Parking Cash Out

Donald C. Shoup, FAICP

TABLE OF CONTENTS

Acknowledgments

I have accumulated many intellectual debts in my research on employer-paid parking. First, I want to thank my wife Pat, who is the best editor a husband ever had. She has read and reread all the many versions of the manuscript, and contributed many ideas as well as unfailing encouragement.

I am also indebted to the Ph.D. students I have worked with at UCLA. Don Pickrell and Richard Willson both wrote their dissertations on employer-paid parking, and I gratefully acknowledge all they have taught me. Jeffrey Brown, Daniel Chatman, Gregg Doyle, Daniel Hess, Hiro Iseki, Eugene Kim, David King, Jianling Lee, Lewison Lem, Michael Manville, William Pitkin, Lisa Schweitzer, and Paul Sorensen have read the manuscript with keenly critical eyes and have made many important contributions.

I also want to thank colleagues who have commented on the manuscript. I have learned much from Kiran Bhatt, William Francis, Laura Gottsman, Jon Kessler, Thomas Higgins, William Menczer, William Schroer, Richard Steinman, Brian Taylor, Peter Valk, Martin Wachs, Melvin Webber, and Jeff Weir.

The South Coast Air Quality Management District provided all the data for the case studies of parking cash out in Chapter 4. The California Air Resources Board, European Conference of Ministers of Transport, University of California Transportation Center, United States Department of Transportation, and United States Environmental Protection Agency provided funding for my research on employer-paid parking. I have used much of their money to employ students to edit my manuscript, which has taken many years to straighten out. If you find anything easy to understand in this report, you can thank, as I do, Aaron Bernardin, Amy Ford, Simon Fraser, Susan Herre, Kevin Holliday, Douglas Kolozsvari, Christopher Lock, Jeremy Nelson, Todd Nelson, Thomas Rice, Michael Sabel, and Alexander Smith. Easy reading is hard writing, and my student editors have spent many hours helping me say what I mean. It has been a joy to work with them, and I hope they have learned as much from me as I have from them.

Several parts of this report have been adapted from articles that were previously published in *Access*, *Journal of the American Planning Association*, *Traffic Quarterly*, *Transport Policy*, *Transportation*, *Transportation Quarterly*, *Transportation Research*, and *Transportation Research Record*. An earlier version of this report appeared in 2002 as a chapter in *Managing Commuters' Behaviour, a New Role for Companies*, published by the European Conference of Ministers of Transport.

Finally, I would like to thank my editor at the Planning Advisory Service, James Hecimovich, for his encouragement, enthusiasm, and wise advice in converting my manuscript into a PAS Report. And thanks to Jim's editorial assistant, Rhonda Smith, for her impeccable copyediting of the many figures, tables, and references.

Parking Cash Out was originally intended to be included as a section in *The High Cost of Free Parking*, published by APA's Planners Press. When that book grew too long, it was decided to publish the section on parking cash out as a separate PAS Report, which is therefore a sort of apocrypha to *The High Cost of Free Parking*. Taken together, these two publications suggest new ways to think about parking. *Parking Cash Out* explains how we can achieve enormous economic, environmental, and social benefits at almost no cost simply by subsidizing people, not parking.

CHAPTER 1

An Invitation to Drive to Work Alone

If we understand what is happening, and if we can conceive and explore alternative futures, we can find opportunities to intervene, sometimes to resist, to organize, to legislate, to plan, and to design. —William Mitchell

Almost every commuter with a car will drive *to* work if there is free parking available *at* work. Free parking is the most common fringe benefit offered to workers in the U.S., and 95 percent of American automobile commuters park free at work. Free parking thus helps explain why 91 percent of commuters drive to work and why 93 percent of their vehicles have only one occupant.[1]

Many solo drivers who park free at work would drive to work alone even if they had to pay for parking. For these commuters, employer-paid parking merely replaces a payment they would otherwise make on their own, and it does not change their travel choices. But employer-paid parking is like a matching grant for commuting by car: employers pay for parking *at* work only if commuters drive *to* work. This matching-grant feature of employer-paid parking invites additional commuters to drive to work alone. Some solo drivers who park free at work, for example, would carpool, ride public transit, walk, or bike to work if they had to pay for parking. Employer-paid parking therefore changes these commuters' travel choices: they drive to work only if they can park free.

This chapter examines how free parking affects commuting. Seven case studies and a statistical model suggest that when compared with driver-paid parking, employer-paid parking increases driving to work by about one-third.

UBIQUITOUS FREE PARKING

Employer-paid parking is a tax-exempt fringe benefit you qualify for only by driving to work, and the *1995 Nationwide Personal Transportation Survey* found that 95 percent of commuters who drive to work park free.[2] As shown in Table 1-1, most commuters park free at work regardless of their age, gender, income, education, or residence.

The share of free parkers declines slightly as income increases: 97 percent of drivers with an income below $20,000 a year park free, but only 90 percent of drivers with an income above $80,000 a year park free. This does *not* mean that lower-income commuters are more likely to be offered free parking. Instead, lower-income commuters who are not offered free parking are more likely to ride transit, walk, or bike to work because they are less able to pay for parking. Therefore, a greater share of lower-income drivers park free at work because lower-income commuters are less likely to drive if they have to pay for parking.

The cost of providing all this free parking is enormous.

The free-parking share also declines as education increases: 99 percent of drivers with less than a high school education park free, but only 87 percent of drivers with a graduate education park free. Again, this does not mean that higher education reduces the likelihood of being offered free parking at work. Instead, education is positively correlated with income, and higher-income commuters are more willing to drive to work even if they have to pay for parking because the price of parking is small in relation to their income.

Other surveys of commuters consistently show most drivers who drive to work park free. For example, a survey of 4,000 commuters in 17 large metropolitan areas revealed that 89 percent of drivers park free at work.[3] Surveys of commuters also discovered that 93 percent of drivers in Southern California and 82 percent of drivers in Washington, D.C., park free.[4] A survey in downtown San Diego showed that 89 percent of employers subsidized commuter parking.[5] The U.S. Bureau of Labor Statistics reported 88 percent of full-time employees at medium and large private establishments were eligible for free or subsidized parking as a benefit.[6] Finally, a survey of commuters from New Jersey to the Manhattan Central Business District (CBD) revealed that 54 percent of drivers during the morning peak travel period park free at work.[7]

The cost of providing all this free parking is enormous. In 1994, American employers provided 85 million free parking spaces for automobile commuters.[8] The accounting firm KPMG Peat Marwick estimated the total annual capital and operating cost of the employer-provided "free" parking spaces amounted to $52.1 billion in 1989, or about 1 percent of the

TABLE 1-1.
SHARE OF AUTOMOBILE COMMUTERS WHO PARK FREE AT WORK

Commuter	Park Free
Sex	
Male	95%
Female	94%
All	95%
Age	
16–30	96%
30–50	94%
50–70	95%
Over 70	94%
Income	
Less than $20,000	97%
$20,000–$40,000	96%
$40,000–$60,000	95%
$60,000–$80,000	92%
$80,000 or more	90%
Education	
Less than High School	99%
High School	98%
Bachelor Degree	92%
Graduate Degree	87%

Metropolitan Area	Park Free
Atlanta	95%
Baltimore	90%
Boston	93%
Buffalo	93%
Chicago	93%
Cincinnati	86%
Cleveland	92%
Dallas	92%
Denver	91%
Detroit	98%
Fort Worth	97%
Houston	93%
Kansas City	96%
Las Vegas	98%
Los Angeles	92%
Miami	91%
Milwaukee	94%
Minneapolis-St. Paul	91%
Nashville	95%
New Orleans	85%
New York	86%
Philadelphia	94%
Phoenix	98%
Pittsburgh	89%
Portland	95%
San Diego	97%
San Francisco	81%
Seattle	92%
St. Louis	95%
Washington	86%

Source: Calculated from data in the *1995 Nationwide Personal Transportation Survey*. Percentages refer to the 51,928 automobile commuters who responded to the question: Do you pay for parking at work?

gross national product.[9] In comparison, the federal, state, and local governments together provided $12.5 billion in total capital and operating subsidies for all public transportation in 1989—less than a quarter of the total parking subsidies for commuters who drove to work.[10]

Employer-paid parking is also common in other countries. Surveys have found that the share of downtown automobile commuters who park free is 76 percent in Auckland, 70 percent in Brussels, 80 percent in Cape Town, 96 percent in Dublin, 87 percent in Edinburgh, 81 percent in London, 68 percent in Paris, and 59 percent in Seoul.[11] In Switzerland, half of all commuters are offered workplace parking.[12] If most drivers park free in these places, they probably do so everywhere else on earth.

Although 95 percent of American automobile commuters park free at work, this does not mean that 95 percent of *all* commuters could park free if they drove to work. Consider, for example, the finding that 54 percent of drivers commuting to the Manhattan CBD park free at work. This statistic certainly does not imply that 54 percent of all commuters to Manhattan could park free if they drove to work. Instead, most Manhattan commuters

ride public transit because, among other reasons, they would have to pay to park if they drove. In other words, most automobile commuters park free in Manhattan because almost everyone who cannot park free *does not drive*. The price of parking strongly influences whether or not a commuter drives to work. The finding that 95 percent of automobile commuters nationwide park free is explained, in part, by the fact that many commuters carpool, ride public transit, bike, or walk to work if they cannot park free when they get there.

EFFECTS OF EMPLOYER-PAID PARKING: SEVEN CASE STUDIES

Several well-documented case studies show that employer-paid parking greatly increases solo driving. The seven studies shown in Table 1-2

TABLE 1-2.
EMPLOYER-PAID PARKING INCREASES SOLO DRIVING: SEVEN CASE STUDIES

	Solo driver mode share			Cars driven to work per 100 employees				
Location and date of case study	***Driver*** **pays for parking**	***Employer*** **pays for parking**	**Percentage point increase**	***Driver*** **pays for parking**	***Employer*** **pays for parking**	**Increase**	**Percent increase**	**Price elasticity of demand**
(1)	(2)	(3)	(4)=(3)-(2)	(5)	(6)	(7)=(6)-(5)	(8)=(7)/(5)	(9)
1. Civic Center, Los Angeles, 1969	40%	72%	+32%	50	78	+28	+56%	–0.22
2. Downtown Ottawa, Canada, 1978	28%	35%	+7%	32	39	+7	+22%	–0.10
3. Century City, Los Angeles, 1980	75%	92%	+17%	80	94	+14	+18%	–0.08
4. Mid-Wilshire, Los Angeles, 1984	8%	42%	+34%	30	48	+18	+60%	–0.23
5. Warner Center, Los Angeles, 1989	46%	90%	+44%	64	92	+28	+44%	–0.18
6. Washington, D.C., 1991	50%	72%	+22%	58	76	+18	+31%	–0.13
7. Downtown Los Angeles, 1991	48%	69%	+21%	56	75	+19	+34%	–0.15
Average of case studies	**42%**	**67%**	**+25%**	**53**	**72**	**+19**	**+36%**	**–0.15**

Sources: Groninga and Francis 1969; Transport Canada 1978; Shoup and Pickrell 1980; Surber, Shoup, and Wachs 1984; Soper 1989; Miller 1991; Willson 1991.

Cases 1, 3, 6, and 7 refer to a study comparing the commuting behavior of employees with and without employer-paid parking.

Cases 2, 4, and 5 refer to a study comparing the commuting behavior of employees before and after employer-paid parking was eliminated.

Willson and Shoup 1990b explain the details of each case study. The arc elasticity of demand is calculated with respect to the price of parking.

compared either (1) the commuting behavior of the same employees *before* and *after* free parking was eliminated, or (2) the commuting behavior of similar employees *with* and *without* free parking. Although case studies conducted in various locations at different times cannot be generalized to all commuters, the results suggest that free parking *at* work increases driving *to* work by about one-third.[13]

More Solo Driving

The first panel in the table (columns 2–4) shows how employer-paid parking increases the drive-alone mode share in each case study, while the last row shows the average of all the case studies. In these seven studies, free parking increases the drive-alone share by between 7 and 44 percentage points. On average, if commuters must pay for parking at work, 42 percent of them drive to work alone; if parking is free, 67 percent drive to work alone. Therefore, free parking increases the drive-alone share by 25 percentage points (67 percent – 42 percent).

More Cars Driven to Work

The second panel (columns 5–8) shows that free parking increases the number of cars driven to work by between seven and 28 cars per 100 employees.[14] On average, commuters who pay for parking drive 53 cars to work per 100 employees, while free parkers drive 72 cars. For every 100 employees, free parking thus replaces commuters' payments for parking 53 cars (the number commuters drive to work when they pay for parking) and stimulates commuters to drive 19 more cars (a 36 percent increase).[15] Because these 19 extra cars represent 26 percent (19 ÷ 72) of all the cars driven to work, about one in four cars parked at work are driven to work as a result of the employer-paid parking.

Price Elasticity of Demand for Parking

The last column of Table 1-2 shows the price elasticity of demand for parking at work.[16] In the seven case studies, the elasticity ranges from –0.08 to –0.23, and averages –0.15.[17] An elasticity of –0.15 suggests reducing the price of parking by 10 percent increases the number of vehicle trips to work by 1.5 percent. Although this elasticity may seem low, it is important to realize the price changes being discussed are quite large. Because employer-paid parking reduces the price of parking by 100 percent, it can produce large increases in solo driving and vehicle use.

Unfortunately, most mode-choice models have been estimated without accurate information on the prices commuters actually pay for parking.

EFFECTS OF EMPLOYER-PAID PARKING: A MODE-CHOICE MODEL

Mode-choice models are another way to analyze how employer-paid parking affects solo driving. These statistical models, which are estimated with information on the price of travel by each mode (drive alone, carpool, transit, bicycle, walk, etc.), are used to predict how changes in these prices will affect commuters' mode choices. Unfortunately, most mode-choice models have been estimated without accurate information on the prices commuters actually pay for parking. Modelers typically use the market price of parking in the vicinity of employment sites to represent what they think commuters must pay for parking. But large changes in the market price of parking have little effect on mode choices where most drivers park free at their employer's expense. A commuter who can park free at work will not care about the price of parking in the garage across the street. When Aaron Adiv at the University of California, Berkeley, surveyed commuters who work in the San Francisco Bay Area, for example, he found only about 10 percent reported paying for parking. Neglecting this issue produces a distortion in transportation models:

> Another important finding, generally ignored by both modelers and planners, is that most people who usually drive to work do not pay for parking at the workplace. High parking fees are apparently not a deterrent for usual automobile users—*i.e.* for the majority of commuters. Again, using zonal parking data in the calibration of demand models highly inflates the cost as perceived by the user.[18]

Because commuters who park free at work do not respond to changes in the market price of parking, most transportation models underestimate how parking prices affect the mode choices of commuters who must pay these prices.

Beyond the problem that most drivers do not pay for parking even where there is a market price for it, accurate information on the market price of parking is often scant. Denvil Coombe and his coauthors explain the unsatisfactory ad hoc methods that transportation modelers use to deal with this problem:

> Within the conventional four-stage transport models . . . the zones are typically too large to permit any specific representation of parking. The normal arrangement is to apply a terminal charge to private-mode trips terminating in certain zones. In practice, these charges are often little more than calibration constants designed to improve the modal split to central urban locations: their magnitude can then be rationalised in terms of aggregate information about parking costs.[19]

The normal arrangement is to assume everyone pays the market price for parking, even if most drivers park free. No wonder these models often fail to find that parking prices have a small effect on mode choice. When parking prices *are* measured properly and incorporated in the model properly, the models show parking prices strongly influence commuters' mode choices. When Irish transport economist Bernard Feeney reviewed the effects of parking prices in 19 mode-choice models, he discovered parking prices were more important than public transport fares or fuel prices in determining travel choices for the journey to work. While most models did not specify parking cost as a separate variable, if travel cost was found to be a significant determinant of mode choice, the travel cost variable usually included parking charges. Feeney concluded:

> In general, the results indicate that out-of-vehicle costs [such as the cost of parking], whether of time or money, are substantially more important [than in-vehicle costs, such as fuel cost] in determining modal choice. This supports the view that parking policy measures are likely to be *relatively* more important than many other traffic management measures in influencing mode choice.[20]

In another study, William Young, Russell Thompson, and Michael Taylor reviewed models of parking as a component of the urban transport system and concluded, "there are no commonly used models that address the question of parking policy satisfactorily."[21] In a subsequent review, Young found that land-use, transport, and traffic models are particularly weak in their ability to assess travelers' responses to parking policies.[22]

In contrast to almost every other previous transportation model, Richard Willson estimated a mode-choice model using accurate data on the parking prices individual commuters pay. These data were available from a transportation survey of 5,060 employees and 118 employers in downtown Los Angeles.[23] Because the survey included questions about the parking policy of each commuter's employer, the data show the parking price faced by each commuter (including the parking price transit riders would have paid if they had driven to work). Willson used these data to estimate the

commuters' probability of choosing one of three travel modes: solo driving, carpool, or public transit.[24] He included employer-paid parking as an independent variable along with the other more customary variables such as income, occupation, and travel time and cost by each mode.

Estimated from Willson's model, Figure 1-1 shows how parking prices affect the mode choices of commuters to downtown Los Angeles.[25] If commuters can park free at work, 70 percent of them drive alone, while only 15 percent ride public transit and 15 percent carpool. But if commuters must pay $5 a day for parking, only 45 percent of them drive alone, while 34 percent ride public transit and 21 percent carpool. Therefore, when compared with free parking, a price of $5 a day for parking reduces the drive-alone share by 36 percent, increases the carpool share by 40 percent, and more than doubles the transit share. Removing free parking at work can drastically alter travel behavior even in Los Angeles, a city whose culture and physical layout celebrate the car.

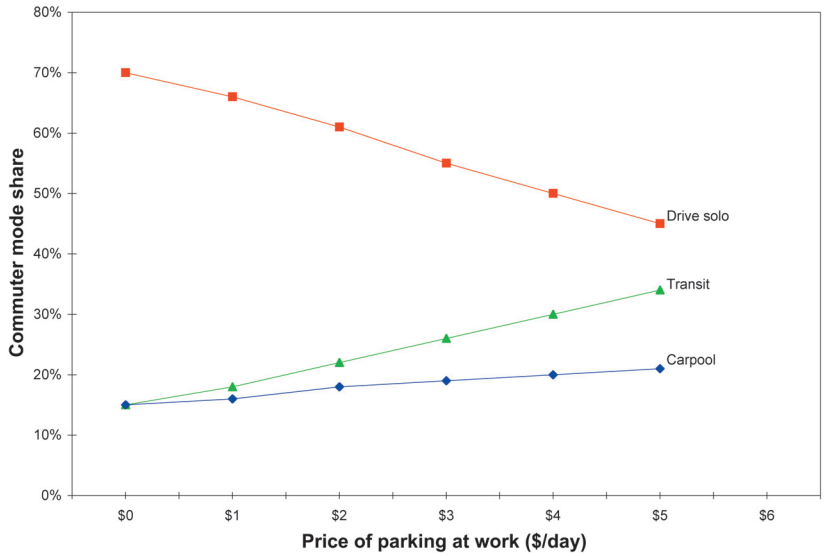
We can also use Willson's model to estimate the effects of parking on the individual mode choices of the commuters in the sample. To show the effects of employer-paid parking, I have used Willson's model to compare (1) the *actual* mode choices of the subsample of commuters whose employers offer free parking to all employees and (2) the *predicted* mode choices for these same commuters if they paid for parking.[26] Table 1-3 shows the results.

More Solo Driving

The first row of Table 1-3 shows that 48 percent of the commuters who pay for parking at work drive to work alone, while 69 percent of the commuters who park free drive to work alone. The model thus suggests that free parking increases the drive-alone share by 21 percentage points; that is, 21 percent of all commuters switch to solo driving from another mode of travel if they are offered free parking at work. The parking price elasticity of demand for solo driving is –0.18, which indicates that a 10 percent reduction in the price of parking at work increases solo driving to work by 1.8 percent. Although this price elasticity may seem low, employer-paid parking increases the drive-alone share by 21 percentage points because the change in price is so large (100 percent).[27]

Removing free parking at work can drastically alter travel behavior even in Los Angeles, a city whose culture and physical layout celebrate the car.

Figure 1-1. Parking Prices and Mode Choices

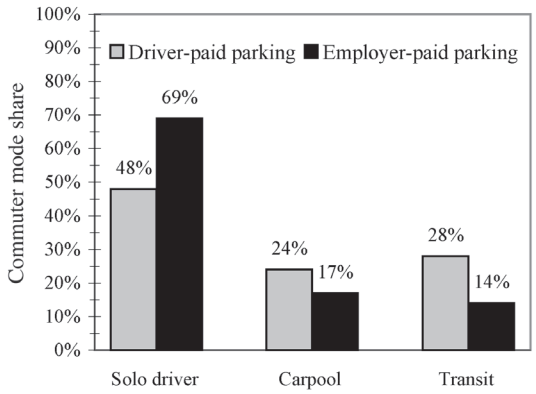


Source: Estimated from Willson (1991) for commuters to downtown Los Angeles.

TABLE 1-3.
EMPLOYER-PAID PARKING INCREASES DRIVING TO THE LOS ANGELES CBD

Travel behavior or travel expenditure	*Driver* pays for parking	*Employer* pays for parking	Absolute change	Percent change	Price elasticity of demand
(1)	(2)	(3)	(4)=(3)-(2)	(5)=(4)/(2)	(6)
1. Solo driver share	48%	69%	+21%	+44%	–0.18
2. Carpool share	24%	17%	–7%	–29%	+0.17
3. Transit share	28%	14%	–14%	–50%	+0.33
4. Cars driven to work (per 100 employees)	56	75	+19	+34%	–0.15
5. Parking expenditure (per employee per year)	$563	$750	+$187	+34%	–0.15
6. Vehicle miles travelled (per employee per day)	18.1	24.1	+6.0	+33%	–0.14
7. Vehicle miles travelled (per employee per year)	3,919	5,230	+1,311	+33%	–0.14
8. Auto use expenditure (per employee per year)	$1,137	$1,517	+$380	+33%	–0.14
9. Parking + auto use expenditure (per employee per year)	$1,700	$2,266	+$566	+33%	–0.14

Source: Shoup 1992. The arc elasticity of demand is calculated with respect to the price of parking at work.



The carpool share was 24 percent for commuters who pay to park, but only 17 percent for commuters who park free (row 2). The cross elasticity of demand between the price of parking and the carpool share is +0.17; in other words, a 10 percent increase in the price of parking at work increases the carpool share for commuting to work by 1.7 percent. Similarly, the transit share was 28 percent for commuters who pay to park, but only 14 percent for commuters who park free (row 3). Employer-paid parking thus halved the number of transit commuters. The cross elasticity of demand between the price of parking and transit ridership is +0.33, which suggests that a 10 percent increase in the price of parking at work increases commuter transit ridership by 3.3 percent.

