public parking structures everyone can use.

Fewer parking spaces also translate into savings after a building is constructed. The capital cost of parking is a heavy fixed burden for a new building that has yet to be leased. The annual cost of Eco Passes, in contrast, varies with the number of workers in the building, so the cost is low if the building is half-empty. Paying a variable cost for Eco Passes instead of a fixed cost for parking spaces can therefore reduce the developer's risk, and improve the feasibility of project finance.

Developers and building owners can offer the Eco Passes to all commuters in a building, and this added amenity should allow higher rents. Alternatively, they can transfer the cost of the Eco Passes to employers by requiring all tenants to offer Eco Passes to their employees. Either way, Eco Passes can be more profitable than free parking.

Employers. By shifting some commuters from cars to transit, Eco Passes can save employers some of the money they now spend to subsidize parking. The added fringe benefit of

free transit for all commuters will also help recruit workers. Eco Passes are a tax-deductible expense for employers and a tax-free benefit for commuters. Employers will earn higher profits if they save more on reduced parking subsidies than they spend for Eco Passes.[13]

Commuters. Eco Passes clearly benefit commuters who ride transit to work, and commuters who usually drive to work can consider the passes a form of insurance for days when their cars aren't available. Eco Passes offer commuters day-to-day flexibility in commuting; public transit is always an option, not a long-term commitment. Commuters can also use their Eco Passes for nonwork trips. In the Silicon Valley survey, 60 percent of commuters reported using their Eco Passes for purposes other than commuting, with an average of four nonwork trips a month.

Public transit agencies. Eco Passes are a demand-side transit subsidy paid for by the private sector. If cities allow developers to provide Eco Passes instead of required parking spaces, Eco Pass sales will increase. The reduction in parking subsidies will finance the Eco Passes and will provide a reliable revenue source for transit agencies. Transit planners can also increase service to sites where developers make long-term commitments to purchase Eco Passes because the demand for transit will be higher where all commuters can ride free. These service improvements will benefit all riders, not just Eco Pass holders, and they may attract additional riders who pay the full fare.

Cities. Parking requirements increase the supply of parking whereas Eco Passes increase the demand for public transportation. Providing Eco Passes in lieu of required parking will therefore convert a supply-side subsidy for cars into a demand-side subsidy for transit. The appropriate reduction in required parking depends on how much Eco Passes reduce parking demand, and cities should specify the reduction they will grant for offering Eco Passes rather than oblige developers and landowners to seek a variance in the parking requirement. Like other zoning variances, parking variances are not granted routinely and must be supported by evidence; the burden of proof is shifted to the developer, who must prove that some parking spaces will not be needed. A special study to provide data supporting the application for a parking variance may cost several thousand dollars, with no guarantee that the variance will be granted. If cities specify the by-right reduction in parking requirements they will give to developers who offer Eco Passes, parking demand management will become more feasible and profitable. Seattle, for example, reduces the parking requirement for a development by up to 10 percent if transit passes are provided to all employees and if transit service is within 800 feet of the development.

Cities can offer bigger reductions in required parking in transit-oriented developments (TODs) because Eco Passes will reduce parking demand more at sites with better transit service. In these areas, substituting Eco Passes for parking spaces will allow higher density without more vehicle traffic. A survey of TODs in California, however, found that cities did *not* reduce the parking requirements in 7 of the 11 of sites studied.[14] Many cities appear to assume that more transit will not reduce parking demand and, conversely, that more parking will not reduce transit demand.

Eco Passes in lieu of parking spaces can significantly reduce the cost of TODs because parking spaces are more expensive in denser areas. A study by the California Department of Transportation points out the higher burden of parking requirements in TODs:

> Increased densities in TODs, coupled with the goal of improving accessibility for pedestrians to transit stations, often means building structured parking garages. Parking spaces in structures can cost from $10,000 to $30,000 each, compared to about $5,000 per space for surface parking. . . . These increased costs can negatively affect the financial feasibility of projects, even if they are otherwise profitable. Hence, if the design and location of TODs enable a reduction in the number of parking spaces needed, the cost savings can be significant.[15]

If cities do not reduce the number of spaces required in a TOD commensurate with the increased cost per space in structures, the cost of the required parking will be higher in a TOD than in a conventional development. Suppose, for example, a city requires 4 spaces per 1,000 square feet of floor area in a conventional development, and the developer's cost of surface parking is $5,000 per space; the cost of the required parking is thus $20 per square foot of floor area (4 x $5,000 ÷ 1,000). Suppose also the city requires only 2 spaces per 1,000 square feet in a TOD, and the developer's cost of structured parking is $20,000 per space; the cost of the parking required for a TOD is thus $40 per square foot of floor area (2 x $20,000 ÷ 1,000), or twice the cost in a conventional development. Allowing a TOD developer to offer low-cost Eco Passes in lieu of high-cost parking spaces can thus improve the TOD's financial feasibility.

