



Evaluating the effects of cashing out employer-paid parking: Eight case studies

Donald C. Shoup

Institute of Transportation Studies, School of Public Policy and Social Research, University of California, Los Angeles, California 90095-1656, U.S.A.

California law requires many employers to offer commuters the option to choose cash in lieu of any parking subsidy offered. This report presents case studies of eight firms that have complied with California's cash-out requirement. For the 1,694 employees of the eight firms, the number of solo drivers to work fell by 17 percent after cashing out. The number of carpoolers increased by 64 percent, the number of transit riders increased by 50 percent, and the number who walk or bike to work increased by 39 percent. Vehicle-miles traveled for commuting to the eight firms fell by 12 percent. Carbon dioxide emissions from commuting fell by 367 kilograms per employee per year. The eight firms' spending for commuting subsidies rose by \$2 per employee per month because payments in lieu of parking increased slightly more than spending for parking declined. Federal and state income tax revenues increased by \$65 per employee per year because many commuters voluntarily traded tax-exempt parking subsidies for taxable cash. Employers praised the cash option for its simplicity and fairness, and said that it helped to recruit and retain employees. The benefit/cost ratio of the eight cash-out programs was at least 4/1. In summary, these eight case studies show that cashing out employer-paid parking can benefit commuters, employers, taxpayers, and the environment. All these benefits derive from subsidizing people, not parking. © 1997 Elsevier Science Ltd. All rights reserved

When it comes to commuters, cars, and free parking in the United States, all percentages are in the nineties. Ninety-one percent of all commuters drive to work (Hu and Young, 1992). Ninety-two percent of all cars driven to work have only one occupant (Pisarski, 1996). Ninety-five percent of all commuters who drive to work receive free parking (Shoup, 1995).

Nationwide, employers provide 85 million free parking spaces for commuters (Shoup and Breinholt, 1997). This parking subsidy is worth \$36 billion a year (Association for Commuter Transportation, 1996).

Most commuters park free even in the central business districts (CBDs) of the largest cities. For example, a survey of commuters to the Los Angeles CBD found that 53 percent of motorists received employer-paid parking (Willson and Shoup, 1990). A survey of trans-Hudson commuters found that 54 percent of auto drivers bound for the Manhattan CBD during the morning peak received employer-paid parking (Port of New York and New Jersey, 1984).

Employer-paid parking is not a purely American phenomenon. For example, a survey of automobile

commuters to central London found that 58 percent received employer-paid parking (Department of Transport, 1992). A survey of automobile commuters to central Cape Town, South Africa, found that 39 percent received employer-paid parking (Cape Town Municipality, 1997).

When employers pay for parking *at work*, commuters must still pay for driving *to work*. Employer-paid parking is thus a matching grant for driving to work—the employer pays part of the cost of commuting by car (the parking cost) only if the commuter pays the rest of the cost (the driving cost). Commuters who do not drive to work cannot benefit from employer-paid parking.

Employer-paid parking stimulates additional automobile commuting, but it also replaces payments for parking that would have been made by commuters who would have driven to work anyway. To estimate the stimulus and replacement effects, we can examine the evidence from previous studies of how employer-paid parking affects commuting behavior. Shoup (1995) summarized the results of seven studies that have

compared either: (1) commuting behavior *before* and *after* employer-paid parking was eliminated; or (2) the commuting behavior of matched samples of commuters *with* and *without* employer-paid parking. When commuters paid for parking, they drove an average of 53 cars to work per 100 employees. When commuters parked free, they drove an average of 72 cars per 100 employees. These studies show that, per 100 commuters, employer-paid parking replaced commuters' payments for parking 53 cars (the number driven to work when commuters paid for parking), but also stimulated a 36 percent increase in the number of cars driven to work.

Employer-paid parking would not create a transportation problem if it merely shifted the cost of parking from commuters to employers, without stimulating additional solo driving. But employer-paid parking is a matching grant—the employer pays for the parking only if the commuter drives to work. This matching arrangement stimulates solo driving.

Cashing out employer-paid parking

In 1992, California enacted legislation that converts employer-paid parking from a matching grant for driving into a block grant for commuting. The law requires many employers who subsidize commuter parking to offer a parking cash-out program. As defined in the law,

'Parking cash-out program' means an employer-funded program under which an employer offers to provide a cash allowance to an employee equivalent to the parking subsidy that the employer would otherwise pay to provide the employee with a parking space. ... 'Parking subsidy' means the difference between the out-of-pocket amount paid by an employer on a regular basis in order to secure the availability of an employee parking space not owned by the employer and the price, if any, charged to an employee for the use of that space (California Health and Safety Code Section 43845).

Offering commuters the option to choose between free parking or its cash value makes it clear that even free parking has an opportunity cost, the foregone cash. Therefore, some commuters who now drive to work alone and park free are likely to take the cash and begin to rideshare. (*Rideshare* here refers to any form of commuting other than solo driving.)

The cash-out requirement applies to employers of 50 or more persons in regions that do not meet the state's clean air standards, but only for parking spaces these employers rent from a third party. Thus, if a commuter trades a parking space for cash, the money previously allocated to renting a parking space directly funds the commuter's cash allowance. Parking spaces *owned* by employers are exempt from the cash-out requirement.

California's cash-out law does not require an employer to subsidize ridesharing, or to adopt any particular subsidy policy. The cash-out requirement is

best understood as a test that an employer's transportation subsidy policy must pass. Any employer's policy will pass the test if it subsidizes the alternatives to parking (such as transit, walking, or cycling) as much as it subsidizes parking. A policy will violate the law only if it subsidizes parking more than the alternatives.

Many commuter subsidy policies comply with the cash-out requirement. For example, employers can offer commuters any of the following:

- No parking subsidy
- A parking subsidy only for carpools
- The choice between a parking subsidy or its cash value
- The choice between a parking subsidy or more than its cash value
- A commuting allowance that can be spent on any form of commuting

Cashing out is likely to increase ridesharing, but the cash-out law does not require commuters to rideshare. The law simply requires employers to offer commuters the option to choose cash in lieu of any parking subsidy offered.

Research questions

Because cashing out employer-paid parking is a new practice, there are concerns regarding its effectiveness. Previous case studies have estimated the effects of eliminating parking subsidies, but it is unclear whether the findings of these studies can predict the effects of cashing out parking subsidies. Little is known about the existing distribution of parking subsidies among commuters, how cashing out parking subsidies will change this distribution, and how much cashing out will cost employers. Because parking is expensive in central business districts, there is the question of whether cashing out will also be expensive in these districts. Finally, little is known about how many parking spaces employers rent to subsidize commuter parking, and how many of these rented parking spaces can easily be cashed out. These concerns suggest the following six research questions:

- (1) How will cashing out reduce vehicle trips for commuting?
- (2) How will cashing out reduce vehicle emissions from commuting?
- (3) How much will cashing out cost employers?
- (4) How many parking spaces can be cashed out?
- (5) How will cashing out change the distribution of subsidies among commuters?
- (6) How will cashing out affect central business districts?

Eight case studies

To answer these six questions, this report presents case studies of eight employers who have complied with

California's cash-out requirement.¹ The employers initially offered parking subsidies greater than the subsidies they offered to ridesharers, and they subsequently adopted subsidy programs that comply with the cash-out requirement.

The eight employers are an accounting firm, a bank, a government agency, a managed-care medical provider, a video post-production company, and three law firms. They range in size between 120 and 300 employees, with a total of 1,694 employees. Two of the employers are in downtown Los Angeles, three are in Century City (a high-density regional center in West Los Angeles), two are in Santa Monica, and one is in West Hollywood. The price of parking at the worksites ranges from \$36 to \$165 a month.

To comply with California's cash-out requirement, a firm must offer commuters the option to choose a cash payment equal to any parking subsidy offered. Of the eight case-study firms, six voluntarily went beyond mere compliance with the law by subsidizing one or more alternatives to parking more than they subsidize parking. Of these six firms, two subsidize public transit or vanpooling more than they subsidize other alternatives, two reduced parking subsidies while increasing ridesharing subsidies, and one ended parking subsidies but retained ridesharing subsidies.

The varied subsidy changes in the eight case studies show that California's cash-out requirement offers flexibility to employers, and that cashing out is not one single policy. Accordingly, the term *cashing out* is used here to denote a variety of policies each of which complies with California's cash-out law.

The case studies examined how cashing out affects the following:

- (1) Commuter mode shares
- (2) Vehicle trips to work
- (3) Vehicle-miles traveled to work
- (4) Vehicle emissions from work trips
- (5) Gasoline consumption for work trips
- (6) Employers' spending for subsidizing commuting

Case study methodology

The eight case-study firms were identified in consultation with Commuter Transportation Services, a regional agency that assists employers at nearly 5,000 sites with rideshare programs. These eight firms are all the employers we could find with cash-out programs that had been in effect long enough to provide data for evaluating the post-cash-out effects. The population is small because California has not yet required firms to comply with the cash-out law. This non-enforcement

has stemmed, in part, from uncertainty regarding the income tax consequences of cashing out parking subsidies. A provision of the Taxpayer Relief Act of 1997 has resolved this tax uncertainty.²

All data for the case studies were obtained from the Trip Reduction Plans that firms are required to submit annually to the South Coast Air Quality Management District (SCAQMD). In preparing these plans, firms survey employees about their method of commuting to work during a specified week of each year. Firms report the survey results in a consistent format and provide detailed information about every ridesharing incentive they offer. We also interviewed five of the firms' transportation coordinators to obtain their personal evaluations of cashing out parking subsidies.