Does employer-paid parking really increase the drive-alone share by 21 percentage points and reduce the transit share by 14 percentage points? If some employers offer free parking because many of their employees drive to work, the high level of solo driving may lead to the high level of employer-paid parking rather than the other way around. If so, we cannot estimate the effects of the free parking itself by comparing the behavior of commuters with and without free parking.[28]

To examine causality, we can look at a subset of the case-study data in Table 1-2: the differences in drive-alone share found in the case studies comparing the travel behavior of the same commuters before and after employer-paid parking was eliminated. Table 1-2 shows three case studies (2, 4, and 5) where employers previously offered free parking and then began to charge for it. In these three cases, the drive-alone share fell by an average of 28 percentage points after drivers began to pay for parking. This finding strongly suggests that employer-paid parking increases solo driving, rather than the other way around.[29]

More Cars Driven to Work

The shift to solo driving increases the number of cars driven to and parked at work. Looking again at the data in Table 1-3, we see that commuters who pay for parking drive 56 cars to work per 100 employees, while free parkers drive 75 cars per 100 employees (row 4).[30] Employer-paid parking therefore generates 19 more vehicle trips to work per 100 employees, and it increases the number of vehicle trips by 34 percent (19 ÷ 56). These 19 extra vehicle trips represent 25 percent of all vehicle trips to work (19 ÷ 75). The parking price elasticity of demand for driving to work is –0.15 (the same as the average elasticity in the seven case studies in Table 1-2).[31]

The additional vehicle trips resulting from subsidized parking increase the total expenditure for parking at work. The average price of commuter parking in downtown Los Angeles was $83.82 a month in 1986, the year the transportation survey was conducted. If drivers paid for parking, commuters parked 0.56 cars per employee, and the total cost of parking was $563 a year per employee (0.56 x 12 x $83.82). If employers paid for parking, commuters parked 0.75 cars per employee, and the total cost of parking was $750 a year per employee (0.75 x 12 x $83.82). Employer-paid parking thus stimulates a 34 percent increase in total spending for parking because 34 percent more commuters drive to work (row 5).

Employer-paid parking leads commuters to drive an additional 1,311 VMT a year per employee (about the distance from Los Angeles to Dallas).

More Vehicle Miles Travelled

We can also use the data in Table 1-3 to examine how employer-paid parking affects total vehicle miles travelled (VMT) to work in downtown Los Angeles.[32] Commuters drive 18.1 VMT a day per employee with *driver*-paid parking and 24.1 VMT a day with *employer*-paid parking (row 6). Employer-paid parking therefore stimulates commuters to drive an additional six VMT a day per employee because many commuters respond to free parking *at* work by driving solo *to* work. This extra driving represents a 33 percent increase in vehicle travel to work (6 ÷ 18.1), and the extra VMT generated by free parking represent 25 percent of all the VMT driven to work when commuters park free (6 ÷ 24.1). In other words, one of every four VMT for commuting are driven *only* because the employer pays for parking. The cross elasticity of demand between the price of workplace parking and VMT for commuting is –0.14, which suggests that a 10 percent increase in the price of parking at work reduces VMT for commuting by 1.4 percent. Because fuel consumption is proportional to VMT, the cross elasticity between the price of workplace parking and the demand for gasoline is also –0.14. A 10 percent increase in the price of parking reduces gasoline consumption by 1.4 percent.

The extra six VMT a day caused by free parking adds up over the course of a year (row 7). Employer-paid parking leads commuters to drive an additional 1,311 VMT a year per employee (about the distance from Los Angeles to Dallas). This added vehicle travel congests traffic and pollutes the air. Los Angeles already has the worst traffic congestion and air pollution in the nation, so employer-paid parking makes a bad situation even worse.[33]

More Spent on Transportation

The average cost of driving a car was 29 cents a mile in the year the transportation survey was conducted.[34] By inducing more commuters to drive, employer-paid parking encourages commuters to spend $380 more a year per employee ($0.29 x 1,311) for driving to work (row 8).

We can now total up the *per-employee* spending for parking and driving, which is the total spending for all employees divided by the total number of employees, including transit users and carpoolers. If an employer pays for parking, commuters on average save $563 a year on parking fees they would otherwise have paid, but they also spend $380 more a year on driving (see rows 5 and 8). The net effect is that commuters save only $183 a year per person for the combined cost of parking *and* driving ($563 less for parking, but $380 more for driving). Therefore, although the employer spends $750 a year to subsidize parking, commuters saved only $183 a year. The disproportion between what employers spend and what commuters save occurs because employer-paid parking increases spending for both parking *and* driving. The increased parking at work inflates what employers pay, and the increased driving to work diminishes what commuters save. As a result, the employer spends $4.10 on parking subsidies for every $1 the commuter saves on parking and driving ($750 ÷ $183). Although these estimates refer only to the monetary costs of parking and driving to work, and do not purport to measure all the benefits and costs of commuting, they do show the extraordinarily high cost of free parking at work.

We can look at this another way. Because employer-paid parking increases spending on parking by $187 a year per employee (row 5) and increases spending on driving by $380 a year (row 8), it increases total spending for parking and driving by $566 a year per employee (row 9). Employer-paid parking therefore replaces $563 a year in commuters' payments for parking and stimulates an additional $566 a year in total spending for parking and driving by both commuters and employers; that is, every dollar the employer spends to replace commuters' payments for parking stimulates an additional dollar of total spending on parking and driving.

The increased parking at work inflates what employers pay, and the increased driving to work diminishes what commuters save.

OTHER EVIDENCE OF THE EFFECTS OF EMPLOYER-PAID PARKING

Other studies have shown that employer-paid parking has a pivotal effect on commuting decisions. One of the first was a 1972 survey of express-bus riders from suburban Virginia to Washington, D.C. Of the bus riders who switched back to driving after trying the express bus, 18 percent said they did so because of the bus fare, which averaged $1.25 a day for the round-trip ($5.65 a day in 2004 prices). Half of these former bus riders parked free at work, where the market price of parking averaged $1.20 a day. The average parking subsidy was about equal to the bus fare that diverted commuters back to their cars.[35] When faced with the choice between paying for the bus or parking free at their employers' expense, commuters predictably chose to drive.

In 1977, using a survey of commuters to the Toronto CBD, David Gillen was able to separate parking costs from running costs (for fuel, tires, etc.), and he estimated the effects of parking prices on mode choices. The elasticity of automobile mode share with respect to the price of parking was –0.31, which suggests that reducing the price of parking by 10 percent will increase the automobile mode share by 3.1 percent.[36]

Richard Westin and David Gillen used the same survey of commuters in Toronto to develop an econometric model that simultaneously treats the mode-choice and parking-location decisions. They explain the mode-choice

decision depends on the parking-location decision because the price of parking depends on how far you walk from your parking space to your destination. Once the optimal parking location has been chosen, the money and time costs of parking can be considered with the other costs of the automobile mode to make the optimal choice among all modes. They estimated a 33 percent increase in the price of parking would induce 17 percent of drivers to shift to public transit for the commute to work in Toronto.[37]

A failed federal initiative in the United States provided a natural experiment on the effects of parking prices on commuting choices in Washington, D.C. In 1977, during one of the periodic national energy crises, President Carter addressed the nation, calling the battle to achieve energy independence the "moral equivalent of war." His subsequent energy policy reduced speed limits, raised gasoline taxes, promoted fuel-efficient cars and—most controversial of all—charged federal employees for parking! The Office of Management and Budget (OMB) issued a directive to eliminate parking subsidies for employees in the Washington, D.C., area, and in 1979 the government introduced parking fees at several sites. The new fees were about 44 percent of nearby commercial rates. At several work sites, most or all of the previously free parking spaces had already been restricted to carpoolers, so in these cases the parking fees were expected to have little effect. When Gerald Miller and Carol Everett at the Urban Institute compared the federal commuters to control groups, they found the parking fees reduced the number of automobiles driven to work by between 1 percent and 10 percent at central sites and by between 2 percent and 4 percent at suburban sites. The experiment was short-lived, however. Federal employee unions went to court on the grounds the government had unilaterally implemented parking regulations and had refused to bargain.[38] After a court ruling in 1981 that the OMB had acted improperly, the fees were restored to the 1979 levels. In 1982, the U.S. Court of Appeals found the OMB did act properly, but the Reagan administration, which had a distinctly different approach to energy issues, declined to reimpose the parking fees.

Half of all choice transit commuters (and 35 percent of all transit commuters) would drive to work if their employers offered free parking.[39]

The lack of free parking at work explains why many commuters ride the bus to work. The Center for Urban Transportation Research at the University of South Florida surveyed 4,000 persons who live within one-half mile of public transportation in 17 metropolitan areas in the U.S. Approximately 70 percent of the respondents who rode transit to work were identified as "choice" riders (those who own a car but choose to ride transit to work). These choice riders were asked: Why do you not take your car to work? Fifty-one percent responded either it costs too much to park or there is no place to park at work. This response implies that half of all choice transit commuters (and 35 percent of *all* transit commuters) would drive to work if their employers offered free parking.[39]

In a study of commuting behavior at medical institutions in San Francisco, Richard Dowling, Dave Feltham, and William Wycko found that the price of parking was the single most influential factor determining the share of commuters who drove to work. The coefficient of correlation between the price of parking and the share of commuters who drove to work was –0.91, and the price of parking explained 83 percent of the variation in the share of automobile commuters to the sites.[40]

Using a large-scale transportation model with data for 1991, Elizabeth Deakin and Greig Harvey estimated a parking charge of $3 a day (the approximate cost-recovery price for parking, given prevailing land and construction costs) for the 95 percent of commuters who parked free at work would reduce VMT in Southern California by 2.7 percent. In

comparison, a congestion charge averaging 10¢ a mile along congested segments of the highway network would reduce VMT by only 2.3 percent. The implication is that charging cost-recovery prices for commuter parking would be more effective in reducing vehicle travel than charging tolls on all congested roads. Deakin and Harvey also estimated that raising the gasoline tax by 50¢ a gallon to 82¢ (from its prior level of 32¢) would reduce VMT by 4.1 percent. By extension, the smaller increase of doubling the gasoline tax to 64¢ a gallon would reduce VMT by 2.6 percent.[41] In other words, charging for parking at work (which would affect only commuters) should have the same effect as doubling the gasoline tax (which would raise the cost of all driving).

A 2001 survey of 3,600 commuters in the San Francisco Bay Area found 76 percent of the commuters who parked free at work drove to work alone, while only 48 percent of those who paid to park drove alone. Results from the annual surveys in the previous nine years showed even larger differences in the drive-alone share between commuters who park free and those who pay to park.[42]

University of Buffalo planning professor Daniel Hess estimated a mode-choice model for commuting to the Portland, Oregon, CBD. Using data from travel diaries, Hess obtained the price of parking at work for all commuters, including those who did not drive to work. The 584 commuters in the sample paid between $0 and $9 a day for parking, and the average price for commuters who did not park free was $5.40. Hess's model for Portland is similar to Richard Willson's model for Los Angeles, and Hess found similar results: free parking at work greatly increases the probability of driving to work alone. With free parking, 62 percent of commuters drive to work alone, while if parking costs $6 a day, only 46 percent drive alone.[43] Hess also estimated that commuters who park free drive 69 cars per 100 persons, while commuters who pay $6 a day for parking drive 48 cars per 100 persons. A $6-a-day parking subsidy in the Portland CBD thus increases the number of cars driven to work by 44 percent.

Charging cost-recovery prices for commuter parking would be more effective in reducing vehicle travel than charging tolls on all congested roads.

David Hensher and Jenny King at the University of Sydney used the stated-preference approach to estimate a joint modal-and-parking-location-choice model. Using a sample of 1,789 drivers and transit riders to the CBD of Sydney, Australia, they found a "high sensitivity to parking prices, far higher than one finds for in-vehicle cost and even travel time in modal choice."[44] They also found that the cross elasticity of demand between the price of parking and the probability of traveling to the CBD by public transit was +0.29, which suggests that increasing the price of parking by 10 percent increases the transit mode share by 2.9 percent. Increases in parking prices in Sydney significantly increased public transport ridership and induced drivers to park farther from their destinations, but produced virtually no loss in total travel to the CBD.

Journalists also occasionally report evidence showing how parking prices affect commuting choices. For example, automobile commuters to Washington, D.C., often pick up hitchhikers so they can drive in the high-occupancy vehicle (HOV) lanes. The hitchhikers are called "slugs," and two strong incentives create the slug market. The first is the self-interest of the driver, who wants to use the HOV lane, and the second is the self-interest of the passenger, who doesn't want to pay for either driving or parking. The *New York Times* explains the process:

> This form of commuting—solo drivers picking up strangers so they can all cruise to work legally in high-occupancy-vehicle lanes—is called "slugging." . . . Slugging started by spontaneous eruption and runs by perpetual motion. When the area's three-person high-occupancy-vehicle lanes opened 30 years ago, some guy and then another and another picked up commuters

> at bus stops to get the passengers needed to use the lanes. No government agency sanctions slugging, runs it, regulates it, promotes it, or thought it up . . . there is no supervisor, dispatcher or schedule, no ticket or fare . . . . "Generally, it's safe because you have one driver picking up two strangers," said Jenny Cameron, 26, who was in line for a ride to her job downtown at the World Wildlife Fund. "I slug because I can't afford the parking downtown," Ms. Cameron said. "It costs $7 in my building."[45]

If Ms. Cameron's employer offered to pay for her parking, we can infer she would drive to work.

Although the price of parking strongly affects commuters' travel choices, mode-choice models often omit the price of parking as a variable. Nevertheless, the surveys, case studies, and mode-choice models that do include the price of parking as a variable all show employer-paid parking substantially increases solo driving to work.

EMPLOYER-PAID PARKING DISCOURAGES CARPOOLING

Employer-paid parking greatly increases solo driving to work where the cost of parking (if the driver pays it) is a large share of the out-of-pocket cost of commuting by car. We can examine the economics of carpooling to show why free parking increases solo driving. Carpoolers split the monetary cost of parking and driving, so the per-person cost of commuting by car decreases as carpool size increases. Employer-paid parking discourages carpooling because it eliminates the savings from splitting the cost of parking. To show this effect, consider the decision whether to carpool for a hypothetical journey to work (see Table 1-4). The cost of parking at work is $4 a day, and the round-trip cost of driving to work (for fuel and other variable costs) is $2 a day. The round-trip travel time is 20 minutes for a solo driver, and each additional person in the car adds another 5 minutes to the travel time because collecting and distributing passengers makes the trip more circuitous. Splitting the monetary cost of driving and parking is an incentive to carpool, while the added travel time is a disincentive.

Employer-paid parking greatly increases solo driving to work where the cost of parking (if the driver pays it) is a large share of the out-of-pocket cost of commuting by car.

The table shows how employer-paid parking reduces the incentive to carpool. Column 1 shows the potential number of commuters in the car. Column 2 shows the commuting cost per person in the car if *drivers* pay for parking. Carpoolers split the $6-a-day cost of commuting by car ($4 for parking and $2 for running cost), so each person in a two-person carpool pays $3 a day, each person in a three-person carpool pays $2 a day, and so on. The larger the carpool, the lower the monetary cost per person. Column 3 shows the commuting cost per person if *employers* pay for parking. With free parking, carpoolers split only the $2-a-day running cost of commuting by car, so each person in a two-person carpool pays $1 a day, and each person in a three-person carpool pays 67¢ a day.

We can now examine the rewards for carpooling. Column 4 shows how much money each carpooler saves when another person joins the carpool if *drivers* pay for parking. For example, each person in a two-person carpool pays $3 a day, so each person saves $3 a day compared with the $6-a-day cost of solo driving. Adding a third carpool member saves each person an additional $1 a day, adding a fourth member saves another 50¢, and so on.

Now consider what happens if the *employer* pays for parking. Each carpooler saves money when another person joins the carpool, but much less than when drivers pay for parking (see column 5). Each person in a two-person carpool saves $1 a day compared with the $2-a-day cost for solo driving. Adding a third carpool member saves each person an additional 33¢ a day, adding a fourth member saves another 17¢, and so on.

Because carpooling slows the journey to work, the money saved by carpooling comes at the cost of added travel time. In effect, carpoolers spend

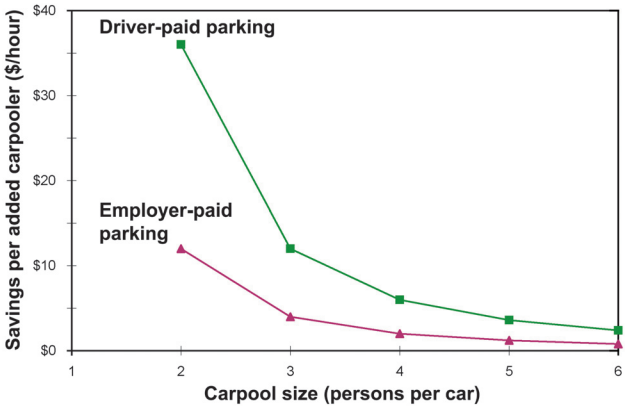
TABLE 1-4.
EMPLOYER-PAID PARKING REDUCES THE REWARDS FOR CARPOOLING

Assumed driving time, parking cost, and running cost for driving to work

Solo driver	20 minutes	Added time for carpooling
2-person carpool	25 minutes	5 minutes = 0.08 hours
3-person carpool	30 minutes	10 minutes = 0.17 hours
4-person carpool	35 minutes	15 minutes = 0.25 hours
5-person carpool	40 minutes	20 minutes = 0.33 hours
6-person carpool	45 minutes	25 minutes = 0.42 hours

Parking cost = $4 per day
Running cost = $2 per day

	Commuting cost per person		Money savings per added carpooler			
			Per person per day		Per person per hour	
Person in cars	Driver-paid parking	Employer-paid parking	Driver-paid parking	Employer-paid parking	Driver-paid parking	Employer-paid parking
(1)	(2)=$6/(1)	(3)=$2/(1)	(4)	(5)	(6)=(4)/0.083	(7)=(5)/0.083
1	$6.00	$2.00				
2	$3.00	$1.00	$3.00	$1.00	$36.00	$12.00
3	$2.00	$0.67	$1.00	$0.33	$12.00	$4.00
4	$1.50	$0.50	$0.50	$0.17	$6.00	$2.00
5	$1.20	$0.40	$0.30	$0.10	$3.60	$1.20
6	$1.00	$0.33	$0.20	$0.07	$2.40	$0.80



time to save money when they choose their carpool size—a larger carpool saves more money, but costs more in travel time. Column 6 shows the monetary savings per hour of added travel time when another person is added to the carpool in the case where *drivers* pay for parking. Each additional person in the car adds 5 minutes (0.083 hours) to each person's travel time, but the cash savings from splitting the cost of parking and driving decline as the carpool size increases. As a result, the added monetary savings per hour spent in added travel time for each new passenger declines as carpool size increases. Each person in a two-person carpool saves $3 for five minutes of added travel time, which translates to a rate of $36 per hour ($3 ÷ 0.083 hours). Adding a third carpool member saves each person an additional $1 and adds another five minutes to travel time, so each

person saves $12 per hour of added travel time.[46] With the fourth member the additional savings per hour falls to $6, and so on.[47]

If *employers* pay for parking, adding another person to the carpool saves less money per hour of added travel time (see column 7). Each person in a two-person carpool saves $1 for five minutes of added travel time, or $12 per hour. Adding a third carpool member saves each person 33¢ and adds another five minutes to travel time, so the savings is $4 per hour, and so on down to only 80¢ per hour for the sixth carpool member.

As this example shows, employer-paid parking greatly reduces the incentive to carpool by eliminating the savings that would result from splitting the cost of parking. It especially reduces the incentive for two solo drivers to club together in a two-person carpool. With *driver*-paid parking, each solo driver saves $36 per hour of added travel time by joining a two-person carpool, but with *employer*-paid parking they each save only $12 per hour. This reduction of $24 an hour in the reward for carpooling can make all the difference in deciding whether to drive to work alone.

The pivotal effect of parking prices on carpooling has often been noted. For example, when University of Washington transportation engineering professor Scott Rutherford and his coauthors examined the transportation demand management (TDM) programs of 14 employers in several areas of the western U.S., they found parking charges are the most effective strategy to reduce solo driving in urban areas where good public transit service is available and where parking is expensive. In their conclusion they say, "Parking, which raises the cost of SOV [single-occupant vehicle] commuting directly, affects mode choice much more than does any other factor."[48]

The graph in Table 1-4 illustrates how free parking reduces the rewards for carpooling. The two curves show the commuters' savings per hour of added travel time caused by adding another person to the carpool—both with and without employer-paid parking—as a function of the carpool size. First consider the upper curve, which shows the money saved per hour of added travel time for each additional person in the carpool if *drivers* pay for parking (from column 6). Because solo drivers can save $36 per hour spent in additional travel time by joining a two-person carpool, only commuters who value their time at more than $36 per hour will drive solo. Commuters who value time at between $12 and $36 per hour will drive in a two-person carpool because they "earn" $36 per hour spent in additional travel time. They will not add a third member to the carpool because they would earn only $6 per hour for the added travel time associated with the third person in the car. Commuters who value time savings between $6 and $12 per hour will drive in a three-person carpool, and so on. In short, the lower the cost of a little added travel time, compared with the value of a little more money, the larger the carpool.

Employer-paid parking greatly reduces the incentive to carpool by eliminating the savings that would result from splitting the cost of parking. It especially reduces the incentive for two solo drivers to club together in a two-person carpool.

Next consider the lower curve, which shows the carpoolers' savings per hour of added travel time for each additional person in the carpool if *employers* pay for parking (from column 7). Commuters who value time savings at more than $12 an hour will drive solo. Commuters who value time savings between $4 and $12 an hour will drive in a two-person carpool. Commuters who value time savings between $2 and $4 an hour will drive in a three-person carpool, and so on.

Employer-paid parking shifts the savings-per-added-carpooler curve down and to the left. This shift draws some carpoolers into solo driving and draws other commuters from larger to smaller carpools. For example, consider commuters who value travel time savings at $20 per hour. If *drivers* pay for parking, they will join two-person carpools because they save $36 per hour of added travel time. But if *employers* pay for parking, these

commuters will drive solo because joining a two-person carpool saves only $12 per hour of added travel time.

Commuters do not precisely calculate these time and monetary costs, of course, but haven't you ever carpooled to a place because you know the parking will be expensive?[49] Commuters surely weigh the time and monetary costs when making travel choices, and employer-paid parking favors solo driving. This example's assumptions are conservative because employer-paid parking subsidies often exceed $4 a day, and carpooling may add less than 5 minutes to travel time for every additional person in the car.[50] Because HOV lanes on the freeways reduce travel times for carpoolers, carpooling may even *reduce* travel time. Employer-paid parking may therefore exert an even stronger incentive toward solo driving than the example suggests. Similar reasoning shows employer-paid parking also encourages solo driving at the expense of public transit, walking, and cycling to work. The previous findings that employer-paid parking increases the number of vehicle trips to work by about one-third thus seem perfectly reasonable.

Employer-paid parking, by itself, does not explain the popularity of solo driving for commuting, but it certainly reduces the driver's cost of solo driving to work, and thus increases the number of solo drivers. Existing mode choices thus do not reveal commuters' real travel preferences because employer-paid parking hides the cost of parking and artificially reduces the prices drivers pay.

To illustrate the difference between commuters' travel choices and their real preferences, consider what would happen if employers offered to pay the cost of gasoline for all automobile drivers to work. Most people would consider this fuel subsidy an environmental outrage. But parking at work typically costs more than gasoline for driving to work. Although free parking can be a bigger subsidy than free gasoline, few people even notice it. Furthermore, through minimum parking requirements, cities accommodate the demand for free parking and thus encourage this outrageous subsidy. Free parking increases solo driving to work, but this does not imply that it has increased commuters' *preferences* for solo driving. Rather, commuters are simply responding to lower *prices* for solo driving. Commuters' choices can accurately reveal their preferences among commute modes only when prices accurately reflect the costs of these modes. If all commuters were given a fair choice among modes, more of them would choose to carpool, walk, bike, or ride public transit to work. But employer-paid parking does not give commuters a fair choice among modes because it offers them either free parking or nothing at all. The employers' subsidies for parking could be used to pay for other fringe benefits or higher salaries, but drivers rarely think about the cost of parking at work and might be surprised to learn that it has any cost at all.