A study of travel patterns in California found that, in practice, TOD employers are far more likely to offer commuters free parking than a transit subsidy. In Los Angeles, for example, 89 percent of all commuters who worked in a TOD in Hollywood were offered free parking, while only 19 percent were offered a transit subsidy. In Orange County, 87 percent of commuters in a TOD in Anaheim were offered free parking, while only 8 percent were offered a transit subsidy. In San Diego, 83 percent of commuters in a TOD in Mission Valley were offered free parking, while only 17 percent were offered a transit subsidy.[16] The TODs were also embedded in regions where free

parking was the norm, and this free parking elsewhere had a major influence on the TOD residents' travel behavior. Among TOD residents, only 5 percent of those whose employers offered free parking rode transit to work, while 45 percent of those whose employers did *not* offer free parking rode transit.[17] TODs will have little effect on travel behavior if parking remains free everywhere, even in the TODs themselves, and transit remains expensive.

Providing Eco Passes instead of parking spaces will increase transit ridership, reduce the cost of transit-oriented development, improve urban design, reduce the need for variances, and reduce traffic congestion, air pollution, and energy consumption. These benefits will come at low cost if the transit system has excess capacity, as most do. Furthermore, cities that offer the in-lieu option will encourage job growth because development costs will be lower than in neighboring cities that require parking spaces with no in-lieu alternative. Reducing the demand for parking will also shift land from parking spaces to other uses that employ more workers and generate more tax revenue.

In-lieu Eco Passes are simpler than conventional in-lieu parking fees because they eliminate the need to construct, operate, and maintain parking structures. Cities can enforce property owners' obligations to purchase the in-lieu Eco Passes by imposing covenants or conditional use permits on land for which the required parking is not provided. The transit agencies will have a strong financial incentive to ensure that property owners buy the required Eco Passes, and they can help in the enforcement process, since their contracts at each site will automatically show whether property owners are fulfilling their obligations.[18]

Transit Passes Instead of Parking Spaces for Various Land Uses

The preceding calculations refer to providing transit passes at employment sites. But cities can also allow transit passes instead of parking spaces at other land uses, such as universities, theaters, stadiums, hotels, and apartments.

Some universities contract with their local transit agencies to accept their student (and in some cases staff) ID cards as transit passes. The ID cards function as Eco Passes and reduce the demand for parking on campus. These programs are generically known as Unlimited Access, and they have spread rapidly during the past decade.[19] Unlimited Access programs do not provide free transit; instead, they are a new way to pay for transit. The university pays the transit agency, and all eligible members of the university community ride free. When UCLA began its Unlimited Access program in 2000, for example, the faculty/staff bus mode share for commuting to campus rose

from 8.6 percent before the program began to 20.1 percent afterward. The number of faculty/staff bus riders increased by 134 percent, and the number of solo drivers fell by 9 percent.[20] If universities offer these Unlimited Access programs, cities can waive some of the required parking the universities would otherwise have to build.

A similar arrangement can be offered for stadiums that offer free transit passes to all ticket holders. The University of Washington has a contract with Seattle Metro that allows stadium tickets to serve as transit passes on the game day. Between 1984 (the year before the program began) and 1997, the share of ticket holders arriving at Husky Stadium by transit increased almost five times (from 4.2 percent to 20.6 percent).[21] Including a transit pass in the ticket price is particularly appropriate for any land use where the peak parking demand occurs infrequently, perhaps only a few days each year. Building enough parking to meet this peak demand is extremely wasteful because additional public transit service can be provided on event days to serve the peak at a far lower cost. Although not related to the issue of parking requirements, public transportation was free to all passengers with tickets for the games during the 2004 Athens Olympics, and attendees used public transportation for almost all their trips. Tickets to concerts and athletic events also serve as transit passes on the event day in many German cities. Because season ticket holders have a free transit pass for every event, they have a stronger incentive to consider public transport as an alternative, and their savings on paying for parking can be considerable.