In each case study the base year is the year before the firm began to offer commuters the option to cash out their parking subsidies. The mode shares were measured in the base year, and in the first, second, or third year after cashing out began, depending on the length of time for which post-cash-out data were available. The year after cash out (when the reductions in solo driving were measured) was 1993 for Case 2, 1994 for Cases 1, 3, 4, and 5, and 1995 for Cases 6, 7, and 8.

Do factors other than cashing out explain the reductions in solo driving that occurred after cashing out? Annual surveys of commuters in Southern California from 1990 to 1994 found that the solo-driver share ranged between 77 and 80 percent, with no downward trend (Commuter Transportation Services, 1994). Five of the eight firms also discontinued other ridesharing incentives when they began to offer the cash option. Therefore, neither regional trends nor the effect of other ridesharing incentives explains the reduction in solo driving at the eight firms.

One firm that did not cash out its parking subsidies was also examined to control for factors other than cashing out. Case 9 is located in Santa Monica near Cases 6 and 7. This firm is a suitable comparison case because its parking subsidy remained \$75 a month greater than its ridesharing subsidy between 1991 and 1995. The comparison firm's solo-driver share was unchanged (at 83 percent) between 1991 and 1995. This finding supports the conclusion that cashing out parking

¹This research was conducted for the California Air Resources Board. Shoup (1997b) reports the complete case studies, describes the case-study methodology in detail, explains the derivation of every estimated change that occurred after cashing out, and includes the full texts of the interviews.

²At the time of the case studies, Section 132(f)(4) of the Internal Revenue Code stated that employer-paid parking was a tax-exempt fringe benefit only if it was "provided in addition to (and not in lieu of) any compensation otherwise payable to the employee." Therefore, if an employer offered an employee cash in lieu of a parking subsidy, the employer should also have reported the parking subsidy itself as taxable income for the employee if the employee took the parking. Because of the tax problem inherent in Section 123(f)(4), California has not yet begun to enforce its parking cash-out law. In the case studies, employers reported the cash paid in lieu of parking subsidies as taxable income, but did not report the employees' parking subsidies as taxable income because they were unaware of Section 132(f)(4). Section 1072 of the Taxpayer Relief Act of 1997 eliminated the "not in lieu of compensation" provision regarding parking subsidies, effective January 1, 1998.

Table 1 Summary of travel changes after cashing out

Case/Location	Solo Driver Share			Vehicle Trips per Employee per Day				VMT per Employee per Year			
	Before	After	Change	Before	After	Change	Percent Change	Before	After	Change	Percent Change
5. Downtown L.A.	75%	53%	-22%	0.79	0.60	-0.19	-24%	5,297	4,013	-1,284	-24%
8. Downtown L.A.	61%	45%	-16%	0.75	0.63	-0.12	-16%	5,281	4,418	-864	-16%
1. Century City	71%	58%	-13%	0.81	0.74	-0.07	-9%	5,461	4,862	-599	-11%
4. Century City	88%	76%	-12%	0.93	0.85	-0.08	-9%	6,578	6,006	-585	-9%
3. Century City	79%	67%	-12%	0.85	0.78	-0.07	-9%	6,113	5,589	-524	-9%
7. Santa Monica	83%	75%	-8%	0.83	0.79	-0.04	-5%	6,294	5,960	-334	-5%
6. Santa Monica	85%	78%	-7%	0.90	0.82	-0.08	-9%	6,478	5,910	-568	-9%
2. West Hollywood	72%	70%	-3%	0.76	0.72	-0.04	-5%	N/A	N/A	N/A	N/A
Weighted average	76%	63%	-13%	0.82	0.73	-0.09	-11%	5,348	4,697	-652	-12%

Sources: Tables 1-2, 1-3, 1-4, 2-2, 2-3, 3-2, 3-3, 4-2, 4-3, 5-2, 5-3, 6-2, 6-3, 7-2, 7-3, 8-2, and 8-3 in Shoup (1997b).

subsidies, and not other factors, caused the reductions in solo driving at the eight firms that cashed out.

Summary of travel changes after cashing out

Table 1 summarizes the travel changes that occurred after cashing out. It shows the changes in solo-driver share, number of vehicle round trips to work, and vehicle-miles traveled (VMT) for commuting. The cases are arranged according to the reduction in solo-driver share after cashing out, in descending order. The last row shows the weighted averages for all 1,694 employees of the eight firms.

Solo-driver share

The first panel in Table 1 shows the solo-share reductions at the eight firms. They range from 3 to 22 percentage points, with an average reduction of 13 percentage points.

The largest reduction in solo-share occurred at Case 5 in downtown Los Angeles. This firm had previously offered commuters either parking subsidies ranging from \$90 to \$145 a month (depending on seniority), or a transit subsidy of \$15 a month. The firm then began to offer all commuters the choice between a parking subsidy of \$100 a month, or \$150 a month in cash.

The smallest solo-share reduction occurred at Case 2 in West Hollywood. This firm had previously offered commuters either a parking subsidy of \$65 a month, or \$45 a month in cash. The firm then raised the cash offer to \$65 a month, equal to the value of the parking subsidy.

Figure 1 shows the commuter mode shares for all 1,694 employees of the eight firms before and after cashing out. The eight firms' mode shares *before* cashing out were almost identical to the nationwide mode shares for commuting found in the 1990 Census. Pisarski (1996, 49) reports that, excluding those who work at home, the mode shares for commuting in the United States in 1990 were solo driver (75%), carpool (14%), transit (5%), and walk plus bicycle (4%). The mode shares for the 1,694 commuters at the eight firms before cashing out were solo driver (76%), carpool (14%),

transit (6%), and walk plus bicycle (3%). In terms of their employees' mode shares before cashing out, the eight case-study firms were typical of the national pattern.

After cashing out, the solo-driver share at the eight firms fell from 76 percent to 63 percent. The carpool share rose from 14 percent to 23 percent, the transit share rose from 6 percent to 9 percent, and the combined walk and bicycle share rose from 3 percent to 4 percent.

Per 100 commuters, cashing out employer-paid parking induced 13 solo drivers to shift to another mode. Of the 13 former solo drivers, 9 joined carpools, 3 began to ride transit, and one began to walk or bicycle to work. These mode shifts reduced the number of solo drivers to work by 17 percent, increased the number of carpools by 64 percent, increased the number of transit riders by 50 percent, and increased the number who walk or bike to work by 39 percent.

The sharp increase in carpooling is especially noteworthy because it runs counter to the national trend. The nationwide carpool share fell from 20 percent in 1980 to 14 percent in 1990, while the carpool share at the eight firms rose from 14 percent before cashing out to 23 percent after cashing out.

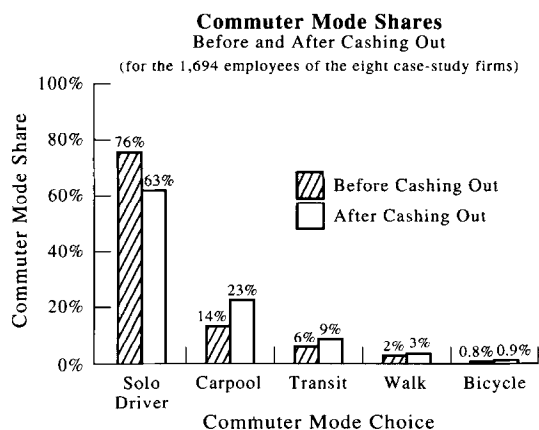


Figure 1 Commuter mode shares. Before and after cashing out (for the 1694 employees of the eight case-study firms).

Vehicle trips to work

The second panel in Table 1 shows how cashing out reduced the vehicle trip rate (VTR), which is defined as the number of vehicle round trips per employee per day for commuting. To determine the VTR, each solo driver is counted as one vehicle trip, each person in a two-person carpool is counted as one-half of a vehicle trip, each person in a three-person carpool is counted as one-third of a vehicle trip, and so on. No vehicle trips are attributed to transit riders, bicyclists, or pedestrians.

Some carpoolers and transit riders may drive short trips to meet their carpool partners or to get to a transit stop, so this VTR calculation may overestimate the reduction in vehicle trips caused by shifts to carpooling and transit. On the other hand, some carpoolers and transit riders who do not have their vehicles at work may make fewer work-related and personal vehicle trips during the day, so this VTR calculation may also underestimate the reduction in vehicle trips. The two factors work in opposite directions, so the net effect is uncertain, and probably small.³

The average number of vehicle round trips to work fell from 0.82 per employee per day before cashing out to 0.73 per employee per day after cashing out. For the 1,694 employees of the eight firms, cashing out thus reduced 0.09 vehicle round trips per employee per day for commuting. This average reduction is per employee offered the cash option (all 1,694 employees), not per employee whose mode choice changed because of the cash option. The VTR reductions ranged from 0.04 in Santa Monica and West Hollywood to 0.19 in downtown Los Angeles.

Cashing out reduced vehicle trips to work by an average of 11 percent ($0.09 \div 0.82$), and thus reduced the demand for parking at work by 11 percent. The reduction in vehicle trips ranged from 5 percent in Santa Monica and West Hollywood to 24 percent in downtown Los Angeles.