Consider what would happen if employers offered to pay the cost of gasoline for all automobile drivers to work. Most people would consider this fuel subsidy an environmental outrage.

COMMUTER PARKING IN THE CONTEXT OF ALL PARKING

Commuter parking demand depends not only on the price of parking at work, but also on the prices for parking everywhere else. The studies in Tables 1-2 and 1-3 show how commuters respond to parking prices at work. But commuters have adjusted their lives to a world with free parking almost everywhere. If parking prices increase only at work, commuters will cut back on solo driving by much less than if parking prices also increase everywhere else. If *all* parking prices increase to cover the full capital and operating costs of providing parking spaces, some families will choose to own fewer cars, and some will choose new residential and work sites that reduce the need to drive. Commuters' responses to parking charges at one work site do not capture these general-equilibrium changes.

The price elasticity of demand for *all* parking is therefore greater than for parking at a single work site.[51]

The studies reported in Tables 1-2 and 1-3 refer only to work trips, which are essential and for which the demand is relatively inelastic. Some commuters can choose a different travel mode if the price of parking at work increases, but they cannot easily change when or where they travel, or how many trips they make. For *nonwork* trips, however, travelers can shift their travel mode, time, or destination for some trips, and they can avoid making other trips. In a survey conducted by Britain's Royal Automobile Club, for example, drivers reported that 30 percent of their car mileage was "not very important" or "not at all important."[52] The demand for these less-essential trips should be much more elastic than for work trips. Therefore, the parking price elasticity of demand for nonwork trips should be much greater than the estimate of –0.15 for work trips.

CONCLUSION: AN INVITATION TO DRIVE TO WORK ALONE

Some commuters will drive to work only if they can park free at work; if they have to pay to park, they will ride public transit, walk, or bike to work. Employer-paid parking draws these commuters into cars for their journey to work. Because many commuters who can park free at work respond by driving to work alone, employer-paid parking increases the number of cars driven to work by about one-third. Employer-paid parking is an invitation to drive to work alone.

Trying to persuade commuters who can park free at work to choose the alternatives to solo driving is almost hopeless. Consider these two ways to discourage solo driving:

1. Give commuters the wrong incentives, but tell them to do the right thing, or
2. Give commuters the right incentives, and let them do as they please.

When people choose their travel mode, most of them probably do as they please no matter what anyone else tells them they should do. Naturally, it makes sense to give people the right incentives *and* tell them to do the right thing, but if one has to choose between incentives and preaching, the more effective policy is beyond doubt.

Free parking distorts transportation prices in favor of solo driving, which increases traffic congestion, fuel consumption, accidents, and air pollution. Removing this distortion is difficult because most commuters (who are also voters) feel employer-paid parking is a basic right. Nevertheless, the next chapter explains how employers can offer free parking at work without distorting transportation prices: offer commuters the option to *cash out* their employer-paid parking subsidies.

Free parking distorts transportation prices in favor of solo driving, which increases traffic congestion, fuel consumption, accidents, and air pollution.

ENDNOTES

1. Table QT-P23 of the 2000 Census shows that 3.3 percent of workers 16 years of age and over worked at home, and that 96.7 percent traveled to work. Of those who did travel to work, 91 percent of commuters drove in a car, truck, or van. Ninety-three percent of these commuters' vehicles had only one occupant. The *1995 Nationwide Personal Transportation Survey* found that 91 percent of all commuters drive to work (Hu and Young 1999, Figure 10 and Table 21). The *2001 National Household Travel Survey* also found that 91 percent of all commuters drive to work and that the average vehicle occupancy is 1.14 persons per car (United States Department of Transportation 2003, 8 and 22). The 1990 Census found that 92 percent of commuters'

vehicles were solo driven (Pisarski 1996, 49). In a nationwide survey of employers regarding their parking subsidy arrangements, Shoup and Breinholt (1997) estimated that employers provided 84.8 million free parking spaces for their employees in 1994.

2. In total, 103 million commuters parked free at work in 1995, and only 5.8 million paid to park. Employers did not provide all of this free parking because some commuters park free on the street, but Shoup and Breinholt (1997) found that employers provided 85 million free parking spaces for commuters in 1994. The share of commuters who park free at work has been almost constant since the first *NPTS* in 1969, when it was 93 percent. The *2001 Nationwide Household Travel Survey* did not ask commuters whether they paid to park at work.
3. Center for Urban Transportation Research (1989).
4. Southern California Association of Governments (1996). Williams (1991) found that only 4 percent of drivers who park at federal facilities in downtown Washington pay the market rate for parking.
5. Hamilton (2000). Only 47 percent of employers subsidized any alternative to solo driving.
6. United States Bureau of Labor Statistics (1999, 2).
7. Port Authority of New York and New Jersey (1984).
8. Shoup and Breinholt (1997) estimated employers provided 84.8 million free parking spaces for their employees in 1994. Total civilian employment increased by 9 percent from 1994 to 2002, and the total number of employer-paid parking spaces probably increased by a similar amount (2003 *Economic Report of the President*, Table B-36).
9. KPMG Peat Marwick (1990) estimated the capital and operating costs of both structured and surface parking. For structured parking they estimated the capital cost is $10,941 per space, with a 40-year economic life and an 8 percent capital recovery factor, and the operating cost is $369 a year per space. The total capital and operating cost for structured parking is thus $107 a month per space. For surface parking they estimated the capital and operating cost is $21 a month per space. They also estimated employers provide 65.5 million free parking spaces for commuters. Shoup and Breinholt (1997) found that American employers provided 84.8 million free parking spaces for employees, or 29 percent more free parking spaces for commuters than KPMG Peat Marwick assumed. The capital cost of parking structures cited in Shoup (2005, Chapter 6) are also much higher than KPMG Peat Marwick assumed. Therefore, KPMG's $52.1 billion estimate of the parking subsidy provided to automobile commuters may understate the actual subsidy.
10. KPMG Peat Marwick (1990, 7).
11. O' Fallon, Sullivan, and Hensher (2003) for Auckland; Proost and Van Dender (2001, 396) for Brussels; Cape Town City Council (1993, Annexure E) for Cape Town, South Africa; Ireland Central Statistics Office (2000, Table 6) for Dublin; Rye, Cowan, and Ison (2004, Table 4) for Edinburgh, Scotland; Baker (1987, 535) for London; Vivier (1999, 7) for Paris; and Kwon and Kwon (2001, 11) for Seoul, South Korea.
12. Neuenschwander, Strub, and Kramer (2000, 12).
13. The Transit Cooperative Research Program (2000) reports additional studies of how parking prices affect travel choices and says the parking price elasticities range from –0.1 to –0.6, with –0.3 being the most frequently cited value. The average elasticity of –0.15 in Table 1-2 thus suggests the seven case studies are a conservative estimate of how employer-paid parking increases solo driving.
14. This measure includes vehicles driven by carpoolers and vanpoolers as well as by solo drivers. Most of the case studies report the number of employees who carpool, but not the average carpool size. The figure of one vehicle per 2.62 carpool/vanpool commuters was used to estimate the number of cars driven to work by carpoolers; this figure was found in the *1988 Commuter Survey* of Southern California commuters

(Commuter Transportation Services, Inc. 1988). The resulting number of cars per 100 employees is quite insensitive to moderate variations in this assumption.

15. Three of the seven studies reported in Table 1-2 refer to "before/after" cases where it was possible to observe commuters' response to an increase in parking prices; the other four refer to "with/without" case studies comparing the behavior of otherwise similar employees who differed only in regard to whether they paid for parking. But none of the three "before/after" cases involved a "pure" price increase of the sort that would reveal the "true" price elasticity of demand for parking as usually defined. In Ottawa, the government stopped providing free parking to its employees but raised the price to only 70 percent of the market value, not to 100 percent. Also, some employees had not been offered free parking before the price increase, so their price of parking didn't increase at all. Both of these factors would be expected to reduce the resulting change in mode split, and the Ottawa case does exhibit the smallest change. On the other hand, in the Warner Center and Mid-Wilshire cases the price of parking increased only for solo drivers; carpoolers continued to park free. This form of parking price increase (for solo drivers only) produced the largest changes in mode split. Removing these three "impure" cases of price change scarcely alters the average results, however, because the below-average response in Ottawa seems to have balanced the above-average responses in Los Angeles. The average price elasticity of demand for parking for the remaining four case studies is –0.14 (rather than –0.15 for all seven cases). The average change in solo share is 23 percent for the four remaining cases (rather than 25 percent for all seven cases). And the average change in the number of automobiles driven to work is 20 per 100 employees for the four remaining cases (rather than 19 for all seven cases).

16. These estimates refer to the cross elasticity of demand between the price of parking at work and the number of cars driven to work. The negative cross elasticity shows parking spaces and vehicle trips are complementary goods—a lower price of parking increases the number of vehicle trips. Because the number of cars parked at work equals the number of cars driven to work, these estimates also refer to the own-price elasticity of demand for parking at work. When price changes are large, as in these case studies, the preferred measure of elasticity of demand is the logarithmic arc elasticity. But the logarithmic arc elasticity is undefined when a price is raised from zero. Therefore, the elasticities in Table 1-2 are calculated as the linear arc elasticity, or "midpoint" elasticity, which approximates the average elasticity between two points along a demand curve. To calculate the midpoint elasticity, the percent change in price is defined as the absolute change in price divided by the average of the two prices between which elasticity is measured. Similarly, the percent change in quantity is defined as the absolute change in quantity divided by the average of the two quantities between which elasticity is measured. Because each case study examined the results of raising parking prices from zero to a market price, the change in market price is equal to the market price, and the average of the two prices (zero and market) is always half the market price. The price change is therefore 200 percent and the midpoint elasticity is half the percentage change in quantity. See Mansfield (1983, 533) or Samuelson and Nordhaus (1989, 425) for an explanation of the midpoint formula.

17. The lowest elasticity (–0.08) occurred in Ottawa, where parking prices did not increase to the full market rate and did not increase for all employees. David Gillen (1977b) subsequently used the post-parking-price-increase data for the Ottawa employees to estimate a logit model of transportation demand and found a price elasticity of demand for parking of –0.23.

18. Adiv (1982, 23). The sample size was 689 commuters. "Only about 10 percent of the 'usual' automobile users reported paying for parking. About two-thirds of the usual users received free parking from their employer as part of their employment benefits. Another quarter of them parked free on the street" (Adiv 1982, 22).

19. Coombe et al. (1997, 64). Transportation planners often use the four-stage Urban Transportation Modeling System (UTMS) to predict modal flows on links between zones in a network. Meyer and Miller (2001) explain the UTMS model.
20. Feeney (1989, 236).
21. Young, Thompson, and Taylor (1991, 64).
22. Young (2000).
23. Willson (1991). The *Los Angeles CBD Employee-Employer Baseline Travel Survey* was undertaken by the Community Redevelopment Agency of the City of Los Angeles in 1986. See Willson and Shoup (1990b) for a full description of the survey. A unique feature of the survey is that it includes not only the price of parking paid by those who drive to work, but also the price of parking those who don't drive to work would pay if they did drive to work. The statistical sample was weighted to represent the entire population of office workers in downtown Los Angeles.
24. Willson used the employers' responses regarding their parking policy to select two subsamples of commuters. The first subsample includes commuters whose employers subsidize no employee parking, and the second subsample includes commuters whose employers subsidize all commuter parking. He then used these subsamples to estimate the commuters' probability of choosing one of three travel modes: solo driver, carpool, or public transit.
25. To show the effect of parking prices on mode shares, Willson held all the independent variables (except the price of parking) constant at their median values in the sample.
26. See Willson (1991) and Shoup and Willson (1992) for more detail on the estimation of this logit model. The model was initially estimated with data on both those who pay to park and those who park free. The model was then used to predict how varying parking prices would affect the mode choices of all commuters in the subsample who park free. Thus, it predicts how those who are now offered employer-paid parking would have behaved if they had not been offered employer-paid parking. The t-statistic for the employer-paid parking coefficient was 6.9.
27. Because the price change is so large, the price elasticity is calculated as the midpoint arc elasticity, not the point elasticity.
28. That is, if employer-paid parking is an endogenous factor, we cannot treat it as an independent variable.
29. One of the with-and-without case studies was conducted in downtown Los Angeles, where the mode-choice model was also estimated. This study compared Los Angeles County employees (who received employer-paid parking) with federal employees (who paid for parking). The two samples of commuters worked in adjacent office buildings. Only 40 percent of the commuters who paid to park drove to work solo, while 72 percent of the commuters who could park free drove to work solo (Willson and Shoup 1990a, 150). This 32 percentage-point difference in the drive-alone share between matched samples of similar commuters with and without employer-paid parking strongly suggests that endogeneity is not a serious problem in the mode-choice model.
30. The number of cars driven to work per employee is calculated by adding together (1) the number of solo drivers and (2) the number of carpoolers divided by the reported average carpool occupancy of 2.92 persons per vehicle. This sum of vehicles driven to work is then divided by the total number of employees (including public transit riders) to yield the number of cars driven to work per employee.
31. The price elasticity of demand is calculated as the arc elasticity, as explained earlier in the discussion of the seven case studies in Table 1-2. The number of parking spaces occupied at work is equal to the number of vehicle trips to work. Therefore, the elasticity between the price of parking at work and the demand for parking at work is equal to the cross elasticity between the price of parking at work and the number of vehicles driven to work.

32. The VMT of commuters in each category (pay parking and free parking) is calculated by summing (1) the round-trip distance of solo drivers and (2) the round-trip distance of carpoolers, divided by the reported average carpool occupancy of 2.92 passengers per vehicle. The total VMT in each category (pay and free) is divided by the total number of employees (including transit users) in that category to show the VMT per employee per day. This measure therefore refers to VMT by automobiles and excludes passenger-miles travelled on public transit. To measure the distance travelled by each solo driver, we use the average reported distance for all solo drivers from the same ZIP code of residence, and for each carpooler we use the average trip distance reported by all carpoolers from the same ZIP code. Because carpoolers reported a greater average travel distance to work than solo drivers from the same ZIP code, this procedure takes into account the phenomenon that shifts from solo driving to carpooling can increase the distance travelled to work. The average round-trip distance to work for all commuters in the sample is 36 miles. Employer-paid parking stimulated a slightly smaller increase in VMT than in parking demand because the offer of free parking induced more commuters with short travel distances to shift to solo driving, presumably because feasible alternatives to solo driving are more readily available for short commutes.
33. In every year since 1983 Los Angeles has topped the Roadway Congestion Index calculated by the Texas Transportation Institute (2003) for 75 cities. Los Angeles is also the only region in the Environmental Protection Agency's most-polluted category of "extreme nonattainment." The four other categories of nonattainment of national air quality standards are, in decreasing seriousness: severe, serious, moderate, and marginal (U.S. Environmental Protection Agency 1995).
34. This value includes depreciation, insurance, and operating cost (American Motor Vehicle Manufacturers Association 1988).
35. Fisher (1972). Eighty-two percent of the former bus riders cited noneconomic reasons for resuming driving to work, but some of these would probably not have switched back to driving if they had not been able to park free at work.
36. David Gillen (1977a) explained why parking cost should be separated from automobile running cost when modeling transportation choices: parking cost is fixed (independent of trip length), while running cost is variable (dependent on trip length). Measuring the combined effect of parking costs and driving costs on travel choice will therefore mask the effects of parking costs alone, for three reasons: (1) parking costs decline as a proportion of the total cost of automobile commuting as trip distance increases; (2) there are fewer alternatives to solo driving as trip distance increases, and this increases the probability of solo driving for longer trips; and (3) incomes rise with greater distance from the CBD, and this also increases the probability of solo driving for longer trips. Because commuters are more likely to drive solo for longer trips, combining the (fixed) parking cost and the (variable) running cost into one total cost measure will understate the effects of parking cost alone, especially for shorter trips.
37. Westin and Gillen (1978).
38. Miller and Everett (1982).
39. Center for Urban Transportation Research (1989). Because 70 percent of all transit riders were identified as choice transit riders, and 51 percent of the choice transit riders would drive to work if their employers offered free parking, 35 percent of all transit riders would drive to work if their employers offered free parking (70 percent x 51 percent).
40. Dowling, Feltham, and Wycko (1991, 116).
41. Deakin and Harvey (1966, 7-8, 7-9, and 7-10). If raising the gasoline tax rate by 156 percent reduces VMT by 4.1 percent, raising the tax rate by 100 percent should reduce VMT by about 2.6 percent. The combined federal-and-state gasoline tax rate was 32¢ a gallon in 1991. Deakin and Harvey say that $3 a day is the approximate

minimum cost of providing an off-street parking space in Southern California, so the policy of charging $3 a day for parking thus represents charging drivers no more than the cost of the parking spaces they use at work.

42. RIDES for Bay Area Commuters (2001, 38 and 109). Free parking versus pay parking was the only variable identified in this comparison, so other variables could explain some of the difference in commuting behavior between those who parked free and those who paid. The survey asked all commuters (not just drivers) about the price of parking at work. The survey found that 78 percent of all *commuters* (not just of all drivers) in the Bay Area could park free at work.

43. Hess (2001, 40). For Los Angeles, Willson (1991) found that 70 percent of commuters who park free will drive to work alone; with a parking charge of $6 a day, only 39 percent of commuters will drive to work alone.

44. Hensher and King (2001, 191).

45. "To Commute to Washington, the Early Bird Gets Slugs," *New York Times*, April 29, 2003. Outside Washington, slugging is called casual carpooling. It is common on the San Francisco Bay Bridge, for example, where three-person carpools travel free. The $2 toll is charged only for the westbound crossing from Oakland to San Francisco and is free in the eastbound direction. In that case, the carpools benefit only on the way into San Francisco. At the end of the workday in downtown San Francisco, all the casual carpoolers needed to get back to the East Bay, but solo drivers had no toll-reduction incentive to pick them up. AC Transit could not figure out why all their busses were empty on the way in to work but full on the way home. When they realized that casual carpooling was the reason, they reduced the bus fare to 50¢ going into San Francisco and increased it to $2 going home.

46. Because another person always adds five minutes to travel time, and five minutes is one-twelfth of an hour, the savings per hour of added travel time is always 12 times the savings per day for adding another person to the carpool.

47. A carpool to work is like a club, and the optimal size of a carpool is like the optimal size of a club. In his economic theory of clubs, James Buchanan (1965, 5) says, "the individual attains full equilibrium in club size only when the marginal benefits that he secures from having an additional member (which may, and probably will normally be, negative) are just equal to the marginal costs that he incurs from adding a member (which will also normally be negative)." In a carpool, another carpooler slows travel down (the marginal benefit of another member is negative), and another member reduces the individual's shared cost for driving and parking (the marginal cost is negative).

48. Rutherford *et al.* (1994, 14).

49. Consider the case of two planning professors at the University of Southern California, Peter Gordon and Harry Richardson. They lived in the same apartment building in West Los Angeles for three years, had offices in the same building at USC, and coauthored many articles. The one time they carpooled to work, they told me, was on the occasion they attended a meeting at the Biltmore Hotel in downtown Los Angeles, where they paid $12 for parking.

50. The added time cost for carpooling may be considered a proxy for the other factors that influence the carpooling decision. For example, the advantages of carpooling may include companionship and sharing the chore of driving; the disadvantages may include the inflexible schedules of fellow carpoolers. Inflexibility is not always a disadvantage for the carpoolers, however. I have been in many meetings in Washington when some participants excused themselves early because they "had to meet their carpool." If the advantages and disadvantages of carpooling are converted into their equivalents in terms of the utility or disutility of added travel time, the time cost of carpooling can represent the net effect of all the factors that enter into the carpooling decision.

51. Why is the price elasticity of demand for parking at one site lower than the price elasticity of demand for parking at all sites? The conventional argument is that if only one firm in an industry raises its price, the observed elasticity of demand will be greater than if all firms in the industry raise their prices. This is so because customers can purchase substitutes for any one firm's product from all other firms in the same industry but cannot easily purchase substitutes for a whole industry's product from other industries. But that firm-versus-industry argument applies when all firms in the industry produce similar and competing products or services that are substitutes for each other, while parking spaces at different locations are complements, not substitutes, for one another. Therefore, free parking everywhere else will reduce the elasticity of demand for parking at work.
52. Jones (1992, 104).

CHAPTER 2

Cashing Out Free Parking

A thing which you enjoyed and used as your own for a long time, whether property or opinion, takes root in your being and cannot be torn away without your resenting the act and trying to defend yourself, however you came by it.

—Oliver Wendell Holmes

Employer-paid parking creates serious transportation and environmental problems, but reform is difficult because most commuters consider it a basic right. A survey of commuters in 17 American cities, for example, found that more than half of bus riders opposed the idea of charging for parking at work.[1] If even bus riders oppose charging for parking, imagine the difficulty in trying to take free parking away from drivers—it would be like trying to take a favorite bone from a vicious dog. To paraphrase Justice Holmes, free parking you have enjoyed for a long time cannot be taken away without your resenting the act, no matter how much harm the free parking does.

PARKING AS A STATUS SYMBOL

The difficulty of economic reform is compounded by the use of parking spaces to denote rank in organizations. In academia, for example, you are not so much what you drive as where you park. At Berkeley, only Nobel Laureates are eligible for the campus's highest status symbol—a named parking space. After Charles Townes won the 1964 Nobel Prize for physics, Berkeley attached his name to a parking space to signal the award, and Townes commented, "It saves me a whole lot of time. The cost is not the big thing—it's the convenience."[2] And shortly after Berkeley professor Daniel McFadden won the 2000 Nobel Prize for economics, he received a standing ovation during halftime at a Cal football game. When asked which was better, the adulation of 50,000 people or the lifetime reserved parking space, he replied, "Well, the parking space goes on and on. It's considered slightly more important than the prize itself."[3] The California Institute of Technology also gives named parking spaces to Nobel Laureates. After Rudolph Marcus won the 1992 Nobel Prize for chemistry, a colleague saw him parking his car in a newly painted space not far from his office. "Well, the Nobel Prize has to be worth something," Marcus said. He continued to walk to work on most days and kept his 1978 Oldsmobile for days he needed to drive.[4]

Universities often lead society in advocating social and economic equality, but their parking hierarchies make the *Titanic* look like a one-class ship. UCLA, for example, has 175 different types of parking permits, carefully graded according to the status of each administrator, faculty member, staff member, or student. Major donors to UCLA receive campus parking permits based on the size of their donations. Parking privileges are cumulative, which means that the holders of higher-ranking permits can park in the spaces reserved for their rank *and* in the spaces available to the holders of lower-rank permits. For example, a Blue-permit holder can park in the spaces reserved for Blue permits *and* in the spaces reserved for the lower-ranking Yellow permits, but a Yellow-permit holder cannot park in the spaces reserved for the higher-ranking Blue permits. UCLA reserves the best parking spaces on campus for the coveted "X" permit, which allows holders to park in the spaces reserved only for X permits *and* in all the spaces reserved for all other permits. The X permit is UCLA's equivalent to the feudal *droit de seigneur*.[5]

In jockeying for parking, politicians make academics look almost egalitarian. Consider this story told by Christopher Hicks in the Office of Management and Administration during the first Bush administration:

Donald C. Shoup

This sign designating a Nobel Laureate parking space indicates that a Nobel Prize is clearly worth something.