The transit-in-lieu-of-parking arrangement can be extended to all manner of land uses. Hotels that offer transit passes to every guest, for example, may attract more visitors who don't bring cars. Guests can avoid the hassle and expense of renting a car, reinforcing tourists' willingness to try public transit in a new city where they don't have a car. Even without any regulatory incentive, some hotels already offer free shuttles to popular destinations or offer guests free tokens on public transit. More hotels will begin to offer free transit passes if cities reciprocate by reducing their parking requirements. Coronado, California, for example, reduces the parking requirements for hotels and motels that offer free transit tickets to guests.[22]

A city can also reduce parking requirements for apartment developers who offer free transit passes for residents. The Centre Area Transportation Authority in State College, Pennsylvania, charges about $100 a year per apartment (depending on location) to give all residents transit passes for the lines serving their apartment buildings. Participating developers are encouraged to include transit amenities in their site designs (bus shelters and bus pull-off lanes). Apartment owners

advertise these transit passes as one of the amenities they offer. The apartment transit passes attract tenants who own fewer than the average number of cars and are appropriate in areas with good transit service and a smaller parking supply.

In-lieu Eco Passes are not just for new development—cities can also allow property owners to remove some of the parking spaces required for existing land uses if they offer transit passes. The in-lieu option will allow parking lots to be converted to infill development, raising density and improving improve urban design without increasing traffic. The new development will also provide more jobs and yield more taxes than the former parking lots, which are perhaps the least fiscally productive of all land uses. Portland, Oregon, for example, is turning a park-and-ride lot at a rail station into a TOD.[23] Converting free parking lots at rail stations into TODs with Eco Passes can increase rather than reduce transit ridership.

Finally, a city can require developers to reduce parking demand if they want to provide more parking spaces than the zoning requires. If the minimum parking requirement for an office building is 4 spaces per 1,000 square feet, for example, and a developer wants to provide 5 per 1,000, a city could require the developer to offer Eco Passes at the site in exchange for permission to build the extra spaces. This would not restrict the maximum number of parking spaces, but developers would have to try to reduce parking demand before they received permission to increase the parking supply. Offering transit passes could reduce parking demand enough that a developer would no longer want to provide more than the required number of spaces.

In summary, a small annual outlay for transit passes can substantially reduce the large capital cost of required parking at many land uses. This new in-lieu option will save money for developers and employers, give commuters a new choice, fill empty seats on public transit, and reduce traffic congestion and air pollution.

PARKING CASH OUT IN LIEU OF REQUIRED PARKING SPACES

Another way to reduce parking demand and parking requirements is to offer commuters the option to "cash out" their employer-paid parking. Giving commuters the choice between free parking or its equivalent cash value shows that even free parking has a cost—the forgone cash. The option to cash out raises the effective price of commuter parking *without* charging for it. Commuters can continue to park free at work, but the cash option also rewards those who carpool, ride public transit, walk, or bike to work.

California law requires many employers who offer free parking to offer commuters the cash-out option as well. Case studies of employers in California show that the cash-out option reduced driving to work by 11 percent (see Table 25-2 in Chapter 25). Because cash out reduces parking demand, it can also reduce the parking requirements for new development. The law addresses this issue by mandating that cities reduce parking requirements for the developments that offer parking cash out:

> The city or county in which a commercial development will implement a parking cash-out program . . . shall grant to that development an appropriate reduction in the parking requirements otherwise in effect for new commercial development.[24]

The legislation also gives developers the option to substitute parking cash out for some of the required parking spaces at *existing* developments:

> At the request of an existing commercial development that has implemented a parking cash-out program, the city or county shall grant an appropriate reduction in the parking requirements otherwise applicable based on the demonstrated reduced need for parking, and the space no longer needed for parking purposes may be used for other appropriate purposes.[25]

In other words, employers can offer parking cash out if they want to expand their operations onto land previously used for required parking. This option will provide growing companies the opportunity to expand in place rather than seek larger quarters elsewhere.

Does Parking Cash Out Reduce Parking Demand?

Cities should reduce the parking requirements for developers who offer parking cash out, but the California legislation does not specify by how much; it says only that the reduction should be "based on the demonstrated reduced need for parking." This is a rather ambiguous standard, but the reduction in the number of cars driven to work after offering cash out suggests the appropriate reduction in requirements. Table 10-3 shows the results found in case studies of employers in Southern California who offer parking cash out (Chapter 25 reports the studies).