Vehicle travel to work

The reductions in total vehicle travel after cashing out are calculated by multiplying each firm's reduction in the number of vehicle trips to work by the commuters' average round-trip distance to work. A 1991 travel survey of commuters in the South Coast Air Basin found that the average one-way vehicle commute distance was 24.1 kilometers (15 miles) (Southern California Association of Governments, 1993). Annual surveys conducted between 1989 and 1994 found that average one-way vehicle commute distances ranged from 23.8 to 26.6 kilometers (14.8 to 16.5 miles)

(Commuter Transportation Services 1994). The average one-way distance used to calculate the reduction in vehicle-kilometers traveled (VKT) for each avoided vehicle commute trip is therefore 24.1 kilometers (15 miles).⁴

When commuters carpool, they may drive a more circuitous route to work than if they drove alone. Fricker (1986, p. 34) defined circuitry as "the extra distance that a member of a carpool travels, compared to that person's drive-alone distance between home and work." He defined the "circuitry factor" as the "ratio of ridesharing distance to drive-alone distance." If circuitry is a serious problem with carpooling, the method used to calculate VMT will underestimate the VMT by carpoolers and will therefore overestimate the VMT reduced when commuters shift from solo driving to carpooling. A sensitivity test of the results, however, found that circuitry had almost no effect on the VMT estimates.⁵

The third panel of Table 1 shows that, at the eight firms, commuters drove from 538 to 2,067 fewer kilometers (334 to 1,284 fewer miles) per employee per year, with an average of 1,050 fewer VKT (652 fewer VMT) per employee per year (4.2 fewer VKT or 2.6 fewer VMT per employee per work day). Again, this reduction is per employee offered the cash option, not per employee whose mode choice the cash option changed.

The reductions in vehicle travel after cashing out ranged from 5 to 24 percent, with an average of 12 percent fewer VMT per employee per year. Reducing vehicle travel for commuting by 12 percent is equivalent

⁴In Case Study 1, we were able to examine all the individual responses for both the 1992 and 1994 surveys. The average distance to work was 14.6 miles in 1992, and fell to 13.9 in 1994. This finding of a reduced average distance to work after cashing out explains why the VMT per employee fell by 11 percent while vehicle trips per employee fell by only 9 percent. In the other case studies, the average distance to work is assumed to be the same before and after cashing out, so the percent changes in vehicle trips and VMT are the same. This finding in Case Study 1 also explains why the average VMT per employee for all cases fell by 12 percent while the average vehicle trips per employee fell by only 11 percent.

⁵Fricker estimated an average circuitry factor of 1.071 for carpooling. That is, a commuter would drive 7.1 percent farther to work if carpooling than if solo driving. Because we have the trip distances for each solo driver and carpooler for Case Study 1, we can estimate the circuitry factor for commuters who travel from the same zip code. The estimated circuitry factor is 1.035. Fricker estimated circuitry for carpoolers traveling to multiple work sites, so there was circuitry possible on both the home-end and work-end of the commute trip. In contrast, the case-study data were gathered at a single work site, so there would be no circuitry on the work-end of the commute trip. If we assume that half of the trip circuitry occurs at the work end and the other half occurs at the home end, we can divide Fricker's circuitry factor (1.071) in half, attributing half of the circuitry to the home end and half to the work end. This leaves a circuitry factor of 1.035; since each of the case studies' commuters all work at the same site, the circuitry factor of 1.035 is in line with the previously published data. A circuitry factor of 1.035 reduces by less than 1 percent the before-after change in VMT in the case studies, compared to no circuitry in carpooling. A low circuitry factor is expected because, in forming carpools, commuters naturally seek partners with non-circuitous trips to work.

³Similarly, vehicles left at home may be used for additional trips during the day, although they are less likely to be driven on the most congested routes at the most congested hours than if they were driven to work. On the other hand, cashing out may over time lead commuters to own fewer vehicles. Again, the net effect on vehicle trips is uncertain, and probably small.

to removing from the road one of every eight cars driven to work at the eight firms.

This estimate of a 12-percent reduction in vehicle travel after cashing out is conservative because it measures only short-term effects. Cashing out is a new practice, and few firms have sufficient years of experience to provide evidence of longer-term effects. Because seven of the eight case studies examined commuters' responses after only one or two years of cashing out, the longer-term reductions in vehicle use may be underestimated. For one firm (Case 3) records are available for three years after the cash-out program began, however, and the solo-driver share fell in each of the following three years.

The firms' representatives offered two practical explanations for this longer-term decline in solo driving. First, new employees who have not already made their commuting choices are more willing to try ridesharing if they can take cash in lieu of free parking. Second, when cashing out is available, word of mouth spreads the idea among fellow workers. Those who have taken the cash describe the deal to others, and more begin to try it.

Do these changes result from cashing out parking subsidies?

The eight firms complied with California's cash-out requirement in several different ways. Five firms (2,3,4,6,7) maintained their existing parking subsidies and increased their ridesharing subsidies. Two firms (5,8) reduced their parking subsidies and increased their ridesharing subsidies. One firm (1) reduced its parking subsidy and maintained its ridesharing subsidy. Six of the firms (1,4,5,6,7,8) exceeded compliance with the cash-out requirement by subsidizing at least one alternative to employer-paid parking by more than the parking subsidy itself. Given these varying policies, can we attribute the results at all eight firms to 'cashing out' parking subsidies?

One way to answer this question is to compare the results for the three Century City firms that complied with the cash-out requirement in different ways. Case 1 previously offered either a parking subsidy of \$110 a month, or \$55 in cash; it then eliminated the parking subsidy, and offered the \$55 in cash only to those who did not drive to work alone. Case 3 previously offered either a parking subsidy of \$100 a month, or nothing; it then began to offer either a parking subsidy of \$100 a month, or \$100 a month in cash. Case 4 previously offered either a parking subsidy of \$120 a month, or between \$50 and \$90 a month in cash for various alternative travel modes; it then began to offer either a parking subsidy of \$120 a month, or \$150 a month in cash. Table 1 shows that, despite differences in the specific terms of cashing out, each of the three firms' number of vehicle trips per employee per day fell by 9 percent.

The results in Century City suggest that differences in the specific terms of cashing out did not greatly affect

the outcomes in terms of the resulting travel changes. The 'before' and 'after' subsidies, and the changes in these subsidies, differed among the three firms, but the reductions in solo shares and vehicle trips after complying with the cash-out requirement were similar.⁶

Summary of emissions reductions and gasoline savings

By reducing vehicle travel, cashing out parking subsidies also reduced vehicle emissions. We can calculate these reductions in vehicle emissions by multiplying the reductions in vehicle trips and VMT by the emissions created per trip end (cold-start and hot-soak emissions) and per VMT (running emissions). For example, Case 4 shows that cashing out reduced 40 trips and 585 VMT per employee per year. The California Air Resources Board has estimated 'emissions factors' that measure the average vehicle's emissions per trip end and per VMT for each type of vehicle emission.⁷ Multiplying 40 trips and 585 VMT by the emissions factors for reactive organic gases (ROG), carbon monoxide (CO), nitrogen oxides (NO_x), and inhalable particulate matter less than ten microns in diameter (PM₁₀) for trip ends and for VMT gives the resulting emissions reductions per employee per year for Case 4.

For the 1,694 employees of the eight firms, cashing out parking subsidies reduced vehicle emissions by 819 grams of ROG, 683 grams of NO_x, 7.2 kilograms of CO, and 500 grams of PM₁₀ per employee per year. The California Air Resources Board (1990) treats reductions in ROG, NO_x, and PM₁₀ as equally valuable, but treats seven grams of CO as equivalent to one gram of the other three pollutants. This valuation method gives an estimated reduction of 3 kilograms of vehicle emissions per employee per year, a 12-percent reduction in vehicle emissions for driving to work.

By reducing vehicle travel, cashing out saved 99 liters (26 US gallons) of gasoline per employee per year, and thereby reduced tailpipe emissions of carbon dioxide

⁶Although Case 1 reduced parking subsidies without increasing ridesharing subsidies, this firm experienced the average reduction in solo-driver share for all 1,694 employees. Therefore, this 'outlier' case did not influence the average reduction in solo share found for the eight firms.

⁷The emissions factors are specific to the year in which the emissions reductions were estimated. For example, the 1993 emissions factors for ROG were 0.86 grams/mile and 7.63 grams/trip-end; the 1994 factors were 0.81 grams/mile and 6.93 grams/trip-end; the 1995 factors were 0.76 grams/mile and 6.54 grams/trip-end. The Motor Vehicle Emission Inventory (MVEI) model 7F1-1, was the source of emission factors available when these emissions reductions were estimated. The California Air Resources Board has since released the MVEI model 7G1-0, which shows higher emission factors for each year. Using the emissions factors from the 7G1-0 model would increase by 12 percent the estimate of vehicle emissions reduced after cashing out. Therefore, the procedure used here (with lower emissions factors from the older 7F1-1 model) produces a conservative estimate of emissions reductions after cashing out. See Shoup (1997b, Appendix 2) for a full explanation of the methodology and the table of emissions factors used in this estimation.

(CO₂) by 234 kilograms per employee per year.⁸ Full-fuel-cycle CO₂ emissions (including the emissions from extracting, transporting, and refining motor fuel) are 57 percent more than tailpipe emissions alone.⁹ When these additional non-tailpipe emissions are included, cashing out reduced 367 kilograms of CO₂ emissions per employee per year, or 12 percent of the total CO₂ emissions caused by automobile commuting to the eight firms.

How much does cashing out cost employers?