> There are fifteen parking spaces there right next to the West Wing. So I put all the new Assistants to the President . . . there so they had the best parking spaces. . . . I had one guy . . . [he] found me literally . . . outside the Oval office. . .on inauguration morning and started screaming at me for, (1) I hadn't gotten artwork hung up in his office, and (2) I had the audacity to put him at the end of that line of parking spaces. He didn't want to be number fifteen, closest to Pennsylvania Avenue; he wanted to be number one.[6]

Parking envy is a perfect example of what Oxford University economist Fred Hirsch termed "positional competition."[7] Because positional goods are valued for their relative characteristics, competition for them becomes a zero-sum game in which a gain to one is canceled by a loss to another. If the angry person in the fifteenth West Wing parking space is promoted to the first position and everyone else is shifted one space down, the gain to one is offset by losses to 14 others.

Parking is perhaps most positional in Hollywood, where status-climbing is rampant and no one even pays lip service to a spirit of equality. Indeed, in the film industry, as Burt Reynolds observed, your parking space knows before you do when your career is in decline—someone else's name is on the sign when you pull into your reserved space at the studio.[8]

As these examples suggest, both the economic and status values of employer-paid parking make it quixotic to recommend charging for parking at work. The story of the federal employees who sued to get their free parking back (see Chapter 1) shows that commuters view employer-paid parking as an entitlement. Nevertheless, this chapter explains how we can reform employer-paid parking without charging commuters for parking: let commuters *cash out* their parking subsidies.

This chapter explains how we can reform employer-paid parking without charging commuters for parking: let commuters cash out their parking subsidies.

CALIFORNIA'S PARKING CASH-OUT LAW

Giving commuters the choice between a parking subsidy or its cash equivalent shows even free parking has an opportunity cost—the forgone cash. The option to cash out thus raises the effective price of commuter parking without charging for it. The cash option converts employer-paid parking from a matching grant for driving to work into a cash grant for commuting. Commuters can continue to park free at work, but the cash option also rewards commuters who carpool, walk, bike, or ride public transit to work.

California enacted a parking cash-out requirement in 1992. The law requires many employers to offer a parking cash-out program:

> "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.[9]

California's parking cash-out requirement applies only to parking spaces firms rent rather than own.[10] When a commuter chooses cash instead of a free parking space, the firm's avoided cost for the rented parking space pays the commuter's cash allowance, dollar for dollar. The firm therefore breaks even when a commuter takes cash instead of a parking space.[11]

The cash-out law sets a simple test for commuter transportation policies. To pass this test, a firm must subsidize ridesharing to work as much as it subsidizes parking at work (in California transportation jargon, ridesharing refers to any alternative to solo driving—even walking and

cycling are called ridesharing). The following three policies pass the cash-out test because they subsidize ridesharing as much as they subsidize parking: (1) no parking subsidy, (2) the choice between a parking subsidy or its cash value, and (3) a commuting allowance that can be spent on any form of commuting. A policy will fail the cash-out test only it if subsidizes parking at work *more* than it subsidizes ridesharing to work.

The law requires firms to offer a parking cash-out option if they subsidize parking, but it does not require commuters to rideshare. Rather, the law simply requires firms to offer commuters the option to choose the cash equivalent of any parking subsidy offered. Once this option is available, commuters can make their own decision about how they want to get to work.

BENEFITS OF PARKING CASH OUT

Perhaps the best way to explain parking cash out is to explain how it works and what it does. Parking cash out (1) gives commuters a new choice, (2) rewards the alternatives to solo driving, (3) reduces vehicle trips, (4) treats all commuters equally, (5) costs employers very little, (6) strengthens the city center, (7) converts economic waste into public revenue, (8) sidesteps employees' opposition to charging for parking, and (9) is not a tax on parking.

Gives Commuters a New Choice

Parking cash out adds new choices for many commuters who now face a take-it-or-leave-it offer of free parking or nothing. Firms can continue to subsidize parking so long as they broaden the offer to include the option to take the cash equivalent of the parking subsidy instead of the parking subsidy itself. Commuters who choose the cash and cease driving to work are clearly better off, or they wouldn't make this choice. Commuters who were already ridesharing are also better off because they receive cash in lieu of the parking subsidies they had already declined. And although the forgone cash means drivers in effect pay for their "free" parking, commuters who continue driving to work are no worse off.

Parking cash out adds new choices for many commuters who now face a take-it-or-leave-it offer of free parking or nothing.

Rewards the Alternatives to Solo Driving

Transportation economists often recommend congestion tolls and parking fees as incentives for drivers to change their behavior, but these proposals look bad from the changees' point of view. In contrast, parking cash out does not require any commuter to pay for anything; instead, it rewards commuters for choosing the alternatives to driving to work alone. Parking cash out is a buy-back, not a take-away. It is also simple: commuters choose either free parking or cash. Parking cash out is an easy reform because it rewards commuters for doing the right thing, rather than punishing them for doing the wrong thing. Parking cash out also rewards the most environmentally benign forms of commuting—walking and bicycling—as alternatives to driving alone. Most commuters who now carpool, walk, bike, or ride public transit to work are unaware of the parking subsidy they do not receive, but cash out will reveal it.

Reduces Vehicle Trips

Giving commuters the choice between free parking or its cash value shows even free parking has a cost—the cash not taken. The forgone cash is a new price for taking the free parking, and this price increases the cost of solo driving. When the opportunity cost of a free parking space becomes explicit, some commuters will cash out and begin to ride public transit, carpool, walk, or bike to work. Many commuters who use their cars for

business or personal reasons while at work will still drive alone, but a 1996 survey of commuters in Southern California found that 40 percent of all automobile commuters do not use their cars while at work.[12] Many commuters are thus in a good position to cash out their free parking.

Chapter 4 presents case studies of firms that have complied with California's cash-out requirement. In these studies, parking cash out reduced vehicle travel to work by 12 percent—the equivalent of removing from the road one of every eight cars used for commuting. For every 100 commuters, 13 solo drivers shifted to another mode after their employer began to offer parking cash out. Of these 13 former solo drivers, nine joined carpools, three began to ride transit, and one began to walk or bike to work. On average, these mode shifts prompted by parking cash out reduced vehicle travel to work by 652 VMT a year per employee.

Treats All Commuters Equally

Employer-paid parking is a subsidy you qualify for by driving to work, so it does not help commuters who cannot afford a car. Nationwide, 20 percent of households with an income of less than $25,000 a year do not own a car, while only 2.3 percent with an income of more than $25,000 do not own a car.[13] Free parking therefore benefits these groups differently. Parking cash out allows a firm to offer free parking and yet avoid any of the bias implicit in subsidizing only commuters who drive.

Cash is taxable, but a parking subsidy is not. As a result, the greatest after-tax benefits among those who choose cash accrue to lower-income commuters. Because they are in lower tax brackets, they gain more after-tax cash in lieu of free parking, and the gain is larger in proportion to their total income. Parking cash out also benefits commuters who have any physical disability that prevents them from driving to work. Offering disabled commuters cash instead of free parking allows them to benefit from commuting subsidies to the same extent that other commuters can.

Parking cash out allows a firm to offer free parking and yet avoid any of the bias implicit in subsidizing only commuters who drive.

These three points—parking cash out avoids bias, benefits the lowest-paid commuters most, and helps disabled commuters—respond to the conventional criticism that charging for parking is unfair. Parking cash out does not penalize solo drivers or favor ridesharers; instead, parking cash out simply treats everyone equally. Parking cash out is much fairer than the customary choice of free parking or nothing at all.

Costs Employers Very Little

California's cash-out requirement applies only to parking spaces firms rent rather than own, and only to firms offering their employees a parking subsidy. If a commuter gives up a parking space for cash, the money previously spent to rent that space becomes the commuter's cash allowance, and the firm breaks even. If a commuter already uses some form of alternative transportation, however, the firm will still be required to offer the cash-out subsidy, but this will not reduce the number of spaces the firm leases (since the commuter did not drive to begin with). A parking cash-out program will thus result in a net cost proportional to the number of employees who already used some alternative to solo driving before the program began. This cost should be small, however, because most commuters now drive to work alone. The *1995 Nationwide Personal Transportation Study*, for example, found that 91 percent of American workers commute by car, and that 95 percent of drivers park free at work. Therefore, only a small share of commuters can become eligible to receive cash without giving up a parking space. Moreover, many of these current nondrivers are not offered free parking (which may explain why they do not drive), so the firm does not have to offer them cash. Finally, some firms already offer a

rideshare subsidy (such as a free bus pass), so the firm's cost for these commuters is only the difference (if any) between the required cash option and the cost of the existing rideshare subsidy.

An example will show how parking cash out can increase costs for firms that now subsidize parking but not ridesharing. Suppose a firm offers free parking to its 100 employees. It pays $100 a month to rent a parking space for each driver but offers no transportation subsidy to other commuters. Suppose also that 90 commuters drive to work alone and the other 10 commuters ride transit, walk, or bike to work.[14] This means the firm offers a parking subsidy of $100 a month to every commuter, but pays only $90 a month per commuter to rent parking spaces because only 90 of the 100 commuters drive (see Table 2-1). The firm thus saves $100 a month for each employee who doesn't drive to work.

Now suppose the firm begins to offer all commuters the choice of either a free parking space or $100 a month. This raises the average subsidy per commuter by $10 a month, from $90 to $100 because now every employee receives either the $100 parking subsidy or $100 in cash. Suppose also that 15 solo drivers switch to another mode to take advantage of the cash option. In this example, parking cash out reduces the number of cars commuters drive to work by 17 percent (15 ÷ 90) and raises the firm's cost to subsidize commuting by 11 percent ($10 ÷ $90). This additional $10 a month per person is the cost of adopting a policy that treats all employees equally no matter how they commute, without reducing the subsidies offered to solo drivers. In this case, complaining that parking cash out will increase a firm's subsidy cost is the same as arguing the firm should save money by subsidizing only solo drivers.

TABLE 2-1.
EMPLOYER'S COST OF OFFERING FREE PARKING (FOR 100 EMPLOYEES)

	Parking cash out		Change	
	Before	With	#	%
Employer's cost per parking space per month	$100	$100	0	0%
Number of employees who drive to work	90	75	–15	–17%
Number of employees who do not drive to work	10	25	+15	+150%
Total commuting subsidy per month	$9,000	$10,000	+$1,000	+11%
Subsidy per employee per month	$90	$100	+$10	+11%

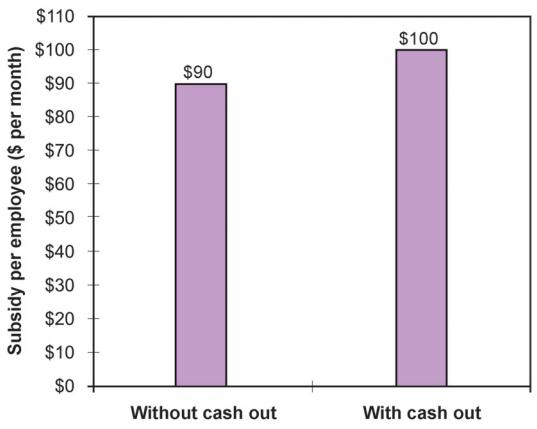


TABLE 2-2.
TRANSFER COST VERSUS REAL COST (COSTS AND BENEFITS PER EMPLOYEE PER MONTH)

	Cost to employer ($/month)	Benefit to employees ($/month)	Benefit to employer ($/month)
	(1)	(2)	(3)
Cost of offering parking cash out (transfer cost)	$10	$10	+
Cost of electricity price increase (real cost)	$10	$0	$0

In this example the firm pays $10 a month more per person to offer parking cash out, but this added cost is a new fringe benefit for commuters who don't drive. The cost of parking cash out is therefore unlike an increase in most other costs, such as an increase in the price of electricity. Instead, the cost of parking cash out is a *transfer* to commuters, and it provides a valuable fringe benefit that helps recruit and retain workers. Table 2-2 illustrates the crucial distinction between transfer costs and real costs in the context of parking cash out. The firm's additional $10-per-person-per-month cost for cash out, rather than simply becoming another expense, becomes added income for nondriving commuters, and offering it can help recruit and retain employees. In contrast, suppose the firm has to pay more for electricity because its price increases. The added cost of electricity provides no benefit to either employees or to their employer—they get the same amount of power for a higher price, and the extra money simply disappears into the coffers of the electric company. Firms would greatly prefer to pay $10 a month per person to offer parking cash out for their employees than to pay the same money for an increase in the price of electricity because cash out is a valuable fringe benefit, while the higher cost of electricity is just a cost. Therefore, parking cash out cannot be compared with a *real* cost—at least not without taking into account the benefits of parking cash out to both employees and their employer.[15]

Parking cash out cannot be compared with a real cost—at least not without taking into account the benefits of parking cash out to both employees and their employer.[15]

Offering cash out without reducing the parking subsidies for solo drivers will increase a firm's cost of subsidizing commuting, but not by much if most commuters already drive to work. And because firms can comply with California's parking cash-out law in several ways, no firm is required to pay more to subsidize commuting. Consider the firm in the previous example. First, it can eliminate parking subsidies altogether, and *save* $90 a month per employee. Second, it can offer every commuter a parking subsidy of $90 a month, with the option to cash it out. Each driver would pay $10 a month for parking (only 10 percent of the cost), and each nondriver would receive $90 a month. This policy would be cost-neutral for the firm. Third, it can eliminate direct parking subsidies, offer all commuters a cash commuting allowance of $90 a month, and let them make their own transportation choices. Again, this policy would cost the firm nothing. In practice, the case studies presented in Chapter 4 found that firms saved almost enough on parking subsidies to pay for parking cash out. On average, the firms' commuting subsidies rose by only 3 percent (from $72 a month per employee before cash out to $74 a month per employee afterward), so parking cash out was almost cost-neutral.

Strengthens the City Center

Many Central Business District (CBD) employers offer free parking to attract workers who might otherwise be deterred by the high price of parking.

Employer-paid parking equalizes the cost of parking between the CBD and suburban work sites (by making it free in both places), but this does not give the CBD a competitive advantage. Because CBD employers pay more to provide free parking, however, the cash alternative for giving up a parking space is also greater, and the CBD will become a more attractive place for nondrivers to work. Allowing commuters to cash out employer-paid parking can therefore increase the CBD's comparative economic advantages. Parking cash out sidesteps the parking-subsidy rivalry between central cities and their suburbs by converting workplace parking subsidies into broader transportation subsidies.

CBD commuters are well placed to take advantage of the opportunity to cash out their employer-paid parking. Public transit service usually focuses on the CBD, so many commuters can take the cash and shift to public transit. Similarly, because high employment density in the CBD implies a high density of potential fellow carpoolers, many commuters can take the cash and shift to carpools. The higher cash allowance for nondrivers, along with the greater variety of alternatives to solo driving, will make the CBD more attractive to many potential employees.

Parking cash out has a special advantage in the CBD because it rewards commuters who walk to work. I learned the importance of this from a friend who works in downtown Los Angeles and moved into an apartment building downtown. Although her new apartment was more expensive than her former place in the suburbs, she could walk to her job only three blocks away, and her employer offered all employees either free parking or $110 a month. Living downtown allowed her to walk to work, she said, and because of the extra cash she was willing to pay $110 more for her apartment. In this case, parking cash out is a rent subsidy for living downtown. Parking cash out not only changed her mode from driving to walking, but also changed her residence from the suburbs to downtown. Many cities are trying to encourage more people to live downtown, and parking cash out contributes to this goal, at no expense to the city.

Parking cash out changes mode choices without changing destination choices.

Commuters who cash out their free parking reduce congestion on trips to the CBD, and this makes the CBD more accessible to everyone, including those who continue to drive alone. In the case studies of parking cash out in Chapter 4, the 22 percent and 16 percent reductions in solo driving at the two CBD firms after cash out show the great potential to reduce traffic congestion. Because parking is usually most expensive in the CBD, parking cash out offers the strongest incentive to rideshare exactly where it does the most good.

Some CBD employers may fear parking prices high enough to divert solo drivers to other modes may also divert travelers to other destinations. But parking cash out doesn't raise parking prices and therefore won't reduce travel to the CBD. Parking cash out changes *mode* choices without changing *destination* choices.

Mode choices versus destination choices. The fact that parking cash out does not raise downtown parking prices is important because higher parking prices in the CBD *do* divert travelers to other destinations. To examine this issue, Dasgupta et al. used a travel demand model to estimate how increased parking prices would change mode choices and destination choices in five English cities (see Table 2-3). The model was used for cities ranging in population from 180,000 (Reading) to more than 500,000 (Leeds and Bristol). Doubling the price of parking in the CBD, they concluded, 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 center by all modes would fall by 5 percent.[16] In other words, higher parking prices reduce vehicle trips to the CBD by both (1) diverting

TABLE 2-3.
CHANGES IN TRAVEL TO THE CITY CENTER AFTER PARKING PRICES ARE DOUBLED

	Change in trips by each mode			
City	Car	Bus	Walk + rail	Change in total trips
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.

travelers from solo driving to other modes and (2) diverting travelers to other destinations.

In contrast to raising the price of parking at work, parking cash out reduces vehicle trips to the CBD by diverting commuters from solo driving to other modes, but not by diverting them to other destinations: it does not change where people go, but how they get there. Allowing commuters to cash out parking subsidies in the CBD encourages them to choose the alternatives to solo driving, but it does not discourage them from working in the CBD. Therefore, parking cash out reduces congestion en route *to* the CBD without reducing economic activity *in* the CBD.

Agglomeration economies. Parking cash out also benefits the CBD in another important way. The CBD's high density of economic, social, and cultural activities produces agglomeration economies that give it competitive advantages over the suburbs. Employer-paid parking reduces the benefits of density, however, because the ample supply of parking spaces provided to commuters for free removes a sizeable share of land from other uses that would employ more people and earn more revenue. Free parking also increases traffic congestion on the routes to the CBD, which discourages additional visitors. For almost a century, this has been one of the central dilemmas of downtowns: how to stay vibrant and dense when the vehicles needed to bring people into the core require parking spaces, which undermine density. Because parking cash out reduces the number of spaces needed, it allows CBD employers both to offer free parking and to enjoy the benefits of higher density at the same time. Cash out also reduces traffic congestion on the routes to the CBD and therefore strengthens the center by bringing more people, but not more cars, downtown. The increased demand for public transit may also allow transit operators to add service to the CBD, reinforcing its position as the hub of the city.

Because parking cash out reduces the number of spaces needed, it allows CBD employers both to offer free parking and to enjoy the benefits of higher density at the same time.

Converts Economic Waste into Public Revenue

Commuters who cash out employer-paid parking must pay taxes on the additional cash income they receive. Free parking is an inefficient fringe benefit if a commuter would rather have its *after-tax* cash value. This inefficiency is a *private waste* because the benefit to the commuter is less than the cost to the employer. This private waste is separate from and additional to all the *public harm* of congestion and pollution caused by employer-paid parking. Allowing commuters to take cash instead of a parking subsidy reduces this private waste.

Suppose, for example, your free parking space costs your employer $100 a month, and you are in the 30 percent marginal income tax bracket. If your employer offers you the option to take $100 a month instead of the free parking, your after-tax cash income would be $70 a month. The opportunity cost of your free parking is thus $70 a month. If you cash out, your choice shows that free parking is worth less to you than $70 a month in cash.

When a commuter voluntarily chooses taxable cash rather than a tax-exempt parking subsidy, federal and state income tax revenues increase. Anyone who chooses $70 in after-tax cash rather than a $100 parking subsidy pays an extra $30 in taxes and is still better off. This $30-a-month increase in tax revenue does not result from increased tax rates nor from taxation of previously tax-exempt parking subsidies. Instead it results from the commuter's voluntary action: cashing out an inefficient in-kind parking subsidy that costs more to provide than it is worth.

The increased tax revenue comes from a reduction in what is known as "deadweight loss." This loss, which results from employer-paid parking, is the difference between what a firm pays to provide a parking space and the value a commuter places on receiving it (i.e., the lowest price at which the commuter would "sell" the parking space back to the firm).[17] For example, suppose the lowest after-tax value at which you will cash out your free parking space is $60 a month. You can take $100 a month in taxable cash, receive an extra $70 a month in after-tax income, and still feel $10 a month better off than when you parked free. Parking cash out therefore eliminates deadweight loss totaling $40 a month: the government captures $30 a month as tax revenue, while you keep $10 a month as an increase in your own welfare.

When a commuter voluntarily chooses taxable cash rather than a tax-exempt parking subsidy, federal and state income tax revenues increase.

Results from the seven case studies summarized in Table 1-2 (in the previous chapter) suggest that many commuters think their free parking spaces are worth less than employers pay for them. On average, when drivers must pay for their parking, they occupy 19 fewer parking spaces per 100 employees than when employers provide parking free of charge. As an extreme example, consider the results found in the Mid-Wilshire Los Angeles case study; after the firm stopped offering free parking for employees who drove to work alone, only one of the 42 solo drivers who had previously parked free was willing to pay the market price of $57.50 a month to continue parking at work. It seems that 41 of the 42 commuters who had driven to work alone felt the free parking spaces were worth less than the $57.50 a month their employer had been paying for them. Not offering commuters the option to cash out their free parking can thus create serious economic inefficiency.

This inefficiency is not a uniquely American phenomenon. Erik Verhoef, Peter Nijkamp, and Piet Rietveld at the Free University of Amsterdam conducted a stated-preference survey of commuters to their university, and from their results estimated drivers' maximum willingness to pay for parking spaces at work.[18] Because free parking was available on the surrounding streets, slightly fewer than half of all those who parked free at the university were willing to pay anything for their university-provided parking spaces. Even if both on-street and university parking were priced the same, the authors estimated that 82 percent of the drivers would be unwilling to pay more than $9 a month for the parking spaces the university provided free (but probably at great expense).[19]

The decision to cash out a parking subsidy proves beyond doubt you think free parking is worth less than your employer pays to provide it. Parking cash out thus converts economic waste into increased tax revenue and increased employee welfare. The tax revenue is an additional public benefit, above and beyond any reductions in air pollution, traffic congestion, and

energy consumption that also result. The case studies presented in Chapter 4 found that when commuters were offered the opportunity to choose taxable cash in exchange for giving up their tax-exempt parking subsidies, federal and state tax revenues increased by $65 a year per employee.[20]

The research summarized in Chapter 1 shows how parking subsidies strongly influence commuters' mode choices and how many commuters switch from solo driving to another mode when asked to pay for formerly free parking spaces. The option to take either a tax-free transit benefit or taxable cash instead of a parking subsidy is a strong incentive to ride public transit, carpool, walk, or bike to work. But parking cash out can produce benefits even for commuters who do not change modes. For example, suppose a commuter chooses to cash out an employer-paid parking space, pays taxes on the cash, and then continues to drive to work but parks in a cheaper space. The commuter is better off, the employer is no worse off, and federal and state income tax revenues increase, all because of the cash-out option. And because parking cash out is not a new charge for parking, it will not increase the Consumer Price Index.[21]

Sidesteps Employees' Opposition to Charging for Parking

Employer-paid parking is both an immovable object and an irresistible force—immovable because, once granted, it is almost impossible to take away, and irresistible because, once offered, it is almost impossible to turn down. But parking cash out allows employers to continue to offer free parking while solving most of the problems created by the free parking itself. The case studies in Chapter 4 show that once firms offer parking cash out, everyone sees its benefits.