Table 10-3

The upper panel of the table (commuter demand) shows how parking cash out reduces the number of cars driven to work per commuter. Cities usually require parking spaces in proportion to

floor area, so the cars per commuter (from Table 25-2) have been converted into cars per 1,000 square feet (in Table 10-3).[26] To estimate the total number of spaces required for all purposes (not just commuters), we must also consider visitor parking, the percentage of commuters who are parked at the time of peak parking demand, and the share of spaces that must be left vacant to ensure that arriving cars can find a place to park. The lower panel of Table 10-3 (non-commuter demand) shows these other components of parking demand.

Commuter parking. When employers offered free parking *without* the cash option, commuters parked 3.2 cars per 1,000 square feet of building area. *With* the cash option, commuters parked 2.8 cars per 1,000 square feet. Parking cash out therefore reduced commuter parking demand by 0.4 spaces per 1,000 square feet, or 13 percent.

Visitor parking. Visitors also occupy parking spaces. Using the results of a survey of office buildings in San Diego, Thomas Higgins (1993) estimated that visitor parking demand is 0.1 spaces per employee.[27] With 4 employees per 1,000 square feet, visitor parking demand is thus 0.4 spaces per 1,000 square feet.

Vacancy factor. A parking system operates most efficiently at an occupancy rate between 85 and 95 percent of capacity, so entering cars don't have to search throughout the entire system to find a vacant space. The Parking Consultants Council recommends that the number of spaces should be between 5 and 10 percent greater than the estimated demand.[28] Adding 10 percent to the estimated commuter and visitor demand increases the required number of parking spaces by 0.3 spaces per 1,000 square feet.

Peak parking factor. The "peak parking factor" is the percent of drivers parked at the time of peak demand. Peak parking demand is less than the total number of cars driven to work because not all drivers park during the peak parking accumulation. A survey in downtown Los Angeles found that 94 percent of commuters parked at the time of peak demand.[29] In other words, the peak parking demand is 6 percent lower than the number of cars driven to work. The peak parking demand is therefore 0.2 spaces per 1,000 square feet less than the number of cars driven to work.[30]

Total parking demand. The resulting estimate of parking demand is 3.7 spaces per 1,000 square feet if the employer pays for parking without the cash option, and 3.3 spaces per 1,000 square feet with it (see total parking demand at the bottom of Table 10-3).[31] This result indicates that parking cash out reduces parking demand by about 11 percent, suggesting that cities can reduce parking requirements by 11 percent for developments that offer the cash option. Although this

figure depends on the circumstances in each location, we can use it to estimate the cost-effectiveness of using cash to reduce the demand for required parking spaces.

Cost-Effectiveness of Parking Cash Out

Parking cash out converts a subsidy for parking into a cash grant commuters can use for any mode of travel. We can estimate the cost-effectiveness of parking cash out by comparing its cost with the resulting savings on providing the required parking (Table 10-4).

Table 10-4

Suppose the required parking costs $10,000 a space (row 1).[32] The previous case studies show that parking cash out reduces peak parking occupancy by 0.4 spaces per 1,000 square feet of office space (row 2), so it reduces the cost of required parking by $4 per square foot of office space (row 3). Chapter 25 reports that employers spent only $24 a year per employee to offer parking cash out to all employees (row 4). The cost is low (only $2 a month per employee) because employers saved almost as much on parking as they paid in cash to commuters. If there are 4 employees per 1,000 square feet (row 5), parking cash out costs 10¢ a year per square foot of office space (row 6).

We can convert these figures into the capital savings on parking per annual dollar spent for cash out. If the ongoing cost to offer parking cash out is 10¢ a year per square foot of office space, and the up-front saving on constructing the required parking is $4 per square foot, every $1 a year spent for parking cash out saves $40 on the initial capital cost of required parking (row 7). The annual cost of parking cash out is only 2.5 percent of the capital savings on required parking (row 8). If the cost of capital is above 2.5 percent a year, parking cash out thus saves more than it costs. Cash out also reduces operating and maintenance costs (including property taxes) for parking because fewer spaces are required. In addition, offering commuters the option to cash out their parking subsidies is a valuable fringe benefit that helps to recruit and retain workers. All things considered, parking cash out is a good investment.