When a commuter trades a free parking space for its cash value, cashing out is a more flexible use of resources previously devoted to subsidizing parking, and is not a new cost for employers. Employers incur a new cost only in the case of commuters who were previously offered a parking subsidy but did not take it. The cash payments to these ridesharers are not offset by reduced rental costs for parking spaces.

Table 2 shows the changes in the eight firms' total spending per employee per month for both parking and for cash payments in lieu of parking. Because the eight firms adopted a variety of cash-out programs, their spending changed in a variety of ways. One firm (Case 1) eliminated its parking subsidy of \$110 a month, but continued to pay \$55 a month to all commuters who do not drive to work alone. This firm saved \$70 per employee per month. The other seven spent an average of \$13 more per employee per month, with a range from \$8 to \$33 per employee per month.

Of the seven firms that spent more after cashing out, two offered commuters either a parking subsidy or its cash value; Case 2 spent \$6 more per employee per month, while Case 3 spent \$16 more per employee per month. The other five firms voluntarily went beyond mere compliance with the cash-out requirement by offering commuters the choice between a parking subsidy or more than its cash value; they spent from \$8 (Cases 6 and 7) to \$33 (Case 5) more per employee per month. These five firms' experience suggests that, when the employers calculate all their commuter subsidies in cash values, many may decide that ridesharing deserves larger subsidies than does solo driving.

Table 2 Summary of employers' subsidy cost per employee (\$ per month)

Case/Location	Before	After	Change	Percent Change
5. Downtown L.A.	\$95	\$128	\$33	34%
8. Downtown L.A.	\$21	\$34	\$13	59%
1. Century City	\$95	\$25	-\$70	-74%
4. Century City	\$116	\$130	\$14	12%
3. Century City	\$85	\$101	\$16	19%
7. Santa Monica	\$59	\$67	\$8	14%
6. Santa Monica	\$48	\$56	\$8	16%
2. West Hollywood	\$60	\$66	\$6	10%
Average	\$72	\$74	\$2	3%

Sources: Tables 1-7, 2-6, 3-6, 4-6, 5-6, 6-6, 7-6, and 8-6 in Shoup (1997b).

The firms' voluntary decisions to go beyond mere compliance with the cash-out requirement explains much of the spending increase they incurred. For example, Case 5 offers commuters either a parking subsidy of \$100 a month or \$150 a month in cash. If this firm had chosen to comply by offering only \$100 a month in lieu of the parking subsidy, its spending per employee would have increased by only \$5 a month, or 15 percent of the actual \$33 a month increase.

The eight firms, considered together, reduced their parking subsidies by almost as much as they increased their cash payments offered in lieu of parking subsidies. In Case 1, the firm's saving of \$70 per employee per month resulted from reducing the subsidies to solo drivers, who previously received larger subsidies than ridesharers. The other seven firms' spending increased by an average of \$13 per employee per month, which resulted from increasing the subsidies to ridesharers, who previously received smaller subsidies than solo drivers. Because the overall subsidy reductions and increases almost net out, the eight firms' total spending for both parking and cash in lieu of parking rose by only 3 percent. The eight firms' average commuting subsidy per employee rose from \$72 to \$74 a month, or by \$2 a month.

This change in spending after cashing out refers only to payments for parking subsidies and for cash paid in lieu of parking subsidies. After they began to offer the cash option, however, five of the firms simultaneously discontinued other ridesharing incentives (such as free breakfast for carpoolers). When firms offer a parking subsidy *without* the cash option, they often try to encourage ridesharing with a grab-bag of incentives to counter the parking subsidy itself. If these firms offer the straightforward choice between a parking subsidy or its cash value, they can dispense with some of these other ridesharing incentives. In all cases where employers adopted a cash-out program and simultaneously deleted other ridesharing incentives, ridesharing increased. This result suggests that reduced spending on other ridesharing incentives can be an important benefit of cashing out employer-paid parking. We have not estimated this spending reduction associated with

⁸To estimate the gallons of gasoline saved, the average VMT reduced per employee per year is divided by the average number of miles per gallon for light-duty passenger vehicles. The SCAQMD has estimated that the average fuel efficiency of light-duty passenger vehicles in Southern California was 25 miles per gallon in 1996. The estimates of VMT reductions in the case studies refer to the years 1993, 1994, and 1995, when average fuel efficiency was lower than in 1996. Therefore, using a 1996 fuel efficiency of 25 miles per gallon produces a conservative estimate of how cashing out reduced fuel consumption in these earlier years.

⁹Combustion of each gallon of gasoline produces 33.5 kilograms of tailpipe CO₂ emissions. Therefore, multiplying the reduction in gasoline consumption by 33.5 kilograms per liter gives the reduction in tailpipe CO₂ emissions. This estimate is conservative because the full-fuel-cycle emissions (counting emissions from extraction, transport, and refining) are 52.6 kilograms of CO₂ per liter of gasoline consumed for commuting (Energy Information Administration, 1994, p.79).

cashing out, although it may be substantial. When the reduced spending for these discontinued incentives is taken into account, however, the firms' total spending for commuting subsidies must have increased less than the estimated \$2 per employee per month, and may actually have declined.

This minor change in the eight firms' total commuting subsidies after cashing out suggests how an individual firm can cash out employer-paid parking without spending significantly more on commuting subsidies: *redistribute the existing total commuting subsidy equally among all commuters, independent of the commuters' travel choices.* This redistribution will neither increase the firm's total cost nor reduce the commuters' total subsidy. It will, however, reduce vehicle travel and vehicle emissions, save gasoline, and treat all commuters equally. It will also comply with California's parking cash-out requirement.

In addition to what the firms spent for parking subsidies and for cash payments in lieu of parking subsidies, there is also the cost of administering cash-out programs. The firms' representatives all said that administration was simple. For example,

It's very simple. It's not difficult at all. (Case 2)

The cash-out program is really simple. It is very easy to administer. (Case 4)

Cash back doesn't cause a problem, it helps you. It's the biggest single help. I give it to payroll and they put it on a computer. It's automatic. (Case 6)

When asked to estimate the administrative cost of cashing out, one firm's representative said that she spent approximately two minutes per employee per month for administering the firm's cash-out program. The other representatives said that the cost was imperceptible. One likened it to the cost of administering changes in the number of exemptions for employees' income tax withholding.¹⁰

When the firms' representatives were asked whether administering the payroll taxes on cash subsidies was a problem, all said 'No.' Payroll taxes on cash subsidies increased by \$1.63 per employee per month after cashing out, and they are included in the employers' subsidy cost in Table 2.

California's cash-out requirement applies only to parking spaces that firms rent, and not to parking spaces they own. Three of the case-study firms both owned *and* rented parking spaces for commuters, and

representatives of these firms said that both owning and renting parking spaces caused no difficulty with the cash-out program. These firms offered the cash-out option to all commuters in both the owned and rented spaces. When a commuter who parks in an owned space takes the cash, a commuter who formerly parked in a rented space takes the owned space, and the firm reduces the number of spaces it rents.

Six of the eight firms had multiple worksites, but they offered cash only at worksites where they rented commuter parking spaces. None of the firms' representatives said that having multiple worksites created any difficulty in cashing out their parking subsidies.

Valuing the benefits of cashing out parking subsidies

When commuters trade a parking space for its cash equivalent, the employer incurs no net cost. But commuters who were already ridesharing also receive cash, and they do not give up a parking space; in this case, the employer does incur a cost, which commuters who were already ridesharing receive as a benefit. The employers' increased cost is a transfer payment to previously undercompensated ridesharers (undercompensated when compared with otherwise identical solo drivers), similar to a pay increase. Because a pay increase is an incentive for employee recruitment and retention, this benefit should at least partly offset the employers' increased cost. In the interviews, employers said that the cash-out option is an added fringe benefit that helps to recruit and retain employees.

It's a good hiring incentive for us. (Case 4)

[Cashing out] is an excellent recruiting point because people count it as income. (Case 5)

Employees are grateful and thankful and more motivated. So, that's a plus for the company. (Case 6)

[Cashing out] made employees happy. It became a benefit we were offering to employees. We emphasize it in our new employee orientation. (Case 8)

In cashing out, the firms reduced parking subsidies and increased ridesharing subsidies. Most of the redistribution thus occurred among employees, from solo drivers to ridesharers. After cashing out, the eight firms spent only \$2.04 more per employee per month (\$24.53 per year) on the sum of parking subsidies and cash payments in lieu of parking subsidies.¹¹ We can compare this cost to the benefits of cashing out parking subsidies, keeping in mind that cost here refers to the employers' transfer payments to previously undercompensated ridesharers.¹²

California's cash-out legislation states that the law has two objectives: to reduce traffic congestion and to

¹⁰In contrast with cashing out, many employer-based trip-reduction programs have high administrative costs. Studying one trip-reduction program, Kenneth Green (1994, p. 56) found that 72 percent of the firm's ridesharing budget was spent for salaries, equipment, facilities, travel, and training for the firm's transportation coordinators. Only 28 percent of the ridesharing budget reached commuters as incentives and subsidies. Although the firm spent \$1.3 million to encourage ridesharing in 1992 and 1993, ridesharing among its employees declined during these two years. Although the firm offered an extensive ridesharing program, it did not offer commuters the option to cash out their parking subsidies.