Parking cash out makes a political end-run around the widely held view that charging for parking is like charging employees for going to work. As mentioned earlier, when the Center for Urban Transportation Research surveyed 4,000 commuters who live close to public transportation routes in 17 cities, it found that 72 percent of the respondents—including 52 percent of bus riders—opposed charging for commuter parking as a way to increase transit ridership. Similarly, Stephen Ison and Stuart Wall at Loughborough University surveyed transportation officials in British local governments and found only road user charges and increased fuel taxes were considered more unacceptable than workplace parking charges as policies to reduce traffic in urban areas.[22] Parking cash out is not a charge for parking at work, but it will have similar effects on commuting.

Parking cash out should not be confused with the very different policy of a tax on parking spaces.

President Carter's failed attempt to charge federal employees for parking illustrates the difficulty of trying to take away free parking without offering some other form of compensation (see Chapter 1). Federal employees sued the government to get their parking back. In alleging a violation of their collective bargaining agreement, the unions said the government had removed a benefit—a form of compensation, like health insurance or vacations—without giving anything in return. Free parking has real value to employees; it cannot be taken away without their resenting the act and trying to defend themselves. Parking cash out solves that problem.

Not a Tax on Parking

Parking cash out should not be confused with the very different policy of a tax on parking spaces. Some cities have imposed a tax on parking spaces or parking receipts, and Thomas Higgins examined the consequences.[23] He points out the tax has no effect on vehicle trips unless drivers pay it. The taxes do not even change parking prices if the parking spaces are in fixed supply. Although reducing vehicle travel is always the stated purpose, raising revenue always appears to be the real one. Because cities

require on-site parking for all new development, taxing these required spaces in order to reduce vehicle travel is at best inconsistent. In contrast, parking cash out raises the effective price of parking for commuting without taxing the parking spaces themselves. In summary, then, parking taxes raise revenue without affecting vehicle trips, while parking cash out reduces vehicle trips and increases tax revenue without taxing parking spaces.

DAILY CASH OUT

A potential problem with parking cash out may be the all-or-nothing nature of the choice: a commuter must decide whether to take cash or a parking permit, but circumstances often change. What happens if a commuter takes cash and begins to ride the bus to work, but also wants to drive to work a few days a month? Fortunately, parking cash out need not prevent commuters from driving to work whenever they choose because firms can offer the cash option on a daily basis. The cash-out program run by the Pfizer Corporation at its laboratories at Sandwich in Kent, England, shows how the daily option gives commuters great flexibility in travel choices. Pfizer estimates the capital and operating cost of providing parking for its employees in Sandwich is more than £1 million a year and the average cost per space is £2 a day.[24] Under the program, Pfizer employees can park free at work on any day, but any commuter who works on site without bringing a car receives a credit worth £2. Commuters can either park free or take the cash value of the free parking, and they can make different choices on different days. Although everyone can park free, commuters who drive to work alone forfeit £2 a day. The daily cash option therefore encourages everyone to consider the alternatives to solo driving whenever possible.

Daily parking cash out is fair and flexible for both the firm and its employees. Giving a credit for arriving and then deducting it for parking informs every commuter, every day, that parking has a cost.

The program is simple. Pfizer employees automatically earn a credit of £2 each day they use their company identification cards to enter their office building. If they have driven to work, they use the same identification cards to access the company parking lot, and £2 is deducted from their account.[25] A solo driver therefore receives both a credit and a debit of £2 for the day (so the net value is zero), but a commuter who has walked, biked, or taken the bus to work receives a net credit of £2 for the day (because there is no debit for parking). These accumulated credits are forwarded to the payroll office at the end of the month, and the cash value is included in each employee's salary one month in arrears. This arrangement automatically enrolls all employees in the program even if they usually drive to work alone.

All staff can use the company's intranet site to check their parking cash-out balances and personal commuting history, which is particularly useful for carpool planning. Each member of a carpool receives £2 for reporting to work, and the one whose identification card activates the parking lot gate incurs the £2 debit. The occupants of each car decide whose card to use on any day, so that both the driver and the passengers can benefit fairly from the cash-out credits.

Fair and Flexible

Daily parking cash out is fair and flexible for both the firm and its employees. Giving a credit for arriving and then deducting it for parking informs every commuter, every day, that parking has a cost. Commuters can earn a £2 bonus on any day simply by showing up at work without a car. Rather than charge commuters to park, the firm pays them not to park. This policy levels the playing field among all modes of travel because all commuters receive the same subsidy—£2 a day—regardless of their mode

choice. Parking cash out does not favor the alternatives to solo driving but instead offers the same subsidy to drivers and nondrivers alike. This seems generous to nondrivers only because most employers currently offer nondrivers nothing. As in the U.S., the cash-out credit is taxable income while the parking subsidy is tax-exempt. So although Pfizer treats all commuters equally, the tax system continues to favor drivers.

Because Pfizer offers free parking to everyone *and* cash to those who don't drive, its cash-out program is more expensive than offering free parking alone. The added cost for cash out is about £5 a month per employee.[26] Pfizer's Transport and Planning manager, John Elliott, says "it would be easy to make the parking cash out system cash neutral by rewarding people who travel by greener modes while charging those who drive alone."[27] The system can also favor the alternatives to solo driving even without charging for parking. For example, suppose a firm's cost to provide a commuter parking space is $3 a day. If both the credit for reporting to work and the debit for using a parking space are $4 a day, this policy gives free parking to everyone but favors the alternatives to solo driving. If a firm wants to encourage commuters to choose the alternatives to solo driving, it should reward those alternatives more than it rewards solo driving.

Pfizer's policy is particularly appropriate for firms that need to reduce vehicle trips as a planning condition for expanding their operations. Pfizer agreed to offer its cash-out program as a transportation demand management (TDM) measure when it sought to expand its headquarters in Kent, and other local governments can require TDM programs similar to Pfizer's when a proposed development will increase the traffic generated at a site. Pfizer has another plant at Walton Oaks, in Surrey, where the planning authority permitted fewer parking spaces, and the cash-out incentive is £5 a day for each commuter who reports to work without a car.[28]

The daily parking cash-out arrangement is particularly well suited to universities.

In 2004, the Twentieth-Century Fox Film Studio in Los Angeles began a similar daily cash-out program. All employees are entitled to free parking, but commuters who arrive on any day by carpool receive $2.50, those who arrive by public transit receive $2.75, and those who walk or cycle receive $3.00. To earn the awards, commuters who arrive by alternative transportation swipe their identification cards through terminals conveniently located throughout the studio. The cash awards are paid to commuters in their payroll checks at the end of the month.[29]

The daily parking cash-out arrangement is particularly well suited to universities. Some professors complain charging for parking discourages coming to campus and claim free parking encourages faculty to make themselves available to meet with students, attend committee meetings, and participate fully in the life of the university. In this situation, daily parking cash out serves everyone's interest. Professors who drive to campus can park free, while those who come to campus without a car receive the cash value of the parking they do not use. Even economics professors can have a free lunch if they forgo a free parking space. This arrangement encourages faculty to come to campus even more frequently than they do with free parking alone, and the cash alternative to free parking does not skew travel choices toward cars. Professors who stay at home, meanwhile, receive nothing. What could be fairer or more efficient?

Parking Fee Level versus Parking Fee Structure

Pfizer's daily cash-out option illustrates a crucial point about parking fees: the distinction between the *level* and the *structure* of the fees. The level of the fee refers to the amount, while the structure refers to the way drivers pay it (per hour, day, or month). For example, a fee of $1 an hour and $24 a day both amount to the same level for a 24-hour parking duration, but drivers

react very differently to an hourly fee than to a daily one. In many cases, drivers will respond more to a change in a parking fee's structure than to a change in its level. To illustrate this, suppose the price of a parking permit at work is $50 a month, with no daily option. If a commuter wants to drive to work a couple of times per week (for example, to run errands at lunch or after work), the rational decision may very well be to acquire a parking permit. And with a permit, the marginal cost to park at work on any given day is zero. If you have bought your car, paid for your insurance, and have a parking permit, why not drive? As a result, commuters are more likely to drive to work *every* day, even on occasions when there are no errands to run. If the price of a permit increases to $60 a month, most commuters will continue to buy a permit and continue driving to work.

In contrast to this situation, imagine that the level of the fee remains $50 a month, but the structure is changed to include the option of paying $2.50 per day (the collection method can be automated with electronic fare cards to avoid any additional inconvenience for the drivers). In this case, commuters do not need to buy a permit for an entire month. Rather, on days when they drive to work, they can pay the fee for those days only. On other days, they can ride transit, carpool, walk, or bicycle to work and save the $2.50 daily fee. Offering the option of a daily fee, then, is likely to reduce the number of commuters who always drive to work and increase the number who drive occasionally. In this way, restructuring the fee without increasing its level can reduce the number of vehicle trips by giving commuters new options.

Another benefit of changing the fee structure to include the daily option is that, in stark contrast to fee increases, it will *not* engender opposition from employees. Raising a parking fee from $50 to $60 a month, for example, can arouse strong opposition but only slightly reduce solo driving. But converting the fee from $50 a month to $2.50 a day can greatly reduce solo driving but arouse no opposition because it will increase the marginal cost of solo driving without increasing the monthly cost for someone who drives every day. Pfizer's daily cash-out program, as a prime example of this phenomenon, is popular with employees, treats full-time and part-time drivers equally, and provides a powerful financial incentive for everyone to rideshare, every day.

Pay-as-You-Park Combined with Pay-as-You-Drive

A pay-as-you-park price structure complements other proposals to convert the fixed costs of cars into marginal costs of driving. Consider the typical fixed cost of car insurance, for example. A sensible reform is pay-as-you-drive car insurance, which converts the conventional dollars-per-year annual insurance premium into a cents-per-mile payment.[30] Just as those who are on a diet overpay at an all-you-can-eat buffet, those who drive relatively few miles per year overpay for an all-you-can-drive insurance policy. Linking insurance payments to a car's odometer is justified because those who drive fewer miles are less likely to have an accident. All other risk-rating factors (such as the owner's age, driving history, vehicle type, and geographic territory) are incorporated into the cents-per-mile insurance fee. Bad drivers of expensive cars in congested areas thus face the highest per-mile fees and have the greatest incentive to curtail their VMT. Todd Litman of the Victoria Transport Policy Institute has estimated that the average U.S. motorist would pay about 6¢ per mile for pay-as-you-drive automobile insurance.[31] Because free parking at work subsidized a typical commute trip by 22¢ per mile in 2001, the combination of pay-as-you-park pricing for stationary cars and pay-as-you-drive insurance for moving ones would therefore increase the cost of solo driving to work by

28¢ per mile (22¢ + 6¢). In comparison, the gasoline tax adds only about 2¢ a mile to the cost of driving, and doubling the gasoline tax will therefore increase the cost of driving by only another 2¢ a mile.[32] Converting the fixed costs of parking and insurance into variable costs—*with no increase in total cost*—will increase the variable cost of driving by *28¢ a mile*, and will thus give everyone a strong cash incentive to drive less. In affecting the decision to drive, the *structure* of fees can thus be far more important than their *level*. Because converting a fixed cost of ownership into a variable cost of use gives drivers a new opportunity to save money, many people should welcome the change.

PARTIAL CASH OUT

Despite the advantages, a firm may not want to offer parking cash out because (1) it doesn't want to spend more than it already does to subsidize commuting, and (2) it doesn't want to reduce the existing parking subsidies. In this case, the firm may want to offer a *partial* cash-out program for those who don't drive without reducing the parking subsidies for those who continue to drive.

A study in the Minneapolis-Saint Paul area found that several employers introduced parking cash out by giving commuters the option to take cash in lieu of free parking, with the caveat that the cash value is less than the parking subsidy. For example, in 1998 the University of Saint Thomas in Minneapolis paid $150 a month per space to rent parking spaces and offered them to all staff at a price of $12.50 a month, resulting in a parking subsidy of $137.50 a month per space. At that time the university did not offer any other commuting subsidies. In 1999 the university continued the existing parking subsidy but also began to offer $100 a month to any commuters who didn't take a parking space. While this offer would not comply with California's parking cash-out requirement (because the parking subsidy exceeds the in-lieu cash alternative), the partial cash out does improve transportation equity and efficiency, and it costs the university less than offering commuters the full cash equivalent of the parking subsidy.

David Van Hattum, Cami Zimmer, and Patty Carlson explain the motives to offer this partial cash-out program:

> The "commuter incentive" was cleverly structured to meet three criteria: 1) to reward those commuters who already used an alternative mode, 2) to minimize additional costs to the University, and 3) to maximize the incentive for the "drive alones" to choose an alternative commuting mode. . . . It is easy to take for granted the existing commuters using an alternative mode. However, it is important to remember that members of this group may, at any time, choose to become drive alones.[33]

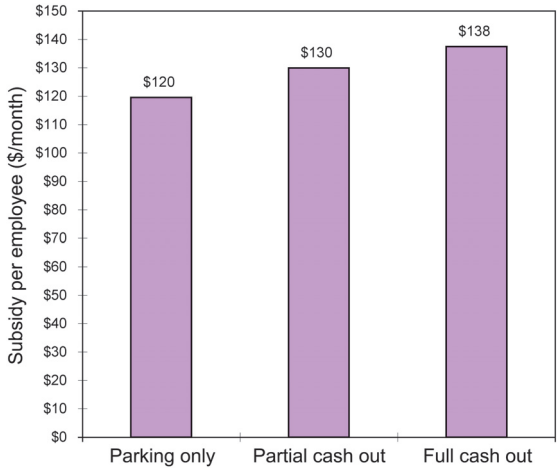
Table 2-4 shows the results of this partial cash-out policy. When the university subsidized only parking, 87 percent of the 238 employees bought a parking permit for $12.50 a month (and received a parking subsidy of $137.50 a month), while 13 percent did not buy a permit (and received nothing). In total, the university spent $28,463 a month to subsidize parking, or $119.59 a month per employee (column 1).

With the partial cash out, 80 percent of the commuters bought a parking permit, while 20 percent chose $100 a month in lieu of a $137.50-a-month parking subsidy (column 2). The university paid $100 a month to the 31 commuters who were already ridesharing, and saved $37.50 a month for the 17 who gave up a parking permit for $100 in cash. The 31 previous nondrivers cost the university $3,100 a month, and the 17 new nondrivers saved the university $637 a month, so the university's spending increased by $2,462 a month, or 9 percent.

TABLE 2-4.
COMPARING THE COST OF PARTIAL VERSUS FULL CASH OUT

		Parking cash out		
	Parking subsidy	Partial	Full	
	(1)	(2)	(3)	
1. Number of employees	238	238	238	
2. Parking subsidy per driver	$137.50	$137.50	$137.50	
3. Drivers with permits	207	190		
4. Driver mode share	87%	80%		(3)/(1)
5. Total parking subsidy	$28,463	$26,125		(2)×(3)
6. Nondrivers	31	48		
7. Nondriver mode share	13%	20%		(6)×(1)
8. Subsidy per nondriver	0	$100	$137.50	
9. Total nondriver subsidy	0	$4,800		(6)×(8)
10. Total commuting subsidy	$28,463	$30,925	$32,725	(5)+(9)
11. Commuting subsidy per employee	$119.59	$129.94	$137.50	(10)/(1)

Source: Calculated from data in Van Hattum, Zimmer, and Carlson 2000.



After the partial cash out, the number of cars driven to campus fell by 8 percent, and transit ridership increased by 55 percent. While these mode shifts are impressive, full cash out would further reduce solo driving to campus. Offering a full cash-out program without reducing the parking subsidy would require giving every employee $137.50 a month (column 3). The university would spend an additional $37.50 a month for each of the 48 employees who already participate in the partial cash-out program, and it would not save any more on parking. Compared with the partial cash-out program, a full cash-out program would increase spending by 6 percent, but it would also further reduce solo driving and treat all employees equally, regardless of how they travel.

WHAT WILL HAPPEN TO ALL THE EMPTY PARKING SPACES?

If commuters cash out their parking subsidies, what will happen to all the vacant parking spaces? Initially, more spaces will become available to

short-term parkers. Parking cash out won't reduce the number of parked cars, but it will reshuffle cars and people in some surprising ways. First, by encouraging carpooling, parking cash out can increase the number of commuters who travel to work by car. For example, after one firm in Los Angeles eliminated parking subsidies for solo drivers but allowed carpoolers to park free, carpooling increased at the expense of both solo driving and public transit.[34] Solo drivers sought out not only other solo drivers, but also transit riders as potential carpool partners so they could continue to park free. Fewer cars were driven to work, but they carried more passengers. Parking cash out can thus reduce peak-hour transit ridership if some commuters shift from transit into cars that formerly carried only one person, and this is not a bad thing. Because the marginal cost of providing peak-hour transit service exceeds its farebox revenue, reducing peak-hour transit demand can also reduce public transit deficits.[35] Reducing both vehicle trips and transit trips during the peak hour is thus even more beneficial than reducing vehicle trips and increasing transit trips.

Second, reducing the demand for commuter parking will reduce its market price, and the lower price will attract other drivers—shoppers, business clients, and tourists—to fill the spaces emptied by solo drivers who choose to cash out. And while most commute trips occur during peak hours, other trips occur more evenly through the day. As a result, parking cash out will spread the peak and therefore reduce peak-hour congestion. Furthermore, because short-term parkers pay more per hour than monthly parkers do, commercial parking garages will earn more revenue.

Third, cashing out can redistribute parking spaces more fairly among the workforce. In 1977, when the Canadian government began to charge its employees for parking in Ottawa, more women began to drive to work.[36] Why? Free parking was previously distributed as a perquisite according to rank, and men got most of the available spaces. After the government began to charge for parking, women were willing to pay for the spaces vacated by men who had previously parked free but were unwilling to pay. Two men began ice skating to work.

Parking cash out won't reduce the number of parked cars, but it will reshuffle cars and people in some surprising ways.

Parking cash out will produce these three effects—encourage carpooling, free up spaces for visitors, and redistribute parking spaces fairly—in the short run when the parking supply is fixed, but in the long run nothing is fixed and nothing is free. By reducing the demand for parking, cash out should eventually reduce the parking supply and make more land available for more productive uses that employ more workers and generate more tax revenue. To obtain this benefit of reduced parking demand, cities must reduce or remove their off-street parking requirements. California's cash-out law, for example, requires local governments to reduce the parking requirements for commercial developments that offer parking cash out.[37] After the parking supply has adjusted downward in response to cash out, the reduction in vehicle trips, traffic congestion, and air pollution will be even greater.

THE POTENTIAL FOR PARKING CASH OUT

California's cash-out requirement applies only to parking spaces firms rent for their employees' use. Spaces firms own are not covered by the law. To estimate the number of these rented parking spaces, in 1994 Mary Jane Breinholt and I surveyed a random sample of 1,200 firms throughout the U.S. The sampling procedure weighted each firm's probability of being selected by the number of the firm's employees. For example, the probability of being selected for the sample was 10 times greater for a firm with 1,000 employees than for a firm with 100 employees. Therefore, all employees in the nation had an equal chance of having their employer

selected for the sample, and we used the responses to estimate the number of commuter parking spaces provided to the entire employed population of the U.S.[38]

We estimated employers provided 84.8 million free parking spaces for commuters in the U.S. in 1994 (equivalent to a parking lot of about 1,000 square miles). Of these, firms rented 19.5 million (23 percent) and owned 65.3 million (77 percent). Firms with fewer than 50 employees rented 16.2 million parking spaces for commuters (four-fifths of all rented parking spaces), while firms with 50 or more employees rented 3.3 million spaces (see Table 2-5). Total nonfarm employment increased by 16 percent between 1994 and 2003, and the number of free parking spaces probably increased as a result.[39] If the number of free parking spaces increased in proportion to total employment, employers provided about 98 million free parking spaces in 2003.

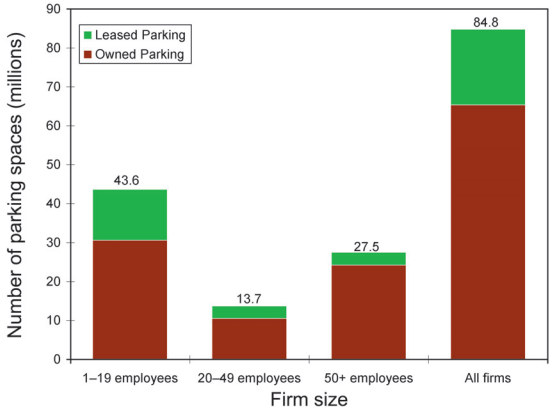
An Exemption for Small Firms?

California requires only firms with 50 or more employees to offer cash out. But since firms with fewer than 50 employees provide four-fifths of the rented parking spaces for commuters, exempting these firms from the parking cash-out requirement is a mistake. Perhaps the legislature chose this size threshold as a result of making an inappropriate analogy between parking cash out and TDM programs. For example, the South Coast Air Quality Management District (SCAQMD) in Southern California requires only firms with 250 or more employees to offer TDM programs for their employees. Smaller firms are exempt from the TDM requirement because

TABLE 2-5.
EMPLOYER-PAID PARKING SPACES IN THE UNITED STATES IN 1994

Firm size	Number of *leased* spaces offered free	Number of *owned* spaces offered free	Number of *all* spaces offered free	Share of all free parking in leased spaces	Share of all employer-paid parking spaces
(1)	(2)	(3)	(4) = (2) + (3)	(5) = (2)/(4)	(6)
1–19 employees	13,000,000	30,600,000	43,600,000	30%	51%
20–49 employees	3,200,000	10,500,000	13,700,000	23%	16%
50+ employees	3,300,000	24,200,000	27,500,000	12%	32%
All firms	19,500,000	65,300,000	84,800,000	23%	100%

Source: Shoup and Breinholt 1997.



a small firm cannot arrange a significant number of convenient carpool matches among its few employees.[40] This economy-of-scale argument justifies exempting small firms from TDM requirements but parking cash out does not rely on ridesharing among a single firm's employees. If commuters can cash out their parking subsidies, they can carpool with employees of other firms, ride transit, cycle, walk, or even continue to drive to work alone—they are free to choose among many options.[41] Having few employees does not reduce the value of this choice, so for parking cash out, firm size does not matter.

For carpooling, the economies of scale depend on the total number of commuters offered the cash-out option, not the number of employees at one firm. These economies of scale occur because finding a carpool partner is much easier when everybody else is also seeking one. Giving all commuters the option to cash out their employer-paid parking greatly increases the probability of finding a carpool partner because commuters can carpool not only with coworkers, but also with workers from other firms. Therefore, including small firms in parking cash out will increase both the number of commuters who are offered cash and the probability they will take it.

Smaller firms have no more difficulty than larger firms in offering cash out, and smaller firms rent almost five times more parking spaces to subsidize commuter parking. Therefore, exempting firms with fewer than 50 employees from the cash-out requirement makes no sense. At the national level, small firms rent approximately 16 million parking spaces for commuters, more than four-fifths of all the rented parking spaces. Therefore, removing the small-firm exemption will more than quintuple the number of rented parking spaces potentially eligible for cash out, from 3.3 million to 19.5 million spaces.

Giving all commuters the option to cash out their employer-paid parking greatly increases the probability of finding a carpool partner because commuters can carpool not only with coworkers, but also with workers from other firms.