CAR SHARING

Another possible in-lieu policy is to provide shared-car parking spaces instead of private parking spaces. A convenient shared-car option may convince some residents to skip buying a

second (or even first) car, and thus reduce the demand for parking. In a study of San Francisco's City CarShare program, Robert Cervero and Yu-Hsin Tsai found that nearly 90 percent of the members were from 0-1 vehicle households, well above the 71 percent share of such households in the city. At the end of City CarShare's second year, 29 percent of the members had disposed of one or more cars, while only 8 percent had increased their vehicle ownership; as a result, 21 percent of the members reduced the number of vehicles they owned. They made 6.5 percent of their trips and drove 10 percent of their VMT in shared cars.[33]

Consider how the in-lieu carshare arrangement might work for a 100-unit apartment house in a city that requires one parking space per apartment. Suppose that making one shared car available for the residents leads ten households in the building to choose not to buy a personal car. In this case, the city can allow one shared-car parking space to substitute for ten private parking spaces, and the number of required spaces would drop from 100 to 91. The developer would contractually commit to providing the shared-car arrangement for the residents as long as the private parking spaces are not provided. The reduction in required parking spaces could also be much greater. In San Francisco, for example, the Planning Department granted a variance to construct the 141-unit Symphony Towers apartments with only 51 parking spaces (rather than the required 141 spaces), in part because the developer committed to provide two parking spaces for the carsharing operator City CarShare. Charges for the parking spaces in the building were unbundled from the apartment rents.[34]

A shared car in the garage of an apartment building would be like something between a taxicab and a private car available for every resident, and it would make the apartments more desirable for the tenants. The arrangement would save money for both the developer (who provides fewer parking spaces) and residents (who own fewer cars) without eliminating anyone's ability to use a car when needed. The car-sharing organization would also gain members, and would be able to locate its cars in more locations, making membership in the club even more beneficial.

The shared-car option can be extended to many land uses. Cities could allow hotels, office buildings, and universities, for example, to provide some shared-car parking spaces in exchange for a reduced parking requirement. By making most parking free to drivers, off-street parking requirements have reduced the demand for car sharing, while offering developers the option to provide shared-car parking spaces in lieu of private parking spaces can increase the demand for car sharing, reduce developments costs, and reduce the demand for driving.

POLICIES APPROPRIATE TO THEIR LOCATIONS

These three policies—Eco Passes, parking cash out, and carsharing in lieu of required parking spaces—are appropriate where most employers and developers offer free parking, most commuters drive to work alone, and public transit has excess capacity. All three of these conditions are met in most U.S. cities. Ninety-one percent of all commuters drive to work in the U.S., 95 percent of automobile commuters park free at work, and only 27 percent of the seats on public transit are occupied.[35] Most cities require ample on-site parking, and they can reduce parking requirements for developers who agree to offer Eco Passes or parking cash out for all commuters.

Eco Passes and parking cash out are not useful in cities where few employers offer free parking, few commuters drive to work alone, and public transit is already packed—but these places almost certainly do *not* require excessive off-street parking. In the many cities that do require excessive off-street parking, however, offering developers the option to reduce the cost of required parking by Eco Passes, parking cash out, and car sharing makes sense for everyone involved.

CONCLUSION: OFFER THE OPTION TO REDUCE PARKING DEMAND

Conventional in-lieu fees give developers the option to finance public parking spaces rather than provide the required private parking spaces. Cities can also give developers the option to reduce the demand for parking rather than increase the supply, and this modest reform will create substantial benefits for all parties:

1. The reduced demand for parking can shift land from parking spaces to activities that employ more workers and yield higher tax revenue.

2. By reducing the number and size of parking lots, reducing the demand for parking improves urban design.

3. Employers use their savings from providing less parking to offer new fringe benefits—Eco Passes or parking cash out—for commuters. This new fringe benefit resembles a wage increase that helps recruit and retain workers.

4. Commuters gain new fringe benefits—free public transit or cash payments—beyond the usual offer of free parking at work.

5. Developers and property owners save money. They can replace a high capital cost for parking with a low annual cost for public transit, parking cash out or car sharing. Fewer vehicle trips reduce a project's environmental impacts, and can help developers satisfy traffic mitigation requirements.

6. Supply-side capital subsidies for required parking are converted into demand-side subsidies for public transit, and the increased transit ridership enables transit agencies to improve service.