¹¹The eight firms' total parking subsidies and cash in lieu of parking subsidies increased by \$3,462 per month. They therefore spent an extra \$24.23 per employee per year ($\$3,462 \times 12 \div 1,694$).

reduce air pollution. In the eight case studies, cashing out parking subsidies reduced 652 VMT per employee per year, and reduced vehicle emissions by 819 grams of ROG, 683 grams of NO_x, 7.2 kilograms of CO, and 500 grams of PM₁₀ per employee per year. What are these reductions worth?

First, Michael Cameron (1991) estimated that congestion costs for Los Angeles range from 10¢ to 37¢ per VMT. DeCorla-Souza and Kane (1991) estimated that the cost of new highway capacity to serve peak users in Los Angeles is 19.8¢ per peak-hour VMT. If we value the benefits of reducing vehicle travel at 10¢ per VMT reduced (the low end of the estimates for Los Angeles), the benefit of reducing VMT by 652 miles per employee per year is worth \$65.20 per employee per year (see Table 3).¹³

Second, the SCAQMD has adopted official values of the 'maximum allowed control cost' of proposed emission-reduction measures. If the cost per kilogram of emissions reduced by a proposed measure is less than this value, the control measure is considered to be cost effective. Presumably, the SCAQMD would not require emissions control measures that cost more than the value of reducing emissions. Therefore, we can interpret the maximum allowed control cost as the value of reducing emissions. Alternatively, we can interpret an emissions reduction from cashing out parking subsidies as being worth the maximum allowed control cost because it can take the place of another emissions reduction measure that has the maximum allowed control cost.

If we accept the maximum allowed control cost as the value of reducing emissions, we can place a value on the vehicle emissions reduced by cashing out parking subsidies. In 1994 the values for these maximum allowed control costs were \$19.80 per kilogram of ROG, \$18.70 per kilogram of NO_x, 38.5¢ per kilogram of CO, and \$4.40 per kilogram of PM₁₀.¹⁴ At these values established by the SCAQMD, Table 3 shows that the emissions reductions are worth \$33.96 per employee per year.

Table 3 Benefits and costs of cashing out parking subsidies per employee per year

Benefit	Amount	Value/Unit	Value
VMT Reduction	652 VMT	10¢/VMT	\$65.20
Emissions Reduction			
ROG	819 grams	\$19.80/kilogram	\$16.22
NO _x	683 grams	\$18.70/kilogram	\$12.77
CO	7.2 kilograms	\$0.385/kilogram	\$2.77
PM ₁₀	500 grams	\$4.40/kilogram	\$2.20
Subtotal			\$33.96
Total benefits:			\$99.16
Total costs:			\$24.53
Benefit/cost ratio = 4/1			

Note: The employers' cost of \$24.53 per employee per year is paid to employees who were already ridesharing before the cash option was offered. Benefits to commuters and their employers are not counted in this calculation; inclusion of these benefits would increase the benefit/cost ratio.

Another way to estimate the value of reducing vehicle emissions is to estimate the costs imposed by the emissions. Using this approach, and considering only the health costs, Small and Kazimi (1995) estimated that vehicle emissions imposed a cost of 3.3¢ per VMT in Los Angeles in 1992. (Other emissions-related costs include physical and psychological discomfort, retarded plant growth, loss of view, and deterioration of paint and other building materials.) At a value of 3.3¢ per VMT, the benefit of reducing 652 VMT is \$21.52, compared with the benefit of \$33.96 estimated by using the SCAQMD's maximum allowed control costs. A benefit of \$33.96 (from reducing the emissions caused by 652 VMT) implies that the cost of emissions is 5.2¢ per VMT. Using slightly different assumptions, Small and Kazimi also estimated that the cost of emissions would be 4.7¢ per VMT, which is close to the result found by using SCAQMD numbers, and using other assumptions they estimated the cost would be as high as 11.9¢ per VMT (for health costs alone). Therefore, the implied emissions-reduction benefit of \$33.96 (5.2¢ per VMT or 3.2¢ per VKT) in Table 3 appears realistic.

Adding the benefits of reducing VMT and vehicle emissions in Table 3 produces total benefits of \$99.16 per employee per year, compared with the firms' total cost of \$24.53 per employee per year. By this measure, the benefit/cost ratio for cashing out employer-paid parking is 4/1. Congestion relief accounts for two-thirds of the total benefits, and pollution reduction accounts for one-third.¹⁵

Distribution of the benefits

Because the firms' total spending for parking subsidies declined by almost as much as their cash payments in

¹²Textbooks on cost-benefit analysis explain why a transfer payment is not a use of resources, and why transfer payments should not be equated with real costs. For example, Mishan (1973, p. 60) says, "A transfer payment, as the term suggests, is simply a transfer in money or kind made by one member or group in the community to others, one which is made *not* as payment for services received but as a gift or as a result of legal compulsion... to the economy as a whole [transfer payments] are neither costs nor benefits; only a part of the pattern of *distributing* the aggregate product. In undertaking a cost-benefit analysis the economist must be careful to exclude them from the relevant magnitudes." (italics in the original)

¹³Cameron estimated that a peak-period congestion toll of 15¢ per VMT would be needed to raise average speeds to 35–40 miles per hour on Los Angeles freeways; without a toll, the congestion-related external costs of automobile use are presumably higher than 15¢ per VMT. After an extensive literature survey, Small (1992) also concluded that a peak-period charge of 15¢ a mile (in 1990 dollars) would be appropriate on congested freeways in Los Angeles. Because my estimates of VMT reductions were made for 1993–1995, using the 1990 values for congestion costs without adjusting for subsequent inflation gives a conservative estimate of the benefits of cashing out.

¹⁴See SCAQMD (1995). These values imply a different weighting of emissions reductions than implied by the California Air Resources Board's procedure of counting reductions in ROG, NO_x, and PM₁₀ as equally valuable, and counting 7 grams of CO as equivalent to one gram of the other three emissions.

lieu of parking subsidies increased, cashing out was almost 'revenue neutral' for them. This aggregate result masks variation among individual firms. Five firms (2,3,4,6,7) maintained their existing parking subsidies and increased their ridesharing subsidies, so income was transferred from firms to ridesharers. Two firms (5,8) reduced their parking subsidies and increased their ridesharing subsidies, so income was transferred from solo drivers to ridesharers. One firm (1) reduced its parking subsidy and maintained its ridesharing subsidy, so income was transferred from solo drivers to the firm.

Cashing out redistributed income in another way. Before cashing out, some firms offered higher parking subsidies to higher-paid employees. After cashing out, all firms offered a uniform commuting benefit to all employees, regardless of their rank in the firm. California's cash-out law does not *require* firms to offer a uniform benefit to all employees; nevertheless, when firms began to offer the cash option, they chose a uniform benefit policy.

Avoiding gender and ethnic bias in transportation policy is necessary to ensure what some might call 'transportation justice.' Because employers subsidize parking for 33 percent of all automobile travel in the United States (Shoup 1995), and because employer-paid parking subsidies are tax-exempt fringe benefits, ensuring justice in the distribution of these subsidies is a significant issue.

Cashing out can eliminate the gender and ethnic bias possible in employer-paid parking. To illustrate gender bias, consider Case 1. In 1992 the firm offered commuters the choice between a parking subsidy of \$110 a month, or \$55 a month in cash. Although the policy favored solo drivers, it did not explicitly favor either men or women. But the firm's 1992 travel survey showed that 78 percent of men and only 62 percent of women drove to work alone. Therefore, in this case, subsidizing parking more than ridesharing inadvertently subsidized men more than women.

Employer-paid parking subsidizes only commuters who own cars and drive to work. Nationwide, 92 percent of non-Hispanic White households own a car, while only 81 percent of Hispanic households and only 70 percent of African-American households own a car (Pisarski, 1996). Therefore, parking subsidies will

benefit these groups differently. Cashing out allows an employer to offer free parking, yet offer all commuters the same subsidy, regardless of how they commute. Cashing out parking subsidies can thus avoid any unintended gender or ethnic bias (or any other bias) in subsidizing commuting.

Cashing out raises the question of who should save money when a commuter decides to forego parking at work. Without the cash option, the employer saves money. With the cash option, the commuter saves money. One firm's representative explained the issue clearly:

If an employee chooses to use an alternative form of transportation, it wouldn't be fair for the company to say oh, goody, we saved \$55 [for parking] this month. I think the benefit should go to the employee who makes the sacrifice. Maybe you want to go on an errand or go shopping and your car is at home and you are at work. So I think that the employee should be compensated and that the company shouldn't benefit. (Case 6)

Income taxes also affect the distribution of benefits. Cash offered in lieu of a parking subsidy is taxable, while the parking subsidy itself is tax exempt. Therefore, commuters who choose cash in lieu of a parking subsidy pay more in federal and state income taxes. Because many commuters chose cash at the eight firms, taxable income increased by \$255 per employee per year after cashing out. This increase is an average for all employees offered the cash option, not simply of those who took the cash.

The Joint Tax Committee of Congress uses a marginal income tax rate of 19 percent to estimate the revenue effects of changes in taxable wages; at this tax rate, federal income tax revenues increased by \$48 per employee per year after cashing out.¹⁶ The California Franchise Tax Board uses a marginal income tax rate of 6.5 percent to evaluate the revenue effects of changes in taxable wages; at this tax rate, California income tax revenues increased by \$17 per employee per year after cashing out.¹⁷

Employers and employees also pay Social Security taxes on the cashed-out parking subsidies, but these additional Social Security tax payments will eventually

¹⁵In addition to providing the public benefits of reducing traffic congestion and air pollution, cashing out also provided private benefits to commuters and their employers. First, commuters who were ridesharing before the program began are better off because they receive cash. Second, commuters who trade a parking space for cash are better off, or they would not choose the cash. The employers' cost of \$24.53 in the denominator of the benefit/cost ratio is a transfer to commuters who were already ridesharing. If this benefit is included in the calculation, the benefit/cost ratio becomes $(\$99.13 + \$24.53)/(\$24.53)$, or 5/1. This benefit/cost calculation neglects the recruitment and retention benefits to employers and the benefits to former solo drivers who shift to ridesharing. Part of the \$24.53 paid to commuters who were already ridesharing will in turn be paid to the federal and state governments as income taxes.