Lease Arrangements for Rented Parking Spaces

A firm's ability to convert a rented parking space into cash depends on the terms of the lease arrangement for the parking. To learn about these lease agreements, SCAQMD surveyed the parking arrangements of firms with more than 50 employees.[42] Of the 417 firms responding to the survey, 49 (12 percent) rented parking spaces and reported their lease arrangements. Of these, 55 percent reported their parking spaces were bundled into the cost of the office space they lease; 29 percent reported the parking was leased separately (unbundled) from their office space; and 6 percent reported parking was included in the lease for office space but itemized separately (unbundled). The remaining 10 percent of firms had some other arrangement, so between 35 and 45 percent of the rented parking spaces (depending on the "other" 10 percent) were unbundled. Finally, 88 percent of the firms with unbundled parking said they had the option to reduce the number of parking spaces leased.[43] Therefore, at least 31 percent of the rented parking spaces in Southern California were readily available for cashing out (35 percent x 88 percent).

Six Million Rented Parking Spaces to Cash Out

We can use these results to make a rough but conservative estimate of the number of commuter parking spaces in the U.S. that might be cashed out.[44] If employers rent 19.5 million spaces to provide free parking to commuters and the leases for 31 percent of these rented parking spaces allow employers to reduce the number of spaces rented, American employers should be able to offer commuters the option to cash out approximately 6 million employer-paid parking spaces.[45] The research reported in Chapter 4 suggests that offering 6 million commuters the option to cash out will

reduce commuter travel by 3.9 billion vehicle miles a year, save 156 million gallons of gasoline a year, and reduce 2.2 million metric tons of CO_2 emissions a year.

While these 6 million easily cashed-out parking spaces represent only 7 percent of all employer-paid parking spaces, many of them are in CBDs where parking cash out produces the greatest benefits. One survey in Southern California, for example, found that 71 percent of the firms in downtown Los Angeles rent parking spaces to subsidize commuter parking. For firms that could reduce the number of spaces they rent, the average parking subsidy was $79 a month per employee; one firm spent $64,500 a month to subsidize commuter parking in rented spaces.[46] Parking cash out, then, clearly has the potential to benefit many employers and employees in central cities.

Cities can increase the share of spaces available for cash out by requiring unbundled parking in commercial leases. Bellevue, Washington, for example, requires downtown office buildings with more than 50,000 square feet to identify the cost of parking as a separate line item in all leases, with the minimum monthly rate per space not less than the price of a bus pass.[47] Because the price of a bus pass was $72 a month in 2003, the minimum price of a leased parking space was also $72 a month. This price for parking does not increase the overall cost of occupying office space because the payment for the office space itself declines as a result. In other words, unbundling separates the rent for offices and parking, but does not increase their sum. Bellevue's unbundling policy makes parking cash out easy for employers and profitable for commuters. If more cities require unbundled parking in leases, many more employers will be able to offer parking cash out, and many more commuters will carpool, ride the bus, walk, or bike to work.

Cities can increase the share of spaces available for cash out by requiring unbundled parking in commercial leases.

CONCLUSION: FREE TO CHOOSE

California's parking cash-out requirement does not prohibit, tax, or discourage employer-paid parking, and it will not eliminate solo driving to work. Instead, an employer who offers to pay for parking for commuters who drive to work alone must offer to pay commuters the same amount if they ride public transit, carpool, walk, or bike to work instead. Parking cash out gives commuters a new choice, rewards the alternatives to solo driving, reduces vehicle trips, enhances employee welfare, treats all commuters equally, costs employers very little, strengthens the city center, increases tax revenue without increasing tax rates, and sidesteps the political opposition to charging for parking at work. And it accomplishes all these goals simply by letting commuters choose how to spend their own money.

ENDNOTES

1. The Center for Urban Transportation Research (1989, 40-41) conducted the survey of 4,000 commuters who live close to public transportation routes in 17 cities; 72 percent of the respondents—including 52 percent of bus riders—opposed charging for commuter parking as a way to increase transit ridership. Nondrivers' opposition to charging for parking is nothing new; when the first parking meters were installed in Oklahoma City in 1935, even those who did not own a car resented the meters and vociferously protested them (Thuesen 1967, 132).
2. *Chronicle of Higher Education* (August 11, 1993). Professor Townes also told the *Contra Costa Times*, "My parking space makes a very big difference to me" (May 31, 2002). Professor Townes won the Nobel Prize for his work in the field of quantum electronics, which led to the widespread use of lasers.

3. "Severe Parking Crunch Plagues Universities," *Los Angeles Times* (February 25, 2001). Professor McFadden won the Nobel Prize for his work on the theory and methods for analyzing discrete choice, and his research has been especially influential in transportation economics.
4. "Life among the Nobelity; For Southland's Laureates, the Thrill of Winning Comes in Small Ways," *Los Angeles Times* (October 14, 1994).
5. The UCLA Parking Service issues a 24-page booklet ("UCLA Parking Permit Privileges") to every permit holder to explain the complicated system. The *droit de seigneur* was the supposed right of a feudal lord to have sexual relations with a vassal's bride on her wedding night.
6. Arnold, Walcott, and Patterson (2000, 15). Parking is just as important on Capitol Hill. In *Washington Goes to War*, David Brinkley (1988, 269) says that when Sam Rayburn was Speaker of the House of Representatives, he persuaded recalcitrant members of Congress with "threats to withhold party campaign money in the next election, promises of good committee assignments certain to produce publicity or even promises of closer, more convenient parking spaces in the House garage, some of the most valued currencies in congressional life." Parking was also important throughout the civil service. "Government employees drove downtown early to seize the free parking spaces on the streets before they were all taken and sat in their cars, eating breakfast out of brown paper sacks and waiting for their offices to open." Even during wartime, patriotic appeals to save gasoline and tires couldn't compete with free parking.
7. Hirsch (1976, 27) says positional goods are "scarce in some absolute or socially imposed sense"; that is, they are in fixed supply, and economic growth does not produce any more of them. Adam Smith (1759, 61) described similar positional competition in *The Theory of Moral Sentiments*: "It is chiefly from this regard to the sentiments of mankind, that we pursue riches and avoid poverty. For to what purpose is all the toil and bustle of this world? What is the end of avarice and ambition, of the pursuit of wealth, of power, and preeminence? Is it to supply the necessities of nature? The wages of the meanest laborer can supply them. We see that they afford him food and clothing, the comfort of a house, and of a family. . . . From whence, then, arises that emulation which runs through all the different ranks of men [and, we would now add, women], and what are the advantages we propose by that great purpose of life which we call bettering our condition? To be observed, to be attended to, to be taken notice of with sympathy, complacency, and approbation, are all the advantages which we can propose to derive from it. It is the vanity, not the ease, or the pleasure, which interests us." Adam Smith could have been talking about competition for parking at the White House, a university, or anyplace else where parking spots are allocated by rank rather than by mere willingness to pay.
8. The *Los Angeles Times* (March 16, 1994) reported "A film animation executive charges that Clint Eastwood ruined her day by ramming her parked car with his pickup truck on the Burbank Studios lot. She had made the mistake of leaving her car in Eastwood's spot while making a delivery."
9. California Health and Safety Code Section 43845. Information about the cash-out law is available online at www.arb.ca.gov/planning/tsaq/cashout/cashout.htm. Shoup (1992) contains the text of the parking cash-out law.
10. In the legislative hearings on the cash-out bill, opponents pointed out that local governments require developers to provide parking spaces. Obligating employers to pay their employees not to use the expensive parking spaces local governments require would be inconsistent. This persuasive argument led the legislature to require parking cash out only if the employer makes an out-of-pocket payment to subsidize parking in a space not owned by the employer. Parking spaces owned by employers are exempt from the cash-out requirement. The cash-out requirement also applies only to firms with 50 or more employees.

11. Some employers offer a larger parking subsidy (such as a reserved, named parking space) to higher-ranking executives, and a lower parking subsidy or no subsidy at all to lower-ranking employees. The cash-out law states that each commuter's cash allowance must be at least equal to the parking subsidy offered to that commuter, so the required cash allowance is smaller for commuters who are offered smaller parking subsidies. The employer is, however, subject to payroll taxes on cash chosen in lieu of tax-exempt free parking.
12. Southern California Association of Governments (1996, 13).
13. These data are from the *2001 National Household Travel Survey* (United States Department of Transportation 2003, 20). Marcus Wigan (1977, 1177) points out that when cities (such as Boston, New York, and San Francisco) limit the number of parking spaces in the CBD to restrain traffic, the increased cost of parking affects only those who pay to park. Those who park free at work continue to travel by car and enjoy better travel conditions as well.
14. To simplify the example I have assumed that no commuters carpool, but carpoolers can easily be added to the analysis.
15. Chapter 4 explains this issue of transfer costs versus real costs more fully in the context of the case studies of firms that have implemented parking cash out.
16. Dasgupta et al. (1994). Total trips fell even where there were large percentage increases in trips by bus, rail, and walking. This occurred because the initial share of trips by car was higher than the initial share of trips by other modes.
17. The price at which a commuter would be willing to sell the space may be higher than the price he or she would be willing to pay for the parking space if the firm didn't provide it "free."
18. Verhoef, Nijkamp, and Rietveld (1996, 402). The sample size was 2,116 respondents.
19. Verhoef, Nijkamp, and Rietveld (1996, 403). They estimated that a conservative value of the land use for on-street parking was one guilder a day per parking space. At an exchange rate of one guilder = $0.40, this is approximately $9 a month for 22 work days a month.
20. The total increase in revenue is divided by the total number of employees who are offered the cash option. This tax revenue windfall therefore amounts to $65 a year for every employee who is offered the option to cash out employer-paid parking, not per employee who trades a parking space for cash.
21. Most other transportation charges, such as gasoline taxes and tolls, do increase prices and thus contribute to inflation.
22. Ison and Wall (2002, Table 6).
23. Higgins (1992).
24. Pfizer is the world's largest pharmaceutical company. Sandwich is a coastal town on the English Channel, 70 miles east of London. The consulting firm of John Whitelegg and Associates designed the cash-out program for Pfizer. The cash value of a parking space is based on the capital cost and on operating costs for security, maintenance, planting, and lighting. The cash-out program began in June 2001, and it is described in the brochure, "Check-In, Cash-Out," available from Pfizer Global Research and Development in Sandwich, Kent, England. The program is also described in U.K. Department of Transport (2002).
25. Pfizer uses a "point" system to record each commuter's credits, and the points are deducted for parking when a card activates the exit barrier as a driver leaves the company parking lot. Points are deducted only when a car passes through the exit barrier for the first time during the workday; subsequent exits from the car park using the same identification card do not register any further deduction of points, so drivers can leave and return during the day without charge. An alternative policy is to offer each employee a monthly transportation allowance and to deduct a

payment for parking on each day a commuter uses an access card to enter the firm's parking facility; the money not used for parking can be taken in cash at the end of the month.

26. The program costs about £400,000 a year for 7,000 employees.
27. U.K. Department of Transport (2002, 102).
28. Enoch (2002, 185).
29. Fox also offers a guaranteed ride home for ridesharers when an unforeseen circumstance occurs (such as a family emergency or unexpected overtime). All employees of the News Corporation and Fox Group companies located in Century City are eligible for the cash awards. The Rideshare Reward program is offered in response to the trip-reduction mandate of the South Coast Air Quality Management District.
30. Information about pay-as-you-drive automobile insurance is available on the Victoria Transport Policy Institute's website at www.vtpi.org/tdm/tdm79.htm.
31. See the section on Pay-as-You-Drive Vehicle Insurance in the online *TDM Encyclopedia* at www.vtpi.org/tdm/tdm79.htm. A low-risk driver might pay 2¢ to 4¢ per mile, while a high-risk driver pays 10¢ to 20¢ per mile.
32. See Shoup (2005, Chapter 7) for the parking subsidy for a typical commute. In 2001 the average combined federal-and-state gasoline tax was 37¢ a gallon and the average fuel efficiency was 20 miles a gallon; the gas tax thus adds only about 2¢ a mile to the cost of driving (37¢ ÷ 20). Since converting the fixed costs of both parking and insurance into variable costs adds 28¢ a mile to the variable cost of driving, this conversion would be equivalent to a huge increase in the gasoline tax. How much would the gasoline tax have to be raised to increase the fuel cost of driving by 28¢ a mile? Because the current gasoline tax costs only 2¢ a mile, the tax rate would have to be raised by 1,400 percent (28¢ ÷ 2¢). And because the current gasoline tax rate is 37¢ a gallon, increasing it by 1,400 percent implies increasing it to $5.18 a gallon (37¢ × 14).
33. Van Hattum, Zimmer, and Carlson (2000, 14).
34. Surber, Shoup, and Wachs (1984).
35. Garrett, Iseki, and Taylor (2000, 4) examined the cost of providing bus transit service in Los Angeles in 1994. They found that the capital and operating cost during the peak period (6 a.m. to 9 a.m. and 3 p.m. to 6 p.m.) was 37 percent higher than during the other 18 hours of the day (9 a.m. to 3 p.m. and 6 p.m. to 6 a.m.), and 59 percent higher than during the night and owl periods (9 p.m. to 6 a.m.).
36. Transport Canada (1978). See also Table 1-2 in Chapter 1.
37. Shoup (1995).
38. See Shoup and Breinholt (1997) for full details of the survey and its findings. Standard and Poor drew the sample from their "Plus" database of 10.6 million firms.
39. Total nonfarm employment grew from 112 million in 1994 to 130 million in 2003.
40. Ferguson (1991) found either no relationship, or a weakly negative one, between a firm's size and the propensity of its employees to carpool. However, the economies of scale in carpooling refer to the total number of commuters seeking to carpool, not to any single firm's number of employees.
41. Parking cash out should also produce more takers for regional rideshare matching programs.
42. PCR (1996).
43. That 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, 293). The case studies of parking cash out reported in Chapter 4 support this finding. 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.

44. This estimate is conservative because it is based on the number of free parking spaces in 1994. Because total nonfarm employment increased by 16 percent between 1994 and 2003, the number of free parking spaces available for cash out must also have increased.
45. 19.5 million x 31% = 6 million. This calculation assumes the national percentage of unbundled parking is the same as in Southern California.
46. Ho (1993).
47. Section 14.60.080(B)(1)(c) of the Bellevue Municipal Code requires "identification of parking cost as a separate line item in such leases [between building owners and tenants] and a minimum rate for monthly long-term parking, not less than the cost of a current Metro two-zone pass."

CHAPTER 3

Parking Cash Out: The Tax Angle

Justice is not to be taken by storm. She is to be wooed by slow advances.

—Benjamin Cardozo

In 1992 the prospects for parking cash out looked bright. The U.S. Department of Transportation published my report *Cashing Out Employer-Paid Parking*, and California enacted its parking cash-out law.[1] Policy analysts in the Clinton administration considered parking cash out a reasonable way to reduce vehicle travel, and in 1993 President Clinton proposed a national parking cash-out requirement as one of the initiatives in his *Climate Change Action Plan*.[2] I was invited to a ceremony at the White House when the president announced the plan, and I naively assumed that Congress would quickly enact a national cash-out requirement.

Alas, it was soon discovered that a quirk in the U.S. Internal Revenue Code penalized parking cash out, even in California. Far from moving quickly to *require* parking cash out, Congress took five years simply to *allow* it. This chapter explains how the tax code penalized parking cash out, and how it was subsequently amended to allow cash out. It also shows how seemingly minor clauses in tax laws can produce serious consequences in the real world and how minor amendments can produce enormous benefits at low cost. Planners who ignore the role of the tax structure are overlooking a massive set of incentives that influence, for better or worse, people's behavior.

ASYMMETRIC TAX EXEMPTION FOR EMPLOYER-PAID PARKING

Employer-paid parking is the most common tax-exempt fringe benefit in the U.S., but it is also an anomaly. Most tax exemptions, like the one for employer-paid health insurance, promote a specific public goal. But the tax exemption for employer-paid parking encourages solo driving to work and thus increases traffic congestion, air pollution, and energy consumption. These effects were not the goals of the tax exemption, of course, but they are the result.

Employer-paid parking was always assumed to be tax exempt but did not officially become so until the Tax Reform Act of 1984. This act introduced the category of "working condition fringe benefits," defined as "any property or services provided to an employee of the employer to the extent that, if the employee paid for such property or services, such payment would be allowed as a deduction" from the employee's gross income as a work-related expense.[3] That is, if your employer gives you something that would be deductible from your taxable income if you paid for it yourself, you do not have to pay taxes on the value of this benefit.[4] But the Internal Revenue Code does *not* allow commuters who pay for parking at work to deduct this cost as a work-related expense, and, as a result, employer-paid parking does not fit the definition of a working condition fringe benefit. To clarify that employer-paid parking was also tax exempt, the Tax Reform Act of 1984 added a special rule for parking: "The term 'working condition fringe' includes parking provided to an employee on or near the business premises of the employer."[5]

Planners who ignore the role of the tax structure are overlooking a massive set of incentives that influence, for better or worse, people's behavior.

As a result of this special rule, parking became the only fringe benefit that was tax exempt when the employer paid for it but was not tax-deductible when the employee did. The asymmetric nature of this tax exemption for *employer*-paid parking (but not for *employee*-paid parking) encouraged employers to offer free parking at work and thus to convert taxable wages into tax-exempt parking subsidies. Employees are not necessarily better off in this bargain, however, because their total compensation is divided between fringe benefits and cash wages, and higher fringe benefits typically come at the expense of lower wages. In *Labor Economics and Labor Relations,* Lloyd Reynolds, Stanley Masters, and Coletta Moser say, "Workers pay for their own benefits through an equivalent wage reduction."[6] Employer-paid parking comes at the cost of lower cash wages for *all* employees—not just for those who drive to work. Those who don't drive to work thus suffer a pay cut to finance free parking for those who do drive to work, so nondrivers subsidize the drivers' free parking. While the trade-off between free parking and lower cash wages is a good bargain for solo drivers, it definitely penalizes employees who do not drive to work and thus get no free parking.

A conventional tax deduction—like the one for charitable contributions—reduces your tax payment in proportion to your marginal income tax rate. If you donate $1,000 to charity, for example, and you are in the 25 percent

tax bracket, your donation reduces your income tax by $250. Your a*fter-tax* cost of the donation is thus only $750, which means that your $1,000 gift has a personal cost of only $750—the federal government matches your $750 with its $250. The deductibility of the donation is justified on the grounds that it encourages charitable gifts to worthy causes. The tax exemption for employer-paid parking is altogether different. To take advantage of it, the employee does not have to pay anything. Instead, the *employer* pays for the parking, and the driver's cost of parking at work is thus reduced by 100 percent—to zero. The tax exemption for free parking therefore encourages solo driving much more than a conventional tax deduction encourages charitable giving. The tax exemption for employer-paid parking is thus more like a tax *credit* than a tax *deduction*. The only limit on the tax stimulus to additional solo driving would seem to be when *everyone* drives to work alone, and we are approaching that limit.

Transit advocates and transportation planners strongly criticized the unlimited tax exemption for free parking. They considered it absurd, for example, that a $400-a-month parking subsidy was tax exempt, while any employer-paid transit subsidy worth more than $15 a month was treated as taxable income. To remedy this situation, the National Energy Policy Act of 1992 replaced the "special rule for parking" with a new tax-exempt fringe benefit, referred to as the "qualified transportation fringe." Under this provision, the tax exemption for employer-paid parking was capped at $155 a month, indexed for inflation (it was $195 a month in 2004). At the same time, employer-paid vanpool and transit subsidies were also made tax exempt up to $60 a month (subsequently increased to $100 a month in 2002).[7] Any subsidies above these tax-exempt amounts are treated as taxable income.

The cap on tax-exempt parking subsidies was a step in the right direction, but the initial cap of $155 a month was not the product of unbiased scientific research. It was chosen (I have been told) because $155 was the average commercial price of parking near Capitol Hill in 1992 and would thus exempt all the parking subsidies received by members of Congress and their staff. An unexpected problem arose in the case of Senators, however, each of whom had a named space. The market price for reserved spaces, which have a lower occupancy rate than unreserved spaces, was approximately $300 a month, so the Senators would have incurred an income tax liability. The Senate solved this problem by reserving the same 100 parking spaces exclusively for its members, but without a name on each space.[8]

The tax exemption for free parking therefore encourages solo driving much more than a conventional tax deduction encourages charitable giving. The tax exemption for employer-paid parking is thus more like a tax credit than a tax deduction.

IS EMPLOYER-PAID PARKING WAGE DISCRIMINATION?

Employer-paid parking is offered to attract employees, but it also results in higher total compensation for those who drive to work, which is wage discrimination in favor of drivers. From the firm's perspective, there is an economic rationale for this wage discrimination because workers who commute by car have the opportunity to choose among many different employers within automobile commuting distance. Those who do not drive, in contrast, must seek work within a more limited area, and the employer does not need to offer an equivalent subsidy to these nondrivers because they have fewer employment options.[9]

Given the need to compete in the labor market for employees who drive, some employers would continue to offer free parking at work even if it were not a tax-exempt fringe benefit. The tax exemption therefore does not motivate *all* employer-paid parking. Nevertheless, the federal government *does* subsidize employer-paid parking through the tax code and thus encourages wage discrimination against commuters who ride public transit, walk, or bike to work.

THE TAX EXPENDITURE FOR EMPLOYER-PAID PARKING

A "tax expenditure" is defined as the reduction in tax revenue resulting from a tax exemption.[10] In 1995, the value of all tax-exempt employer-paid parking subsidies was estimated at $31.5 billion a year, while the marginal income tax rate for all taxpayers averaged 19 percent.[11] Based on these figures, the federal tax expenditure for employer-paid parking was $6 billion a year (0.19 × $31.5 billion).[12] The federal government, in other words, would have collected $6 billion a year more revenue if commuters had paid income taxes on their parking subsidies.

We can use the data in Chapter 1 to estimate the federal tax expenditure for employer-paid parking for commuters to downtown Los Angeles, and its effects on driving behavior (see Table 1-3). Firms that offered free parking spent $750 a year per employee to provide the tax-exempt subsidy. At a 19 percent marginal tax rate, the tax expenditure (forgone tax revenue) for free parking was thus $143 a year per employee ($750 × 0.19). Free workplace parking, as computed in Chapter 1, increased employees' and employers' combined spending for driving to and parking at work by $566 a year per employee.[13] Every $1 of federal tax expenditure for free parking in downtown Los Angeles thus stimulated $3.97 in additional private spending for driving and parking ($566 ÷ $143).

Free parking at work also stimulated commuters to drive an additional 1,311 vehicle miles travelled (VMT) a year per employee. Therefore, for every $1 of tax expenditure on employer-paid parking, commuters drove an additional 9.2 vehicle miles (1,311 ÷ $143).[14] The tax exemption for employer-paid parking certainly looks cost-effective—if, that is, the goal is to increase vehicle travel at peak hours.

The tax exemption for employer-paid parking certainly looks cost-effective—if, that is, the goal is to increase vehicle travel at peak hours.

PARKING CASH OUT: TWO TAX PENALTIES

The Internal Revenue Code not only encouraged employer-paid parking, but two rules in the tax code actually penalized parking cash out: (1) the not-in-lieu-of-compensation provision and (2) the constructive-receipt doctrine. As a result of these two tax penalties, few California employers offered cash out even after California enacted its cash-out law. Seemingly minor features of the tax code can thus have a huge impact on travel patterns. A brief look at these two rules for parking will show the need to pay close attention to financial incentives in the tax code.