7. Fewer vehicle trips reduce traffic congestion, air pollution, and energy consumption.

Eco Passes and parking cash out are cost effective because it is much cheaper to pay for a transit ride to and from work than to pay for a free parking space at work. Case studies suggest that developers can save at least $46 on the capital cost of required parking for each $1 a year they spend on Eco Passes. They can also save $40 on the capital cost of parking for each $1 a year they spend to offer parking cash out. The low cost of reducing the demand for parking compared with the high cost of increasing the supply shows that Eco Passes and parking cash out are cost-effective strategies. These cost-effectiveness comparisons were made in places famous for their addiction to cars: Silicon Valley (for Eco Passes) and Southern California (for parking cash out). If Eco Passes and parking cash out can reduce parking demand in these two places, they can probably achieve the same results in other cities.

TABLE 10-1

ECO PASS PRICE SCHEDULE
Santa Clara Valley Transportation Authority
(annual price per employee)

	Number of employees			
Employer's location	1-99	100-2,999	3,000-14,999	15,000+
Downtown San Jose	$80	$60	$40	$20
Areas served by bus and light rail	$60	$40	$20	$10
Areas served by bus only	$40	$20	$10	$5

Source: Santa Clara Valley Transportation Authority, 2001.

TABLE 10-2

COST-EFFECTIVENESS OF ECO PASSES
(Silicon Valley)

	Assumptions	
	Conservative	Optimistic
1. In-lieu parking fee ($/parking space)	$26,000 (Mountain View)	$50,994 (Palo Alto)
2. Parking requirement (spaces/1,000 square feet of floor area)	3 (Mountain View)	4 (Palo Alto)
3. Capital cost of required parking ($/square foot of floor area)	$78 (3x$26,000/1,000)	$204 (4x$50,994/1,000)
4. Reduction in parking demand (%)	19%	19%
5. Capital savings on required parking ($/square foot of floor area)	$15 ($78x19%)	$39 ($204x19%)
6. Annual cost per employee for Eco Passes ($/employee/year)	$80	$5
7. Employees per 1,000 square feet (employees/1,000 square feet of floor area)	4	4
8. Annual cost per square foot for Eco Passes ($/square foot of floor area/year)	$0.32 ($80x4/1,000)	$0.02 ($5x4/1,000)
9. Capital savings per $1 of annual cost for Eco Passes ($/year)	$46 ($15/$0.32)	$1,938 ($39/$0.02)
10. Annual cost of Eco Passes as % of capital savings (%/year)	2.2% ($0.32/$15)	0.1% ($0.02/$39)

Conservative assumptions: Low in-lieu fee, low parking requirement, high Eco Pass cost.
Optimistic assumptions: High in-lieu fee, high parking requirement, low Eco Pass cost.

TABLE 10-3

PARKING CASH OUT REDUCES PARKING DEMAND

	Cars parked per 1,000 square feet when employers pay for parking			
Commuter demand (location/case number)	*Without* cash out	*With* cash out	Reduction #	Reduction %
(1)	(2)	(3)	(4)	(5)
Downtown L.A. (1	2.9	2.2	-0.7	-24%
Downtown L.A. (8	2.9	2.4	-0.5	-16%
Century City (1)	3.0	2.7	-0.3	-9%
Century City (4)	3.7	3.3	-0.3	-9%
Century City (3)	3.4	3.1	-0.3	-9%
Santa Monica (6)	3.6	3.3	-0.3	-9%
Santa Monica (7)	3.5	3.3	-0.2	-5%
West Hollywood (2)	2.3	2.2	-0.1	-5%
Case study averag	3.2	2.8	-0.4	-13%
Non-commuter demand				
Visitor parkin	+0.4	+0.4	0	0
Vacancy facto	+0.3	+0.3	0	0
Peak parking facto	-0.2	-0.2	0	0
Total parking demand	**3.7**	**3.3**	**-0.4**	**-11%**

Source: Chapter 25. The eight case studies are ranked in descending order of the reduction in parking demand (Column 4).

TABLE 10-4

COST-EFFECTIVNESS OF PARKING CASH OUT

1.	Capital cost per parking space	$10,000	per space
2.	Reduction in parking demand	0.4	spaces per 1,000 square feet
3.	Capital savings on parking	$4	per square foot ($10,000 x 0.4/1,000)
4.	Annual cost per employee for cash out	$24.23	per employee per year
5.	Employees per 1,000 square feet	4	employees per 1,000 square fe
6.	Annual cost per square foot for cash o	$0.10	per square foot per year ($24.23 x 4/1,000)
7.	Capital savings per $1 of annual cost for parking cash out	$40	per year ($4.00/$0.10)
8.	Annual cost of parking cash out as % of capital savings (%/year)	2.5%	per year ($0.10/$4.00)

1. Santa Clara Valley Transportation Authority (1997). The number of cars driven to work by solo drivers fell by 21 percent. Because some commuters switched from carpools to transit and because carpoolers drive fewer than one vehicle per person, the total number of cars driven to work fell by only 19 percent. The transit share increased from 11 percent before the free transit passes, to 27 percent afterward.