¹⁶The 1,694 employees' taxable commuting subsidies rose by \$36,026 a month after cashing out, or by \$432,314 a year. The increase in taxable income was therefore \$255 per employee per year after cashing out. The average marginal income tax rate of all taxpayers in the United States who report a positive tax liability, weighted by the number of taxpayers paying each marginal tax rate, was 19 percent in 1996 (Shoup, 1997b). Using this 19-percent rate, the 1,694 employees' state and federal income tax payments increased by \$82,140 a year, or \$48 per employee per year. This tax revenue is a transfer to the government from commuters who would otherwise have received the full value of the cash-out payments.

¹⁷The California Franchise Tax Board uses this marginal tax rate of 6.5 percent to calculate the effects of changes in taxable wage income. In making federal conformity estimates, the Franchise Tax Board also calculates that California income tax revenues will rise by one-third of the rise in federal income tax revenues; given the federal marginal tax rate of 19 percent, this rule of thumb yields a 6.3 percent marginal tax rate for California.

increase the employees' Social Security benefits. This higher retirement income will compensate employees for the payroll taxes they pay on their cashed-out parking subsidies.

Comparison with earlier research

We can compare the eight new cash-out studies with the seven previous studies of employer-paid parking described earlier. When employers offer free parking without the cash option, the number of cars driven to work is similar in both sets of case studies—75 cars per 100 employees in the eight new studies, and 72 cars per 100 employees in the seven previous studies. This close match between the new and previous case studies suggests that the new studies are consistent with previous research on the effects of employer-paid parking.

Cashing out parking subsidies reduced the number of cars driven to work by 11 percent, while eliminating parking subsidies reduced the number of cars driven to work by 26 percent. Two reasons help to explain this difference. First, cashing out reduces but does not eliminate the tax subsidy for solo driving because commuters must pay income taxes on the in-lieu cash. When commuters are offered the cash option, income taxation reduces the *after-tax* opportunity cost of taking a free parking space.

Second, the 'endowment effect' may also reduce the effect of cashing out parking subsidies. The endowment effect refers to situations where the possession of a good increases the value one places on it (Hanemann, 1991). In cashing out, the value a commuter places on a parking space is the lowest price at which he or she would be willing to "sell" the parking space. This price may be higher than what the commuter would be willing to pay for the parking space had the employer not provided it "free." The endowment effect helps to explain why new employees, who have not yet made their commuting choices, appear more open to choosing cash in lieu of free parking, and why, once a cash-out program is in place, employee turnover leads to continuing reductions in the solo-driver share.

A survey of the literature on the endowment effect found evidence that the availability of substitutes for a good reduces the divergence between the prices that one will pay for the good and accept for it (Adamowicz *et al.*, 1993). This evidence suggests that one's willingness to pay for parking and willingness to accept cash in lieu of parking will tend to converge where mass transit and carpooling are good alternatives to solo driving, which is most likely in the CBD. In the eight case studies, the two firms in downtown Los Angeles had the largest reductions in solo-driver shares—22 and 16 percent—after cashing out. The three firms in Century City, a high-density regional center in West Los Angeles, had the next largest reductions—13 and 12 percent. The three smallest reductions in solo-driver

share—8, 7, and 3 percent—occurred in the lower-density areas of Santa Monica and West Hollywood.

How will cashing out affect the CBD?

Cashing out employer-paid parking should not be confused with raising the price of parking. Cashing out parking subsidies will reduce vehicle trips by diverting solo drivers to other modes, without changing their trip destinations. Raising parking prices will similarly divert solo drivers to other modes, but will also divert some travelers to other destinations.

Dasgupta *et al.* (1994) estimated how raising the price of parking in the CBD would change both mode shares and trip destinations in five English cities (see Table 4). They made their estimates by using the same travel demand model for cities that range in population from 180,000 (Reading) to more than 500,000 (Leeds and Bristol).

They estimated that doubling parking prices in the CBD would reduce vehicle trips to the CBD by an average of 17 percent, and increase trips to the CBD by other modes by 10 percent. But *total* trips to the CBD by all modes would fall by 5 percent. That is, raising the price of parking would reduce vehicle trips to the CBD in part by diverting travelers from solo driving to other modes, and in part by reducing the number of trips to the CBD. In contrast, cashing out employer-paid parking can divert travelers from solo driving without reducing total trips to the CBD. Therefore, cashing out can reduce congestion en route to the CBD without reducing economic activity in the CBD.

If commuters cash out their parking subsidies, what will happen to all the vacant parking spaces in the CBD? Cashing out will reduce the parking demand of those who now park free, but the supply of parking will increase for everyone else. Cashing out will not immediately reduce the number of parked cars, but it will reshuffle cars and commuters in some surprising ways.

First, cashing out will increase carpooling, in part because finding a carpool partner is much easier when everyone else is looking for one. If the shift to carpooling increases the average vehicle occupancy for commuting by more than it reduces the number of cars driven to work, cashing out will increase the number of

Table 4 Mode shares and total trips for travel to the city center after parking prices are doubled

	Change in Trips by Each Mode			Change in Total Trips
	Car	Bus	Walk + Rail	
Reading	-23%	14%	14%	-7%
Bristol	-21%	13%	15%	-8%
Sheffield	-17%	8%	8%	-4%
Derby	-13%	9%	9%	-5%
Leeds	-10%	5%	3%	-3%
Average	-17%	10%	10%	-5%

Source: Tables 18 and 19 in Dasgupta *et al.* (1994).

commuters who travel to work by car. Transit ridership could fall as a result (Mehranian *et al.*, 1987). Because the marginal cost of providing peak-hour transit service exceeds its farebox revenue, however, reducing peak-hour transit demand could reduce transit deficits.

Second, reducing the demand for parking should reduce the market price of parking, and this lower price should attract others to fill the parking spaces emptied by solo drivers who cash out. Parking spaces vacated by peak-hour commuters will become available to shoppers, business clients, tourists, and others who will bring business to the CBD. Because most commute trips occur during peak hours, while other trips occur more evenly through the day, cashing out employer-paid parking should thus spread the peak and reduce peak-hour congestion.

Third, cashing out may redistribute parking spaces in other ways. For example, when the Canadian government began to charge its employees for parking in Ottawa, more women began to drive to work. Why? Free parking had previously been distributed according to employees' rank in the organization, and men got most of the available spaces. Afterward, many women were willing to pay for the spaces vacated by men who had parked free but who were unwilling to pay to park. Two men began ice skating to work.

These three effects will occur in the short run, when the parking supply is fixed. By reducing commuter parking demand, cashing out employer-paid parking should in the long run also reduce the parking supply. California's cash-out legislation requires local governments to reduce minimum parking requirements for commercial developments that implement parking cash-out programs (Shoup, 1995). The reduction in vehicle trips should be greater in the long run after the parking supply has adjusted downward in response to cashing out parking subsidies.

Cashing out employer-paid parking can benefit the CBD in another way. The high density of economic, social, and cultural activities in the CBD produces 'agglomeration economies' that strengthen the CBD in comparison with lower-density areas. Employer-paid parking conflicts with high density because additional space must be allocated to providing all the commuter parking spaces that are offered free. Parking cash out allows CBD employers to offer free parking *and* to enjoy the benefits of high density because parking is not truly 'free' if it can be cashed out. Only when an employer offers commuters the choice between free parking or nothing will parking have no opportunity cost to motorists.

Cashing out employer-paid parking can also strengthen the CBD by reducing traffic congestion on routes to the CBD. Solo-driver commuters typically account for 65 to 85 percent of the total traffic volume to and from the CBD during peak hours (Beebe, 1991). During the morning peak, work trips account for 71 percent of all VMT in the United States (Shoup, 1995).

Commuters who cash out will reduce congestion on the trip to work, so the CBD will become more accessible to everyone, including those who continue to drive to work alone. The 22- and 16-percent reductions in solo-driver share for the two downtown firms after cashing out show the potential to reduce CBD-bound traffic congestion.

Finally, many CBD employers subsidize parking because the high cost of parking downtown would otherwise deter potential employees from choosing to work there. But employer-paid parking merely equalizes the cost of parking between the CBD and suburban work sites (by making it free in both places), and does not make the CBD a superior location. Because employers pay more to provide parking in the CBD, however, they can also offer commuters more cash in lieu of a parking space. With the cash option, commuters will see the CBD as a better place to work than it had been with free parking alone.