Not-in-Lieu-of-Compensation Provision

If an employer gave commuters the option to choose cash in lieu of a parking subsidy, the otherwise tax-exempt parking subsidy for automobile commuters became taxable income even for those who drove to work and did not choose the cash. Section 132(f)(4) of the Internal Revenue Code stated:

> Benefit not in lieu of compensation—[The tax exemption] shall not apply to any qualified transportation fringe unless such benefit is provided in addition to (and not in lieu of) any compensation otherwise payable to the employee.

This provision meant that so long as the employer subsidized only parking, there was no income tax on the subsidy, but if the employer began to subsidize carpooling, public transit, walking, and cycling to work, drivers would be penalized with an additional tax.

This provision posed a problem in California, given the state's cash-out requirement. To satisfy this requirement, any firm with more than 50 employees would have to offer commuters who rideshare a cash subsidy equal to the parking subsidy they would have received if they

drove to work. Because of the cash option, the parking subsidy itself would cease to qualify as a tax-exempt fringe benefit, since it would no longer be "provided in addition to (and not in lieu of) compensation otherwise payable to the employee."[15] As a result, commuters who continued to drive to work would be forced to pay federal income taxes on their formerly tax-exempt parking subsidies. Furthermore, both employees and employers would also be required to pay Social Security and other payroll taxes on the parking subsidies. In short, the tax code severely limited the appeal of parking cash out—not only in California but throughout the rest of the U.S. as well.

The not-in-lieu-of-compensation provision makes sense for tax-exempt fringe benefits—such as pensions and health insurance—that promote the public welfare. Penalizing the option to take cash in lieu of a pension contribution, for example, is logical because the aim of the tax exemption is to encourage employees to save for their retirement. In contrast, penalizing the option to take cash in lieu of free parking is entirely illogical. After all, free parking encourages solo driving, which other public policies are meant to discourage. Restricting the option to cash out employer-paid parking directly increases traffic congestion, energy consumption, and air pollution.

Constructive-Receipt Doctrine

Another feature of tax law—the constructive-receipt doctrine—also penalized cash out. According to this doctrine, when firms offer commuters the choice between a tax-exempt fringe benefit and taxable cash, those who choose the tax-exempt fringe benefit are taxed on the "constructively received" cash income they were offered but did not accept. People are taxed, in other words, on cash available to them, regardless of whether they take it. In an early definition of constructive receipts, Oliver Wendell Holmes wrote, "The income that is subject to a man's unfettered command and that he is free to enjoy at his own option may be taxed to him as his income, whether he sees fit to enjoy it or not."[16] The constructive-receipt doctrine implies that commuters who are offered but decline taxable cash in lieu of a tax-exempt parking subsidy should pay income taxes on the cash not taken.

Penalizing the option to take cash in lieu of free parking is entirely illogical.

Difference between the Two Rules

To understand the difference between the not-in-lieu-of-compensation and the constructive-receipt rules, consider a firm that offered commuters a parking subsidy of $100 a month. If the firm offered *only* a parking subsidy, the subsidy was tax-exempt according to the not-in-lieu-of compensation rule. If the firm offered the choice between a $100 parking subsidy and $75 in cash, the parking subsidy lost its tax-exempt status because it was offered in lieu of compensation otherwise payable to the commuter. Taxable income therefore increased by $100 a month for all commuters who accepted the parking subsidy. The not-in-lieu-of-compensation rule effectively prevented firms from offering cash out, at least if they understood the bizarrely intricate tax code.

Now suppose that the not-in-lieu-of-compensation rule was removed, so the $100 parking subsidy remained tax-exempt despite the $75 cash offer. This change would *not* remove the tax burden on commuters who drive to work. Because of the constructive-receipt doctrine, commuters who accepted the tax-exempt $100 parking subsidy would still be expected to pay taxes on the $75 in cash they were offered but did not take. Taxable income increased by $75 a month for commuters who took the tax-exempt $100 parking subsidy because they were offered (and therefore

"constructively received") the $75 in taxable cash. Independent of the not-in-lieu-of-compensation rule, the constructive-receipt rule also prevented firms from offering cash out.

In short, two obscure features of the tax code penalized parking cash out. First, commuters who were offered a cash alternative to a parking subsidy were liable for income taxes on the otherwise-tax-exempt parking subsidy. Second, commuters who were offered a cash alternative but chose a parking subsidy were liable for income taxes on the constructively-received cash. The tax code encouraged employer-paid parking and discouraged parking cash out. The tax code also impeded California from enforcing its cash-out law.

REMOVING THE TAX PENALTIES

The conflict between the Internal Revenue Code and California's cash-out law highlighted the irrationality of the not-in-lieu-of-compensation rule for employer-paid parking. Progress was difficult because few transportation analysts understood the byzantine tax code, while few tax analysts appreciated its harmful transportation effects. Nevertheless, several analysts in the Environmental Protection Agency—Laura Gottsman, Jon Kessler, and William Schroer—continued to advocate parking cash out, and in 1998 they persuaded the late Senator John Chafee to introduce an amendment to the Internal Revenue Code to remove the penalties for offering cash in lieu of parking. The amendment was enacted in 1998 as part of the Transportation Equity Act for the 21st Century (TEA-21). Section 9010 of the act ("Election to Receive Taxable Cash Compensation in Lieu of Nontaxable Qualified Transportation Fringe Benefits") amended the tax code to state that employers *can* offer taxable compensation in lieu of a tax-exempt transportation fringe benefit.[17] Section 132(f)(4) of the code now says:

> No constructive receipt—No amount shall be included in the gross income of an employee solely because the employee may choose between any qualified transportation fringe and compensation which would otherwise be includible in gross income of such employee.

If a commuter chooses taxable cash instead of a tax-exempt parking space, tax revenue increases.

This reform removes the not-in-lieu-of-compensation provision and overrides the constructive-receipts doctrine, so the tax code now explicitly permits what it previously prohibited. Therefore, without triggering a tax penalty, employers can now offer commuters the option to choose taxable cash instead of tax-exempt parking, transit, or vanpool subsidies. This one-sentence amendment to the tax code can begin to undo the harm caused by the tax exemption for employer-paid parking and has the potential to produce major improvements in urban transportation and air quality. Employers can now finance a broad array of commuter travel choices with the same money they previously spent only on providing free parking.[18]

A REVENUE WINDFALL FOR FEDERAL AND STATE GOVERNMENTS

If a commuter chooses taxable cash instead of a tax-exempt parking space, tax revenue increases. To show this, suppose a firm pays $100 a month per space to provide free parking at work. Commuters in the 25 percent marginal tax bracket who cash out the $100 tax-exempt parking subsidy receive $100 in cash, which is then reported as taxable wages on a year-end W-2 statement. Of this $100, the commuter receives $75 after taxes, so those who cash out their free parking show they prefer $75 in cash to a free parking space that costs the firm $100. Voluntary choice produces the extra $25 in tax revenue, and this windfall comes from increased economic

efficiency, not higher tax rates. Few other tax reforms will increase tax revenue without increasing tax rates, make employees better off, and at the same time reduce traffic congestion, improve air quality, and conserve energy.

Even before the Internal Revenue Code was amended in 1998, some firms complied with California's cash-out law because they were unaware of the tax complications. Case studies of eight such firms found that solo driving to work fell by 17 percent after cash out was offered (see Chapter 4), and taxable income increased by $255 a year per employee because some commuters chose taxable cash instead of tax-exempt parking subsidies.[19] Given the income tax rates commuters paid on the taxable cash, federal income tax revenues increased by $48 a year per employee, while California income tax revenues increased by $17 a year per employee.[20]

PAYING FOR PARKING WITH PRE-TAX INCOME

As a byproduct of allowing commuters to accept cash in lieu of a tax-exempt parking subsidy, TEA-21 also allows commuters to pay for parking with pre-tax income. Firms that do not subsidize parking can now allow employees to pay for their parking through a reduction in their taxable wages. To examine the tax consequences of this arrangement, consider a firm that offers free parking and a cash-out option of $100 a month. A commuter who earns a salary of $4,000 a month can park free or can take $100 in extra taxable cash by forgoing the free parking. But the firm can also pay a salary of $4,100 a month and charge $100 a month for parking. The employee can then choose a taxable salary of either $4,100 a month *without* a free parking space, or $4,000 a month *with* a free parking space. In effect, drivers pay $100 a month for parking by accepting a lower taxable income, so their $100-a-month payment for parking is tax-exempt. (See Table 3-1.)

As this example illustrates, if employers adjust wages to compensate for fringe benefits, the tax consequences are the same whether the employer or the commuter pays for parking. The after-tax cash forgone by a commuter who drives to work is the same in both cases. A commuter who earns $4,000 a month with free parking that can be cashed out for $100 a month in taxable income receives the same total compensation as one who earns $4,100 a month without free parking and can pay $100 a month (pre-tax) to park. Because both commuters can take either $4,000 in taxable wages *with* a parking space or $4,100 in taxable wages *without* a parking space, their cost of parking is the *after-tax* value of $100 a month regardless of whether the employer offers free parking.[21]

With an average 19 percent federal tax rate and an average 6.5 percent state tax rate, commuters face a 25.5 percent combined marginal income

Given the income tax rates commuters paid on the taxable cash, federal income tax revenues increased by $48 a year per employee, while California income tax revenues increased by $17 a year per employee.[20]

TABLE 3-1.
EQUAL AFTER-TAX WAGES WITH EMPLOYER-PAID AND DRIVER-PAID PARKING ($ PER MONTH)

	Employer-paid parking		Driver-paid parking	
Total salary	$4,000	$4,000	$4,100	$4,100
Park at work?	Yes	No	Yes	No
Cash in lieu	$0	$100	$0	$0
Parking fee	$0	$0	$100	$0
Taxable salary	$4,000	$4,100	$4,000	$4,100

tax rate.[22] Social Security and Medicare add an additional payroll tax rate of 7.65 percent, so a typical commuter's total marginal tax rate on earned income is about 33 percent.[23] The employer also pays 7.65 percent in payroll taxes. Therefore, paying $100 for commuter parking from pre-tax income saves the commuter $33 and saves the employer $7.65.

These savings are not merely hypothetical. For example, pre-tax payments for parking save the University of California's employees $5.4 million a year in payroll and federal income taxes, while the university itself saves $1 million a year in payroll taxes (see Table 3-2).[24] The annual tax savings per employee with a payroll deduction for parking ranges from $69 at UC Santa Barbara to $236 at UCLA, with an average savings of about $155 a year per employee.[25]

How do these tax changes for commuters and employers combine to affect government tax revenues? Two counteracting influences are at play. First, for any commuters who formerly paid for their own parking with after-tax dollars but now pay with pre-tax dollars (such as at the University of California), the government will lose tax revenue. Second, for any commuters who used to receive tax-exempt employer-paid parking but now choose taxable cash instead, the government will gain tax revenue. The net effect of these two factors depends upon their relative magnitudes. According to estimates made by Congress's Joint Committee on Taxation, the changes to the tax code will result in an overall increase in federal income tax and Social Security tax revenues of around $169 million between 1998 and 2007 (without any increase in tax rates). In other words, the increase in tax revenues from the cash-out option will outweigh the decrease in revenues from pre-tax deductions for parking. The primary reason for this estimated windfall is that 95 percent of automobile commuters nationwide already parked free at work before the tax changes

TABLE 3-2.
PAYING FOR PARKING FROM PRE-TAX INCOME: TAX SAVINGS AT THE UNIVERSITY OF CALIFORNIA

			Total annual tax savings			Annual tax savings per employee		
Campus	Employees with parking	Total annual parking fees	University	Employees	Both	University	Employees	Both
(1)	(2)	(3)	(4)	(5)	(6)=(4)+(5)	(7)=(4)/(2)	(8)=(5)/(2)	(9)=(7)+(8)
Berkeley	3,719	$2,028,000	$101,694	$550,412	$652,106	$27	$148	$175
Davis	8,692	$3,403,944	$192,152	$938,736	$1,130,888	$22	$108	$130
Irvine	4,875	$1,019,088	$59,234	$282,750	$341,984	$12	$58	$70
Los Angeles	11,384	$8,473,700	$409,704	$2,276,800	$2,686,504	$36	$200	$236
Riverside	1,923	$456,617	$23,029	$123,072	$146,101	$12	$64	$76
San Diego	4,569	$2,324,496	$121,896	$630,522	$752,418	$27	$138	$165
San Francisco	1,755	$1,265,106	$41,476	$321,165	$362,641	$24	$183	$207
Santa Barbara	2,559	$517,993	$30,129	$145,863	$175,992	$12	$57	$69
Santa Cruz	1,628	$415,193	$25,497	$115,588	$141,085	$16	$71	$87
Total	**41,104**	**$19,904,137**	**$1,004,811**	**$5,384,908**	**$6,389,719**			
Average						**$24**	**$131**	**$155**

Source: University of California Payroll and Tax Services, June 4, 1998. The university's tax savings are from payroll taxes.
The employees' tax savings are from both payroll taxes and income taxes.

(and thus had no need to start paying for parking with pre-tax dollars). As a result, the number of commuters who cash out their parking subsidies will exceed the number who pay for parking with pre-tax dollars, and the federal government will therefore gain more tax revenue than it loses.[26]

How will paying for parking with pre-tax income affect vehicle trips to work? The reduced after-tax price of parking for those who pay to park will induce some commuters to begin driving. On the other hand, the opportunity to cash out their parking subsidies will motivate other commuters to stop. Because 91 percent of commuters already drive to work, few people can begin driving because of the reduced after-tax price of parking, but many people can stop driving.[27] Therefore, the *net* effect of the price changes should be to reduce driving to work.

PAYING FOR TRANSIT AND VANPOOLS WITH PRE-TAX INCOME

Fewer than 1 percent of all employers offer transit fringe benefits, and most commuters who ride public transit therefore pay their fares with after-tax income.[28] TEA-21 removed the not-in-lieu-of-compensation provision for *all* transportation fringe benefits, however, so commuters can now begin to pay for transit and vanpools with pre-tax income in the same way they can pay for parking with pre-tax income. For example, when the University of California began to allow commuters to pay for parking with pre-tax income in 1999, it also allowed them to pay for transit and vanpool expenses in the same way. Any employer can make a similar arrangement for commuters to pay for transit and vanpools with pre-tax income, although the complexity of the arrangement probably means only larger firms will offer it.

TRANSPORTATION AND TAX EQUITY

Parking cash out increases transportation tax equity in four ways.

Parking cash out increases transportation tax equity in four ways. First, it increases equity among all commuters who are offered free parking. Without the cash option, free parking does not benefit commuters who ride public transit, walk, or bike to work. With the cash option, commuters receive the same benefit regardless of how they travel.

Second, allowing commuters to pay for parking with pre-tax income improves equity between those commuters who park free and those who do not. Commuters who park free can take taxable cash instead, while commuters who do not park free can pay for parking with pre-tax income. The commuter's after-tax opportunity cost of taking a parking space at work is therefore the same regardless of whether employers or employees pay for parking.

Third, allowing commuters to pay for public transit with pre-tax income improves equity between those who drive to work and those who ride transit or vanpools. Most automobile commuters receive tax-exempt free parking while most transit and vanpool commuters pay with taxable income. Using pre-tax income to pay for transit and vanpools removes this inequity.

Fourth, parking cash out increases equity for employees even in retirement. By sheltering wages from Social Security taxes, employer-paid parking reduces workers' future retirement benefits, which are based on each worker's taxable earnings. Because lower-wage workers earn a higher rate of return on their Social Security tax payments, they will receive disproportionately higher retirement benefits if they cash out their employer-paid parking subsidies.[29]

CONCLUSION: SLOW ADVANCES

The federal and state governments provide one of their strongest economic incentives—tax exemption—to reward employer-paid parking. This tax

exemption is an anomaly in tax policy because it encourages behavior that other policies are meant to discourage—solo driving to work. California addresses this problem by requiring large employers to give commuters the option to cash out any parking subsidy offered. Until 1998, however, the federal tax code penalized employers who complied with California's parking cash-out requirement.

In 1998, TEA-21 amended the tax code to allow the choice between an employer-paid parking subsidy and cash income. Commuters can cash out their employer-paid parking subsidies, and can also pay for parking from pre-tax income. In addition, transit and vanpool commuters can pay their commuting costs from pre-tax income. But TEA-21 did not fully resolve the tax code's bias toward driving to work. To begin with, the tax code continues to favor driving because employer-paid parking is tax exempt and in-lieu cash is taxable. Even more significant, the tax code *allows* parking cash out but does not *require* it. TEA-21 thus achieved only a partial reform of the tax code: it no longer prohibits parking cash out, but it still favors solo drivers over other commuters. If traffic congestion, air pollution, and energy waste were truly considered to be urgent national problems, this tax preference for solo drivers would be insupportable.

Allowing employers to offer commuters taxable cash in lieu of a tax-exempt parking subsidy is a step in the right direction, and Chapter 6 proposes further reforms. As Supreme Court Justice Benjamin Cardozo said, "Justice is not to be taken by storm. She is to be wooed by slow advances."[30] Rather than continuing to frighten justice away, we have at last begun to woo her.

ENDNOTES

1. Shoup (1992) includes the text of California's parking cash-out law.
2. U.S. Environmental Protection Agency (1993). The parking cash-out requirement was one of only two transportation initiatives included in the *Climate Change Action Plan*. The other was improved tire labeling to inform consumers some tires have lower rolling resistance and therefore produce higher automobile fuel efficiency; this innocuous-sounding proposal was never adopted because (I am told) American tire manufacturers objected it would disclose the lower rolling resistance and higher fuel efficiency of most imported tires.
3. Other transportation fringe benefits such as travel allowances and free bus passes were not considered tax exempt. This difference in tax treatment between a free bus pass and free parking was justified on the grounds that "the bus is taking people to or from work, but if they are using parking, they are already there." Employer-paid subsidies for "coming and going" were taxed as income, but subsidies for "being there" were tax exempt, albeit without specific legislative sanction. A staff counsel of the House Ways and Means Committee provided this explanation to Tad Widby, president of Commuter Transportation Services, Inc., in Los Angeles. Transit Cooperative Research Program (2003) provides a history of the tax treatment of employer-paid parking.
4. If your employer pays for your expenses at a convention in Hawaii, for example, the employer does not have to report this as taxable income on your W-2 form because you could deduct this expense from your taxable income if you paid to go to the convention.
5. Section 132(d) of the Internal Revenue Code defines a working condition fringe, and the special rule for parking was added as Section 132(h)(4). If the *employer* paid for a commuter's parking, the special rule exempted the subsidy from federal income tax (and from state income taxes and all payroll taxes). But *employees* who paid for parking could not deduct the cost from taxable income as a work-related

expense. As discussed below, in 1992 the special rule for parking was replaced by the new Section 132(f) dealing with "qualified transportation fringes."

6. Reynolds, Masters, and Moser (1998, 400). See also Leibowitz (1983).
7. See Title 26, Subtitle A, Chapter 1, Subchapter B, Part III, Section 132 of the Internal Revenue Code. The exemptions are indexed to the cost of living and rounded to the next lowest multiple of $5. A nationwide survey of employers in 1995 found that fewer than 1 percent offered any transit subsidies, while 81 percent offered parking subsidies (Association for Commuter Transportation 1996). Even with the option to offer tax-exempt transit subsidies, most employers apparently prefer to subsidize only parking.
8. In 1994 the Senate solved another parking problem with equal finesse: "After acrimonious debate, senators recently voted 53–44 against doing away with their special parking privileges at National Airport . . . . Five days after that vote, the sign on the VIP lot that had read 'Reserved parking/Supreme Court Justices/Members of Congress/Diplomatic Corps' was replaced by one that says "Restricted parking/authorized users only.' No need to provoke the public with superfluous information" (*Los Angeles Times*, June 2, 1994).
9. For an individual firm, the supply of labor is more elastic among drivers than among nondrivers. The firm can take advantage of the nondrivers' more inelastic supply curve for labor by offering them a lower wage. Wage discrimination refers to the practice of paying different wages to different groups for the same work, just as price discrimination refers to the practice of charging different prices to different groups for the same product. Employers may pay higher wages to older workers, and movie theaters may charge lower prices to senior citizens. Employers have an incentive to pay lowers wages to workers who have an inelastic supply of labor.
10. Tax expenditures are "those revenue losses attributable to provisions of the federal tax laws which allow a special exclusion, exemption, or deduction from gross income or which provide a special credit, a preferential rate of tax, or a deferral of tax liability" (Public Law 93–3, Section 3(a)(3)).
11. Association for Commuter Transportation (1996). This estimate of employer-paid parking subsidies was based on the market prices of parking spaces, not the resource cost of providing them. Because off-street parking requirements drive down the market price of commuter parking spaces, these prices underestimate the resource cost of providing all the free parking spaces at work. This estimate is therefore lower than KPMG's estimate that the capital and operating costs of employer-paid parking spaces were $52.1 billion a year (KPMG Peat Marwick 1990).
12. The Joint Tax Committee of Congress used an average marginal income tax rate of 19 percent to estimate tax expenditures in 1996. This average rate is derived from a microsimulation of tax returns representing the distribution of all taxpayers in the U.S. who report a positive tax liability, weighted by the number of taxpayers paying each marginal rate (personal communication from Thomas Koerner of the Joint Tax Committee). The *Budget of the United States Government, Fiscal Year 1997* estimates only the tax expenditure for employer-paid parking provided in facilities not owned by the employer. This estimated tax expenditure was $1.3 billion in 1996. The *Budget* does not estimate the much larger tax expenditure for employer-paid parking in parking facilities owned by employers, which *is* included in the estimated tax expenditure of $6 billion a year.
13. See row 9 in Table 1-3.
14. The tax exemption for employer-paid parking does not cause all this additional VMT because many firms would offer free parking even if it were not a tax-exempt fringe benefit.
15. The 1992 National Energy Policy Act added the not-in-lieu-of-compensation provision to the Internal Revenue Code after California enacted its cash-out legislation, so the California legislators were unaware of any conflict with the tax code.