2. As an administrative precedent for purchasing transit passes in lieu of providing the required parking, some cities allow property owners to purchase parking permits in public garages in lieu of providing the required on-site parking. For example, Kirkland, Washington, allows a property owner to pay an annual in-lieu fee of $1,020 per required parking space not provided, and the owner receives a parking pass to a public garage for each fee paid. This obligation runs with the land and commits future property owners either to pay the annual fee or to provide the required parking.

3. See the SCVTA's website <www.vta.org/eco_pass.html> for details of the Eco Passes. The Eco Pass's price includes a guaranteed ride home. On any day they ride transit to work, commuters are entitled to a free taxi ride home in the event of illness, emergency, or unscheduled overtime. The public transit systems in Boulder and Denver, Colorado, and Salt Lake City, Utah, offer similar Eco Pass programs.

4. Eco Passes avoid the problem of "adverse selection." The concept of adverse selection was developed in the context of insurance coverage. Adverse selection describes the tendency for people with a greater potential of loss to purchase more insurance. This tendency leads to higher loss payments, and then to higher insurance premiums for everyone who is insured. Similarly, adverse selection increases the cost of conventional transit passes sold to the public. Because frequent transit riders often buy monthly passes, transit agencies must price these passes on the assumption that passholders are frequent riders. There can also be adverse selection among employers. Firms with many commuters who ride transit will have an incentive to buy the Eco Passes, and this will tend to increase the transit operators' cost.

5. In the example, 20 percent of commuters opt for the conventional transit passes. Because all commuters get Eco Passes, and not just those who ride transit every day, the daily transit ridership may increase. Although some commuters who had opted for the conventional transit passes rather than parking spaces may begin to drive to work on some days, those who previously drove to work every day may begin to ride transit occasionally.

6. See Federal Transit Administration (1998) for data on annual passenger miles and annual vehicle revenue miles for public transit systems in the U.S. Dividing the 17.5 billion passenger miles traveled on bus transit in 1997 by the 1.6 billion vehicle revenue miles of service on bus transit gives an average occupancy of 10.9 passenger miles per bus mile (17.5 ÷ 1.6 = 10.9 passengers per bus). Dividing the average bus occupancy of 10.6 passengers by the average bus capacity of 40 seats gives an average seat occupancy of 27 percent (10.9 ÷ 40 = 27 percent); that is, if all passengers are seated during their trips, only 27 percent of bus seats are occupied. This calculation overestimates the number of bus seats that are occupied because some passengers stand rather than sit. An average bus occupancy of 10.9 passengers may seem low, but Davis and Diegel (2002, Table 2.11) estimated that the average bus occupancy was only 9.2 passengers in 2000. Naturally, some

transit vehicles are packed at rush hours, but this must be a small percentage of all transit vehicle-miles for the average occupancy to be only 27 percent. If Eco Passes increase ridership during the hours when capacity must be increased to carry more riders, the marginal cost of the additional riders can be high.

7. See Table 9-4 for the cities's in-lieu fees in 2002.

8. Santa Clara Valley Transportation Authority (1997).

9. Suppose the Eco Pass costs $80 a year per employee. If there are 4 employees per 1,000 square feet of office space, the Eco Passes cost $320 a year per 1,000 square feet of office space (4 x $80), or 32¢ a year per square foot of office space ($320 ÷ 1,000). The SCVTA charges the highest price of $80 a year per employee only in downtown San Jose, and the highest price elsewhere is only $60. The table thus overstates the highest cost of Eco Passes in Mountain View and Palo Alto by 33 percent, and the calculations in Table 10-2 are even more conservative.

10. Mary Smith (1999, 535). This estimate excludes property taxes.

11. If the off-street parking requirements satisfy the commuter demand for free parking, employers have enough spaces to offer everyone free parking. If cities offer a reduction in parking requirements equal to the reduction in parking demand caused by the in-lieu Eco Passes, the required parking supply still meets the demand for free parking, but everyone also can ride transit for free.

12. The developers who pay the conventional in-lieu fees to finance public parking structures thus inadvertently subsidize their competition, who also benefit from the public parking spaces.