Employers' comments on cashing out

Beyond reducing traffic congestion and air pollution, and benefiting ridesharers, cashing out parking subsidies also benefited the employers. As mentioned earlier, the cash option helps firms to recruit and retain employees, and in the interviews the firms' representatives reported other benefits:

The employees think it's fair. (Case 2)

[Cashing out] has been really positive. (Case 2)

Since we moved to cash out, we've always received a good response. (Case 4)

I would definitely recommend [cashing out]. We've always found that cash works. Cash is always a good incentive. (Case 4)

[Cashing out] has been a really good experience. People really like it. (Case 5)

People like the idea, they like the cash in hand, and it does add to their paycheck. (Case 5)

[Employees] love it. The ones that qualify love it. And the ones who drive alone don't care because they get free parking. (Case 6)

Compared to the previous policy, I think [cashing out] is fairer. (Case 8)

If we decided to scratch the program, we would probably end up with at least fifty or sixty more employee cars, with no place to park. (Case 8)

Cash works very well for us. (Case 8)

Although California's cash-out requirement may appear, on first impression, to be an unfunded mandate for employers, the employers' comments suggest that it is not. The cash payments for ridesharing are a more flexible use of resources formerly devoted exclusively to subsidizing parking. Therefore, the cash-out requirement is a self-funded mandate, not an unfunded

one. This self-funding feature of cashing out helps to explain the employers' approval.

This approval often does not extend to other ridesharing incentives. One firm's experience clearly illustrates the difference between cashing out and other ridesharing incentives. After becoming exempt from the SCAQMD's trip-reduction regulations because its employment declined, one firm (not one of the eight case studies) immediately withdrew all its ridesharing incentives except cashing out. In the words of a memorandum sent to all employees, "Our most successful incentive was to offer to cash out monthly paid parking . . . It is our intention, as there is very little administrative burden and [it is] the right thing to do, to continue to offer this benefit."

This firm's experience suggests that the effects of cashing out will be sustained in the long run. Parking is a traditional part of most employers' benefit package, and cashing out can logically relate to the parking benefit. Many other ridesharing benefits—such as free carwashes for carpoolers—are not a traditional part of the benefit package, and can appear superfluous except to satisfy clean air regulations.¹⁸ Cashing out can be a normal operating procedure for any business because it treats all employees equally in terms of an important fringe benefit. Therefore, once established, cashing out is likely to become a permanent feature of the employers' benefit package.

If the benefits of cashing out parking subsidies are more than four times the costs, why must California *require* firms to offer their employees the cash option? Why would firms not do it voluntarily? One reason is that the benefits of reducing VMT and vehicle emissions accrue to the region, not to the individual firms that offer cash, and individual firms cannot be expected to consider these regional benefits when subsidizing commuters. Improved transportation and air quality will make the region a better environment for business, but each individual firm's contribution is infinitesimal. Similarly, subsidizing commuter parking *without* the cash option will increase traffic congestion and degrade air quality, but firms that subsidize parking are unaware that they are causing any regional problem.

Problems stemming from the divergence between individual and collective interests have been variously described as the free-rider problem, the tragedy of the commons, the prisoners' dilemma, and the public-goods problem. Thomas Schelling (1978, pp. 127–129) says,

A good part of social organization—of what we call society—consists of institutional arrangements to overcome these divergences between perceived individual interest and

some larger collective bargain. . . . What we are dealing with is the frequent divergence between what people are individually motivated to do and what they might like to accomplish together. . . . What we need in these circumstances is an enforceable social contract. I'll cooperate if you and everybody else will. I'm better off if we all cooperate than if we go our separate ways.

Society must somehow deal with the problem that rational individual behavior can lead to an irrational collective outcome. If traffic congestion and air pollution are not reduced by cashing out parking subsidies, they must be reduced by some other means, and these other means can have both higher costs for employers and lower benefits for employees.

The potential for cashing out employer-paid parking

Employer-paid parking is a matching grant for driving to work, and it stimulates solo driving. By converting this matching grant for driving into a block grant for commuting, cashing out employer-paid parking can neutralize a powerful and ubiquitous subsidy for the automobile.

California's cash-out requirement applies only to rented parking spaces. In a nationwide survey of employers' parking policies, Shoup and Breinholt (1997) found that American firms provide 84.8 million free parking spaces, of which they rent 19.5 million (23 percent), and own 65.3 million (77 percent). Firms with fewer than 50 employees rent 16.2 million parking spaces (83 percent of all rented spaces) for their employees, while firms with 50 or more employees rent 3.3 million spaces (17 percent).

Although California does not require firms with fewer than 50 employees to cash out their parking subsidies, nationally these firms provide almost five times more free parking in rented spaces than do the firms with 50 or more employees. Because smaller firms should have no more difficulty in cashing out parking subsidies, and smaller firms rent many more parking spaces to subsidize commuter parking, exempting firms with fewer than 50 employees from the cash-out requirement seems inappropriate.

To learn about parking lease agreements, the SCAQMD commissioned a survey of the parking arrangements of firms with more than fifty employees in Southern California (PCR, 1996). Of the 417 responding firms, 49 rented parking spaces and reported their lease arrangements. Of these 49 firms, 55 percent reported that their rented parking spaces are included (bundled) in the cost of the office space they lease; 29 percent reported that the parking is leased separately (unbundled) from their office space; and 6 percent reported that the parking is included in the lease for office space, but that the cost of parking is separate from the cost of office space (unbundled). The remaining 10 percent of firms reported some 'other'

¹⁸Employers who do not offer to cash out parking subsidies sometimes offer desperate-sounding ridesharing incentives. For example, the ridesharing publication for Southern California, *Crossroads*, in March 1997 recommended that, at Easter, employers should "give each employee a plastic egg with instructions to decorate it in a rideshare theme. Put all the entries on display and award prizes for the most 'egg'cellent work of art."

arrangement. Thus, between 35 and 45 percent of the rented parking spaces are unbundled.

Of the firms with unbundled parking, 88 percent reported that they can reduce the number of parking spaces leased.¹⁹ The eight cash-out case studies support this finding that parking leases usually allow firms to reduce the number of parking spaces they rent. Each firm's parking lease sets the price the firm pays for the spaces it rents, but does not set the number of parking spaces it must rent. These survey and case-study results together suggest that many employers can easily shift spending between parking subsidies and salary.

These results are preliminary, and refer to both the nation (the number of rented parking spaces) and Southern California (the share of rented parking spaces that are unbundled and can easily be cashed out), but we can use them to roughly estimate the number of employer-paid parking spaces in the United States that might be cashed out. If employers rent 19.5 million parking spaces for commuters, if 35 percent of these rented parking spaces are unbundled, and if the leases for 88 percent of these unbundled parking spaces allow a reduction in the number of spaces rented, approximately six million employer-paid parking spaces can easily be cashed out.²⁰

We can speculate about what would happen if all the commuters who park free in these six million easily-cashed-out parking spaces were offered the cash option. If the cash offer reduces 1,050 VKT (652 VMT) and 367 kilograms of CO₂ emissions per year per commuter offered cash, as found in the eight case studies, offering to cash out six million employer-paid parking spaces would reduce 6.3 billion VKT (3.9 billion VMT) and 2.2 million metric tons of CO₂ emissions per year.

To put these reductions in perspective, the average annual automobile travel for commuting in the United States is 7,813 VKT (4,853 VMT) per household (Hu and Young, 1992). Therefore, offering commuters the option to cash out six million employer-paid parking spaces, and reducing the parking supply accordingly, could reduce the equivalent of all vehicle travel and vehicle emissions for commuting by 800,000 households.

¹⁹That is, the firm can reduce the number of parking spaces leased without having to break the parking lease or pay for unused parking spaces. This high share of parking leases that allow firms to vary the number of parking spaces they lease is not surprising. In the only textbook on parking for office parks, the sample of a standard parking lease includes the price of parking but does not stipulate the number of parking spaces to be leased (see National Association of Industrial and Office Parks/Educational Foundation, 1986, p. 293).

²⁰These six million parking spaces that can be easily cashed out are only 7 percent of all employer-paid parking spaces, but most are probably in central cities where cashing them out will produce the greatest benefits. A survey of 137 large firms in high-density office centers in Southern California found that 58 percent lease parking spaces to subsidize commuter parking; the share in downtown Los Angeles was 71 percent (Ho, 1993). For firms that can reduce the number of spaces they lease, the average parking subsidy was \$79 per employee per month. One firm in downtown Los Angeles spent \$64,500 a month to subsidize commuter parking in leased spaces.

If cashing out employer-paid parking in the easily-cashed-out parking spaces succeeds in reducing vehicle trips and is popular with commuters and employers, it could be expanded in several ways. First, many of the employer-rented commuter parking spaces that are now bundled in the employers' leases for their premises could be unbundled and then cashed out. Second, firms that own their commuter parking spaces and also sell public parking in these spaces could offer commuters the cash option and make the cashed-out spaces available to the public. Third, if, as California's cash-out law requires, urban planners reduce minimum parking requirements for developments that cash out commuter parking subsidies, the developers' cost saving by constructing fewer parking spaces would fund the cash-option even in employer-owned parking spaces (Shoup, 1995). Finally, if cashing out parking subsidies becomes a popular fringe benefit, people may begin to ask, 'If employer-paid parking for a solo driver is tax-exempt, why is the equivalent benefit for a ridesharer taxed as income?'

Employer-paid parking is a widespread phenomenon, and not only in the United States (although it is better documented in the United States). Therefore, cashing out employer-paid parking should in many places be a cheap and effective way to reduce traffic congestion, energy consumption, air pollution, and the risk of global warming.

Because latent demand for travel can recongest roads after cashing out decongests them, cashing out parking subsidies will not eliminate traffic congestion that is caused by the underpricing of roads. By increasing the average vehicle occupancy, however, cashing out parking subsidies will at least increase the number of passengers transported by existing roads, and will in this sense increase road capacity.