13. For example, if the Eco Passes cost $40 a year per employee and they reduce the demand for commuter parking by 19 percent (as found in the Silicon Valley), the Eco Passes save more than $40 a year per employee on parking subsidies if the firm had been spending more than $211 a year per employee to subsidize parking (because reducing a parking subsidy of $211 a year by 19 percent saves $40 a year). Many firms spend far more than this break-even value of $211 a year ($17.60 a month) per employee to subsidize parking.

14. California Department of Transportation (2002, Appendix B).

15. California Department of Transportation (2002, 1).

16. Lund, Cervero, and Willson (2004, 88).

17. *Ibid.* (64).

18. Employees will also know whether their employer continues to offer the Eco Passes, and they might report an employer who failed to comply with a covenant to provide Eco Passes.

19. Universities have given their programs a variety of names—such as BruinGO, ClassPass, SuperTicket, and UPass. See Brown, Hess, and Shoup (2001) for a survey of 35 Unlimited Access

programs. There were more than 60 programs by 2002.

20. Brown, Hess, and Shoup (2003).

21. University of Washington Transportation Office (1997).

22. "The parking requirement for a hotel or motel facility may be reduced by the City during parking plan review by up to twenty percent if . . . complimentary transit tickets are provided to customers and employees, free use of bicycles is similarly provided, and telephones, faxes, computers with modems, and other business machines are readily available on site" (Section 86.58.230E of the Coronado Municipal Code). Many hotels in German cities have also arranged for their hotel guest identification to serve as a transit pass.

23. Portland TriMet (2002, 3-11).

24. California Health and Safety Code Section 65089.

25. *Ibid.*

26. Table 25-2 shows the numbers of cars driven to work per commuter before and after giving commuters the option to cash out their parking subsidies. A downtown Los Angeles employee survey found an average office occupancy density of 4.2 employees per 1,000 square feet (Barton Aschman Associates 1986). The absentee rates (for sickness, vacations, telecommuting, and travel) at the eight case study firms ranged from 5 percent to 27 percent, with an average of 10 percent of employees absent on each day. Given an occupancy density of 4.2 employees per 1,000 square feet and average employee absentee rate of 10 percent, Table 10-3 shows the number of cars driven to work per 1,000 square feet before and after employers offered commuters the option to cash out their parking subsidies in the eight case studies, based on the data in Table 25-2.

27. Higgins (1993) assumed a daily average of 0.5 visitors per employee, a visitor parking turnover rate of four per day, and a visitor drive-alone share of 85 percent. If there are 0.5 visitors per employee per day, if 85 percent of these visitors arrive by car, and if visitor parking spaces turn over four times per day, the visitor parking demand is (0.5 x 0.85)/4 = 0.1 parking spaces per employee.

28. Parking Consultants Council (1992, 5).

29. Wilbur Smith and Associates (1981). Hartmut Topp (1991, 7) reports that the peak parking factor for commuter parking in Frankfurt, Germany, is about 85 percent.

30. Commuters drive 3.2 cars per 1,000 square feet when employers offer free parking without the cash option. The peak parking demand is 0.2 spaces per 1,000 square feet less than this because 6 percent of these cars aren't parked at work at the time of peak demand.

31. The estimates in Table 10-3 do *not* show that parking demand is *exactly* 3.7 or 3.3 spaces per 1,000 square feet of office space. The wide variation among the case-study sites shows that there

is not one "right" number of parking spaces for all office buildings. Nevertheless, the evidence does show that the cash option reduces parking demand and that cities can allow developers, property owners, and employers to offer parking cash out instead of providing some of the required spaces.

32. The assumed cost of $10,000 per space is lower than the cost per space (in 2002 dollars) for any of the 15 parking structures built at UCLA since 1961 (see Table 6-1).

33. Cervero and Tsai (2003, 5, 24-25). The typical shared-car trip was 5½ miles and cost $32. The typical shared car was leased out for seven hours per day.

34. U.S. Environmental Protection Agency (2004, 25). Symphony Towers is located at 724 Van Ness Avenue, and is described on the San Francisco Housing Action Coalition's website at <http://www.sfhac.org/images/HAC_Board_1.pdf >. As an added incentive to participate in carsharing, developers might even offer to pay every resident's small annual membership fee in the carshare organization. In Los Angeles, for example, one shared-car plan has a $25 annual fee plus a charge of $10 per hour. See the Flexcar website at <www.flexcar.com>.

35. See Chapter 22 for data on free parking at work and the share of commuters who drive to work.