Parking is free for 99 percent of all automobile trips in the United States. Therefore, road pricing would in most cases charge motorists during a short time between two free parking spaces. By increasing the price of automobile travel toward its social cost, cashing out parking subsidies would complement road pricing. Because cashing out free parking is far simpler than pricing roads, it seems sensible to cash out parking subsidies along with or before imposing road prices.

Conclusion: Subsidize people not parking

Many commute policies can satisfy California's requirement to cash out employer-paid parking. Therefore, predicting how this requirement will affect travel demand is difficult. The eight case-study firms are not a random sample of employers, and commuters working for firms that have cashed out their parking subsidies do not represent all commuters, so these early outcomes may not predict what will occur when other firms cash out their parking subsidies. Nevertheless, we can learn much from this experience.

The eight case studies show that cashing out employer-paid parking reduced traffic congestion, vehicle emissions, and gasoline consumption. For the 1,694 employees of the eight case-study firms, cashing out reduced, per employee:

- 0.09 vehicle trips per day.
- 1,052 VKT (652 VMT) per year.
- 819 grams of ROG emissions per year.
- 683 grams of NO_x emissions per year.
- 7.2 kilograms of CO emissions per year.
- 500 grams of PM₁₀ emissions per year.
- 367 kilograms of CO₂ emissions per year.
- 99 liters (26 US gallons) of gasoline consumption per year.

Vehicle travel for commuting fell by 12 percent, equivalent to removing from the road one of every eight automobiles used for commuting to the eight firms. The eight firms' spending for parking subsidies declined by almost as much as their cash payments in lieu of parking subsidies increased, and their total spending for commuting subsidies rose by only \$2 per employee per month. Because many commuters voluntarily traded their tax-exempt parking subsidies for taxable cash, federal and state income tax revenues rose by \$65 per employee per year. Employers praised cashing out for its simplicity and fairness, and said that it helps to recruit and retain employees. The benefit/cost ratio of the eight cash-out programs was at least 4/1. In summary, cashing out employer-paid parking can benefit commuters, employers, taxpayers, and the environment.

California's cash-out requirement does not prohibit, tax, or even discourage employer-paid parking. Instead, employers who offer to pay for parking *if a commuter drives to work* must also offer to pay the same amount *if the commuter rideshares to work*. Employers can continue with any existing parking subsidy arrangement, so long as they broaden the offer to include the option of using the cash value of the parking subsidy for mass transit, carpooling, bicycling, or any other purpose the commuter prefers. Offering commuters the option to cash out their parking subsidies will reduce traffic congestion, improve air quality, conserve gasoline, enhance employee welfare, and increase tax revenue without increasing tax rates. All these benefits will derive from allowing commuters to spend their own income according to their own preferences. That is, these benefits will derive from subsidizing people, not parking.

Acknowledgements

I am grateful to the California Air Resources Board, the Federal Transit Administration, and the University of California Transportation Center for financial support. Aaron Bernardin provided superb research assistance in analyzing the data for the eight case studies. I am also grateful for help from Steven Bass, Kiran Bhatt, Jacquilyne

Brooks, Jeffrey Brown, Roosevelt Brown, Mark Brucker, Leland Burns, Tim Chan, Louis Cherene, Norm Coontz, Heidi von Dachenhausen, Daniel Dermittel, Mary Ellen Doyle, David Forkenbrock, Daniel Frakes, Anne Geraghty, Audrey Gilliam, Laura Gottsman, Kenneth Green, Daniel Hess, Catherine Higgins, Kathleen Hiyaki, John Holtzclaw, Michael Kelley, Jon Kessler, Eugene Kim, Laurel de Leo, Trent Lethco, Waldo Lopez, Michael Mauch, Dawn Meier, Luis Morris, James Ortner, Virginia Parks, Le Pham, William Pitkin, Joshua Polston, Joyce Rooney, John Shaw, Patricia Shoup, James Shrouds, Linda Snyder, Jay Sundu, Peter Valk, Roy Young, Catherine Wasikowski, Jeff Weir, and Richard Willson.

References

- Adamowicz, W., Bhardwaj, V. and Macnab, B. (1993) Experiments on the difference between willingness to pay and willingness to accept. *Land Economics*, **69**(4), 416–427.
- American Automobile Manufacturers Association (1995) *Motor Vehicle Facts and Figures 95*, American Automobile Manufacturers Association. Detroit.
- Association for Commuter Transportation (1996) *Commuter Choice Initiative*. Association for Commuter Transportation. Washington, D.C.
- California Air Resources Board, Office of Air Quality Planning and Liaison (1990) Cost-effectiveness: district options for satisfying the requirements of the California Clean Air Act. Sacramento, CA.
- Cameron, M. (1991) *Transportation Efficiency: Tackling Southern California's Air Pollution and Congestion*. Environmental Defense Fund. Los Angeles.
- Cape Town Municipality (1997) *Cape Town Integrated Inner City Public Transport Study*, Preliminary Findings.
- Center for Urban Transportation Research (1989) *Factors Related to Transit Use*, prepared for the Urban Mass Transit Administration. Center for Urban Transportation Research, University of South Florida. Tampa.
- Commuter Transportation Services (1994) *State of the Commute Report, 1994*. Commuter Transportation Services. Los Angeles.
- Dasgupta, M., Oldfield, R., Sharman, K. and Webster, V. (1994) *Impact of Transport Policies in Five Cities*, Project Report 107. Transport Research Laboratory. Crowthorne, Berkshire.
- DeCorla-Souza, P. and Kane, A. (1992) Peak period tolls: precepts and prospects. *Transportation*, **19**, 293–311.
- Department of Transport (1992) *Transport Statistics Report, Transport Statistics for London 1992*, prepared by the Government Statistical Service, Department of Transport. London.
- Energy Information Administration (1994) *Emissions of Greenhouse Gases in the United States 1987–1992*, DOE/EIA-0573, United States Department of Energy. Washington, DC.
- Environmental Protection Agency (1993) *The Climate Change Action Plan*. United States Environmental Protection Agency. Washington, DC.
- Fricker, J. (1986) Circuitry factor values in ridesharing: a detailed update. *Transportation Research Record* **1082**, 34–40.
- Green, K. (1994) Costs of compliance with environmental regulations: a case-study of rule 1501 compliance efforts at five Hughes Aircraft Company business units. Doctoral Dissertation, University of California, Los Angeles.
- Hanemann, W. (1991) Willingness to pay and willingness to accept: how much can they differ? *American Economic Review*, **81**, 635–647.
- Hu, P. and Young, J. (1992) *Summary of Travel Trends, 1990 Nationwide Personal Transportation Survey*, Report No. FHWA-PL-92-027, United States Department of Transportation. Washington, DC.
- PCR (1996) Implementation of parking cash out—employer characteristics and implementation costs. Prepared for the South Coast Air Quality Management District. Diamond Bar, CA.
- Peat Marwick. (1990). The dimensions of parking. Prepared for the United States Department of Transportation. Washington, DC.
- Mishan, E. (1973) *Economics for Social Decisions, Elements of Cost-Benefit Analysis*. Praeger Publishers. New York.
- National Association of Industrial and Office Parks/Educational Foundation (1986) *Parking for Industrial and Office Parks*. National Association of Industrial and Office Parks/Educational Foundation. Arlington, VA.

- Pisarski, A. (1996) *Commuting in America II: The Second National Report on Commuting Patterns and Trends*. Eno Transportation Foundation. Landsdowne, VA.
- Port Authority of New York and New Jersey (1984) *1984 Trans-Hudson Auto Survey*. Port Authority of New York and New Jersey. New York.
- Schelling, T. (1978) *Micromotives and Macrobehavior*. W. W. Norton & Company. New York.
- Shoup, D. (1992) *Cashing Out Employer-Paid Parking*, Report No. FTA-CA-11-0035-92-1. U.S. Department of Transportation. Washington, D.C.
- Shoup, D. (1994) Cashing out employer-paid parking: a precedent for congestion pricing? In *Curbing Gridlock, Peak-Period Fees to Relieve Traffic Congestion*. National Academy Press, Volume 2, 152–200. Washington, D.C.
- Shoup, D. (1995) An opportunity to reduce minimum parking requirements. *Journal of the American Planning Association*, 61(1), 14–28.
- Shoup, D. (1997a) The high cost of free parking. *Journal of Planning Education and Research*, 17(1), 3–20.
- Shoup, D. (1997b) Evaluating the effects of parking cash out: eight case studies. Prepared for the California Air Resources Board. Sacramento, CA.
- Shoup, D. and Breinholt, M. (1997) Employer-paid parking: a nationwide survey of employers' parking subsidy policies. In *The Full Social Costs and Benefits of Transportation*. ed. D. Greene, D. Jones and M. Delucchi. Springer-Verlag. Berlin.
- Small, K. (1992) Using the revenues from congestion pricing. *Transportation* 19, 359–381.
- Small, K. and Kazimi, C. (1995) On the costs of air pollution from motor vehicles. *Journal of Transport Economics and Policy*. XXIX (1), 7–32.
- South Coast Air Quality Management District (1995) Best available control technology methodology report. Diamond Bar, CA.
- Southern California Association of Governments (1991) 1991 Southern California origin-destination survey–summary findings. Los Angeles.
- Willson, R. and Shoup, D. (1990) The effects of employer-paid parking in downtown Los Angeles: a study of office workers and their employers. Prepared for the Southern California Association