16. *Corliss v. Bowers*, 281 U.S. 376, 378 (1930).
17. Section 9010 of the Transportation Equity Act for the 21st Century amended Section 132(f)(4) of the Internal Revenue Code, applicable to taxable years beginning after December 31, 1997. The Taxpayer Relief Act of 1997 had previously amended Section 132(f)(4) to remove the not-in-lieu-of-compensation problem for parking; to deal with uncertainty about the tax treatment of transit and vanpool subsidies, TEA-21 amended Section 132(f)(4) again in 1998 to remove the not-in-lieu-of-compensation problem for *all* transportation fringe benefits, including transit and vanpool subsidies.
18. Information about parking cash out is available on the Environmental Protection Agency's website at www.epa.gov/oms/transp/comchoic/ccweb.htm.
19. See Shoup (1997, 41 and A-25) for the calculation of taxable income. The increase in taxable income of $255 a year per employee is per employee *offered the cash option*, not per employee *who chose it*. Taxable income increased only for employees who cashed out their employer-paid parking subsidies, and their total increase in taxable income is divided by the total number of employees.
20. As mentioned earlier, the federal government assumes a 19 percent marginal tax rate to calculate the effects of changes in taxable wage income. The California Franchise Tax Board uses a 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 California income tax revenue rises by one-third of the rise in federal income tax revenue; given the 19 percent federal marginal tax rate, this rule of thumb yields a 6.3 percent marginal tax rate for California.
21. TEA-21 did not make employee-paid parking automatically tax exempt. Commuters can thus pay for parking out of pre-tax income only if their employers allow them to pay for parking by accepting a reduction in taxable income. The tax-exemption for employee-paid parking thus depends on a voluntary reduction in taxable income, not on an automatic exemption from taxable income. Employer-paid parking is not considered a welfare benefit subject to the Employee Retirement Income Security Act of 1974, and it is not required to be provided on a nondiscriminatory basis. In other words, an employer can provide tax-exempt parking subsidies to some employees but not to others and can provide different subsidies to different employees.
22. The simple addition of the two separate marginal tax rates assumes the commuter does not deduct state income taxes in calculating federal income taxes. If the commuter does deduct state income taxes in calculating federal income taxes, the combined marginal tax rate is 24 percent.
23. In 1998, wages above $68,000 a year were exempt from the 6.2 percent tax rate for Social Security but were subject to the 1.45 percent tax rate for Medicare. For a precise calculation, the amounts payable under both the Federal Insurance Contributions Act (FICA) and the Federal Unemployment Tax Act (FUTA) should be considered. Because FUTA payroll taxes (and all other payroll taxes) were not considered, the employer's savings could be higher than calculated here.
24. California has not yet amended its income tax code to conform to the changes in the federal tax code, so the payment for parking is not exempt from state income tax.
25. The range in tax savings among the campuses reflects the range in parking prices among the campuses. The University of California deducts parking from employees' pre-tax income unless an employee opts to have it deducted from after-tax income. Some employers instead deduct parking from after-tax income unless an employee opts to have it deducted from pre-tax income. Because almost all employees opt for pre-tax payment, making that the default option reduces paperwork costs. Why would a commuter opt to pay for parking with after-tax income? Paying for parking with after-tax income will increase a commuter's Social Security payroll taxes and will therefore increase Social Security income in retirement. Some farsighted low-wage commuters who earn a good return on their Social Security tax

payments and are in a low marginal income-tax bracket may be better off paying for parking with after-tax income.

26. If parking cash out did not increase federal tax revenue, I doubt that Congress would have amended the Internal Revenue Code to permit it, despite the environmental, energy, economic, and equity advantages.

27. For the 9 percent of commuters who now do *not* drive to work, the new option to pay for parking with pre-tax income *reduces* the price of parking by the commuter's marginal tax rate. For the 91 percent of commuters who now *do* drive to work, the option to choose taxable cash in lieu of employer-paid parking *increases* the opportunity cost of taking the parking to the after-tax value of the parking subsidy. Therefore, the option to pay for parking with pre-tax income will reduce the price of parking at work for a few commuters by 20 to 30 percent (the marginal tax rate), but the option to choose cash in lieu of employer-paid parking will increase the price of parking at work for many more commuters by 70 to 80 percent (one minus the marginal tax rate).

28. Association for Commuter Transportation (1996).

29. Cohen, Steuerle, and Carasso (2004) explain how the rate of return on Old Age and Survivors Insurance contributions is higher for lower-income workers.

30. Benjamin Cardozo was an Associate Justice of the United States Supreme Court from 1932 to 1938, and he was a proponent of small, measured developments.

CHAPTER 4

Parking Cash Out: Evaluating the Effects

It's very simple. It's very easy to administer. It's not difficult at all. It's automatic. It's a good hiring incentive. The employees think it's fair. Cash works very well for us. —Transportation Coordinators at Case Study Firms

Although the Internal Revenue Code penalized parking cash out until 1998, some employers were unaware of the conflict and voluntarily complied with California's cash-out law, and the results are encouraging. By introducing parking prices as a factor in commuters' travel choices, parking cash out reduced vehicle travel to work at the participating firms by an average of 12 percent—equivalent to taking one of every eight commuters' cars off the road. At the same time, parking cash out cost the firms only $2 a month per employee because they saved almost as much on parking as they paid out in cash. Furthermore, because many commuters voluntarily traded their tax-exempt parking subsidies for taxable income, federal and state income tax revenues rose by $65 a year per employee. Finally, the employers praised parking cash out for its simplicity and fairness, adding that it helped them recruit and retain workers. These results imply that parking cash out works as well in practice as it does in theory.

EIGHT CASE STUDIES

Eight employers in Los Angeles County were selected for the case studies. They include an accounting firm, a bank, a government agency, a managed-health-care provider, a video post-production company, and three law firms. Two are in downtown Los Angeles, three in Century City, two in Santa Monica, and one in West Hollywood. They range in size from 120 to 300 employees, with a combined total of 1,694 employees. The case studies examine how parking cash out affected the following six outcomes: (1) commuter mode shares, (2) vehicle trips to work, (3) vehicle miles travelled (VMT) to work, (4) vehicle emissions for work trips, (5) gasoline consumption for work trips, and (6) employers' spending to subsidize commuting.

To comply with California's cash-out law, an employer must offer commuters the option of a cash payment equal in value to any parking subsidy offered. Table 4-1 shows the commute subsidy policies of the eight firms both before and after complying with the law: after complying, two offered commuters a cash payment equal to the parking subsidy, while six voluntarily went beyond mere compliance and subsidized one or more commute alternatives more than they subsidized parking. The varied policies of the eight firms show California's cash-out law offers employers great flexibility in the way they subsidize commuting. Accordingly, the term *parking cash out* is used here to denote any policy consistent with California's cash-out law.

CASE STUDY METHODOLOGY

The eight case-study firms were identified in consultation with Commuter Transportation Services, Southern California's regional rideshare-matching agency. They were the only firms in Southern California with cash-out programs old enough to provide data for evaluating the results. Data for the case studies were obtained from the Trip Reduction Plans that regulated firms must submit annually to the South Coast Air Quality Management District (SCAQMD). In preparing these plans, firms survey employees about their commutes to work during a specified week of each year, and the results are reported in a consistent format.[1] In addition, the plans provide detailed information about every rideshare incentive the firms offer.

TABLE 4-1.
COMMUTE SUBSIDIES BEFORE AND AFTER CASH OUT ($ PER EMPLOYEE PER MONTH)

	Before parking cash out		After parking cash out	
Case study	Parking	Alternatives	Parking	Alternatives
(1)	(2)	(3)	(4)	(5)
Case 1	$110	$55	$0	$55
Case 2	$65	$45	$65	$65
Case 3	$100	$0	$100	$100
Case 4	$120	$50-$90	$120	$150
Case 5	$90-$145	$0-$15	$100	$150
Case 6	$55	$0-$15	$55	$55-$70
Case 7	$62	$25-$175	$62	$77-$165
Case 8	$30	$0	$11	$50

Appendix A explains each firm's commute subsidies.

To supplement this information, I interviewed five of the eight firms' transportation coordinators to obtain their personal evaluations of parking cash out.[2]

SUMMARY OF TRAVEL CHANGES AFTER CASH OUT

Table 4-2 summarizes the reductions in drive-alone share, vehicle trips to work, and VMT for commuting at the eight firms after compliance with the cash-out law. The cases are arranged in descending order according to the reduction in drive-alone share after cash out. The last row shows the weighted averages for all 1,694 employees of the eight firms. The drive-alone share fell from 76 percent before employers offered cash out to 63 percent afterward. The number of daily vehicle trips to work fell by 11 percent, and total vehicle travel to work fell by 652 VMT a year per employee. These three outcomes are explained in detail below.

Drive-Alone Share Fell by 13 Percentage Points

The first panel (columns 2 through 4) in Table 4-2 shows the drive-alone share at the eight firms fell by an average of 13 percentage points after parking cash out. The largest solo-share reduction (22 percentage points) occurred at Case 5 in downtown Los Angeles. The 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. After cash out, the firm offered all commuters either a parking subsidy of $100 a month or $150 a month in cash. This large increase in the reward for the alternatives to solo driving, combined with the availability of many rail and bus transit routes that converge on downtown, help explain the substantial mode shift away from solo driving. The smallest reduction (3 percentage points) 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. To provide an equal subsidy to all commuters, the firm then raised the cash offer to $65 a month. The small mode shift probably stems from the small increase in the cash offer, and the relatively sparse public transit service in West Hollywood.

TABLE 4-2.
SUMMARY OF TRAVEL CHANGES AFTER PARKING CASH OUT

	Solo driver share			Vehicle trips per commuter per day				VMT per employee per year			
Location (case)	**Before**	**After**	**Change**	**Before**	**After**	**Change**	**% Change**	**Before**	**After**	**Change**	**% Change**
(1)	(2)	(3)	(4)=(2)-(3)	(5)	(6)	(7)=(5)-(6)	(8)=(7)/(6)	(9)	(10)	(11)=(9)-(10)	(12)=(11)/(9)
Downtown LA (5)	75%	53%	–22%	0.79	0.60	–0.19	–24%	5,297	4,013	–1,284	–24%
Downtown LA (8)	61%	45%	–16%	0.75	0.63	–0.12	–16%	5,281	4,418	–864	–16%
Century City (1)	71%	58%	–13%	0.81	0.74	–0.07	–9%	5,461	4,862	–599	–11%
Century City (4)	88%	76%	–12%	0.93	0.85	–0.08	–9%	6,578	6,006	–585	–9%
Century City (3)	79%	67%	–12%	0.85	0.78	–0.07	–9%	6,113	5,589	–524	–9%
Santa Monica (7)	83%	75%	–8%	0.83	0.79	–0.04	–5%	6,294	5,960	–334	–5%
Santa Monica (6)	85%	78%	–7%	0.90	0.82	–0.08	–9%	6,478	5,910	–568	–9%
West Hollywood (2)	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%**

Source: Shoup 1997. The firms are listed in descending order of the change in solo driver share in Column 4.

Figure 4-1. Commuter Mode Shares Before and After Parking Cash Out

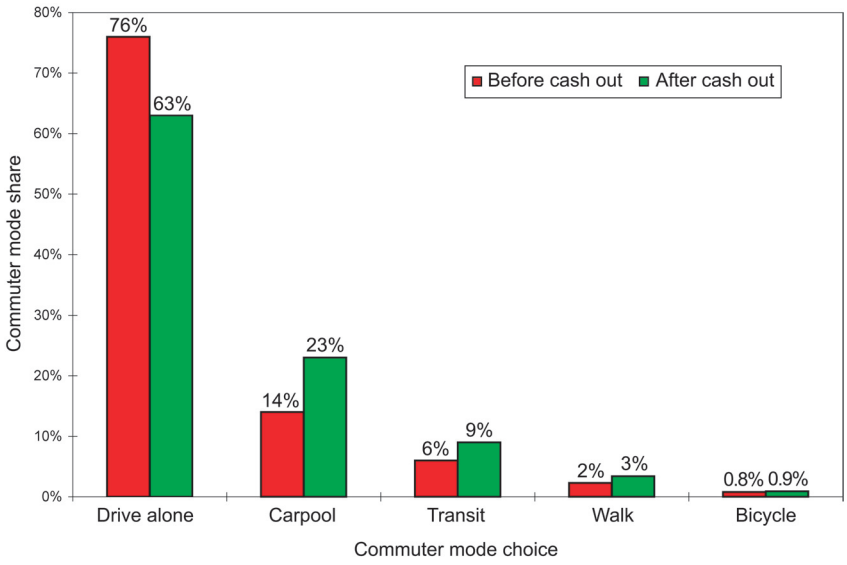


Figure 4-1 shows the commuter mode shares for all 1,694 employees before and after parking cash out. The mode shares before cash out were almost identical to the nationwide averages for commuting found in the 1990 Census.[3] After cash out, however, the drive-alone share fell from 76 percent to 63 percent, the carpool share rose from 14 percent to 23 percent, the transit share rose from 6 percent to 9 percent, and the combined walk/bicycle share rose from 3 percent to 4 percent. A chi-square test of statistical significance shows that the probability of observing such large changes in mode shares in such a large sample by chance would be less than one in a trillion.

Three times more solo drivers switched to carpools than to public transit, which shows that parking cash out can work even where public transit is not attractive or available.

One way to look at the effects of parking cash out is to consider a hypothetical group of 100 commuters. Before cash out, 76 were solo drivers. Cash out induces 13 of these solo drivers to shift to another mode: nine join carpools, three begin to ride transit, and one begins to walk or bike to work. The noteworthy shift from solo driving to carpooling runs counter to the national trend. Nationwide, the 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 cash out to 23 percent afterward. Three times more solo drivers switched to carpools than to public transit, which shows that parking cash out can work even where public transit is not attractive or available. By encouraging carpools, parking cash out takes advantage of the many empty seats in cars already on the road to work. A simple, fair, and almost costless reform of employer-paid parking can significantly reduce vehicle travel.

Vehicle Trips to Work Fell by 11 Percent

The second panel (columns 5 through 8) in Table 4-2 shows how parking cash out reduced the vehicle trip rate (VTR), which is defined as the number of vehicle round trips per commuter per day. If, for example, all commuters drive to work alone, the VTR is one because every person at work creates one vehicle round trip to work. If all commuters drive from home to work in two-person carpools, the VTR is 0.5 because every person creates one-half of a vehicle trip. The VTR thus represents the "vehicle intensity" of commuting. To calculate the VTR, each solo driver is counted

as one vehicle trip, each person in a two-person carpool is counted as half 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, cyclists, or pedestrians.[4]

In the eight case studies, the average number of vehicle round trips to work fell from 0.82 a day per commuter before cash out to 0.73 a day per commuter afterward. Parking cash out therefore led to a reduction of 0.09 vehicle round trips a day per commuter. The total number of vehicle trips to work fell by 11 percent (0.09 ÷ 0.82), and as a result the number of parking spaces required at work also fell by 11 percent.[5]

Vehicle Travel to Work Fell by 652 VMT a Year per Employee

The third panel (columns 9 through 12) of Table 4-2 shows that commuters drove an average of 652 fewer vehicle miles a year per person after the firms complied with the cash-out law. The reduction in total vehicle travel after cash out was calculated by multiplying each firm's reduction in the number of vehicle trips to work by the average round-trip commute distance.[6] A 1991 travel survey of commuters in Southern California found the average one-way vehicle commute distance was 15 miles (24.1 kilometers).[7] In annual commuter surveys conducted between 1989 and 1996, the average one-way vehicle commute distances ranged from 14.8 to 16.9 miles.[8] Fifteen miles is therefore used as the average one-way distance to work to calculate the VMT reduction for each avoided vehicle trip.[9]

Commuters who carpool may drive a more circuitous route to work than if they drove solo and this route change will affect the VMT calculation. To measure this effect, Jon Fricker defined the term "circuity" as "the extra distance that a member of a carpool travels, compared to that person's drive-alone distance between home and work," and he defined the "circuity factor" as the "ratio of ridesharing distance to drive-alone distance."[10] If carpooling creates substantial circuity, the method used to calculate VMT to and from work would overestimate the actual VMT reduction that occurs when commuters shift from solo driving to carpooling. Nevertheless, a sensitivity test of the results in this case found that circuity had almost no effect on the VMT estimates.[11]

In the eight case studies, the reductions in vehicle travel after cash out ranged from 5 to 24 percent, with an average of 12 percent fewer VMT a year per employee—equivalent to removing from the road one of every eight cars driven to work at the case-study firms.

In the eight case studies, the reductions in vehicle travel after cash out ranged from 5 to 24 percent, with an average of 12 percent fewer VMT a year per employee—equivalent to removing from the road one of every eight cars driven to work at the case-study firms. This estimate is conservative because it measures only short-term effects. Parking cash out is a new practice, and few firms have offered it long enough to show the longer-term effects. Seven of the eight case studies examined commuters' responses after only one or two years of cash out. Case 3, however, did have records available for three years after cash out, and the drive-alone share fell from 79 percent in the year before cash out to 76, 69, and then 67 percent in the following three years.[12] This steady decline suggests that parking cash out will have greater effects the longer it is in place.

The transportation coordinator at Case 3 offered two likely explanations for the long-term decline in solo driving. First, new employees who haven't established their commuting habits are more willing to try ridesharing if they can choose cash instead of free parking. As more new employees join a firm offering cash out, more of them will choose the alternatives to solo driving. Second, when the option to cash out is available, word of mouth spreads the idea among fellow workers. Those who have taken the cash recommend the deal to others, and more begin to try it. Therefore, the benefits can increase in the long run as parking cash out becomes established in a firm's workplace culture.

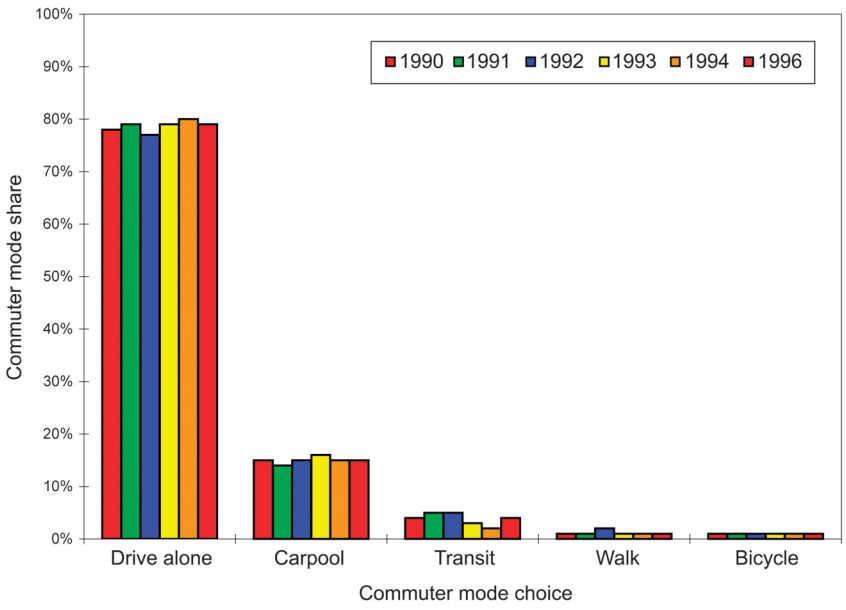
Do These Changes Result from Parking Cash Out?

Factors other than parking cash out might have contributed to the reductions in solo driving found at the eight firms, but this is unlikely. Figure 4-2 shows the mode shares for all commuters in Southern California from 1990 to 1996, as reported in surveys conducted by the Southern California Association of Governments.[13] Because the drive-alone share ranged between 77 and 80 percent during these years, with no downward trend, regional patterns do not seem to explain the reduction in solo driving at the eight firms. Nor is it likely that other rideshare incentives led to the decline in solo driving because five of the eight firms discontinued all other rideshare incentives when they began to offer the cash option.

To control for the possible influence of factors other than cash out, one additional firm that did not offer a cash-out program was also examined. This firm provides a suitable comparison because its parking subsidy remained $75 a month greater than its rideshare subsidy between 1991 and 1995. During that time its drive-alone share remained the same—it was 83 percent in both 1991 and 1995. Parking cash out alone thus seems to explain the reduction in solo driving at the eight case-study firms.

As mentioned earlier, the eight firms complied with California's cash-out requirement in several different ways (see Table 4-1). Five firms chose to maintain their parking subsidies and increase their rideshare subsidies (Cases 2, 3, 4, 6, and 7), two reduced their parking subsidies and increased their rideshare subsidies (Cases 5 and 8), and one eliminated its parking subsidy for solo drivers while maintaining its rideshare subsidy (Case 1). Given the variation in these policies, can we attribute the results at all eight firms to parking cash out? 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 (Cases 1, 3, and 4). The "before" and "after" subsidies, and the changes in them, differed among the three firms.[14] Yet despite these differences, each firm's vehicle trips per employee fell by the same amount—9 percent (see Table 4-2). The specific terms of cash out did not significantly affect the resulting changes in travel choices.

Figure 4-2. Commuter Mode Shares in Southern California, 1990–1996



EMISSION REDUCTIONS AND GASOLINE SAVINGS

Parking cash out also reduced vehicle emissions for commuting to work by 12 percent. These emission reductions are calculated by multiplying the reductions in vehicle trips and VMT by the emissions created per trip and per mile. The *per-trip* variable refers to the emissions created when a vehicle is started and warms up (a "cold start"), and when it cools down at the destination (a "hot soak"); the cold-start and hot-soak emissions at the beginning and end of a trip are independent of the trip length. The *per-mile* running emissions, however, do depend on the distance driven. The sum of the cold-start and hot-soak emissions plus the running emissions create the total emissions for any trip.

The California Air Resources Board (ARB) has estimated emission factors—the average vehicle's emissions per trip and per mile—for each type of emission and for each year.[15] Using these data, we can estimate the emission for the case-study firms in 1993. Consider Case 4: cash out eliminated 40 trips and 585 VMT a year per employee. If we multiply the 40 trips and 585 VMT by the emission factors for reactive organic gases (ROG), carbon monoxide (CO), nitrogen oxides (NO_x), and inhalable particulate matter less than 10 microns in diameter (PM_{10}), we find the emission reduction for this firm. For all eight firms, the average reductions per year per employee after parking cash out were 819 grams of ROG, 683 grams of NO_x, 7.2 kilograms of CO, and 500 grams of PM_{10}.

The PM_{10} reductions are particularly important. Particulate-matter pollution consists of very small liquid and solid particles—smoke, soot, dust, salt, acids, and metals—floating in the air. These particles are small enough to evade the respiratory system's natural defenses, and they can lodge deep in the lungs. Health problems begin as the body reacts to these microscopic foreign particles. PM_{10} can increase the number and severity of asthma attacks, cause or aggravate lung and heart diseases, and reduce the body's ability to fight infections.[16]

The California Air Resources Board considers reductions in ROG, NO_x, and PM_{10} as equally valuable, but treats seven grams of CO as equivalent to one gram of the other three pollutants because CO is considered less harmful.[17] Based on this valuation, the combined reduction of these four pollutants is equivalent to about three kilograms of vehicle emissions per employee per year.

The shifts in travel behavior prompted by parking cash out reduced vehicle travel to work by 12 percent—652 VMT a year per employee—and thereby saved 26 gallons (99 liters) of gasoline a year per employee (assuming an average fuel efficiency of 25 miles per gallon).[18] Reducing gasoline consumption also reduces the emissions of carbon dioxide (CO_2), a greenhouse gas. (Carbon dioxide should not be confused with carbon monoxide, or CO, which was discussed above.) Because parking cash out reduced gasoline consumption for vehicle commuting by 12 percent, it also

TABLE 4-3.
EMISSIONS REDUCTIONS AFTER PARKING CASH OUT (PER EMPLOYEE PER YEAR)

ROG	819 grams
NO_x	683 grams
CO	7.2 kilograms
PM_{10}	500 grams
CO_2	367 kilograms

reduced CO_2 emissions by 12 percent. Combustion of each gallon of gasoline produces 19.6 pounds of tailpipe CO_2 emissions, and the full-fuel-cycle emissions (which include the emissions from extracting, transporting, and refining motor fuel) are 57 percent more than tailpipe emissions alone.[19] Parking cash out therefore reduced CO_2 emissions by 800 pounds (367 kilograms) a year per employee.[20]

CONSISTENCY WITH PREVIOUS RESEARCH

The cash-out case studies are consistent with previous research on the effects of employer-paid parking. Table 4-4 compares three different types of parking research conducted in downtown Los Angeles in recent years. The first row shows the results predicted from the mode-choice model estimated with survey data (from Table 1-3). The model predicted that for every 100 employees, commuters will drive 75 cars to work when offered free parking *without* the cash option, 62 cars when offered free parking *with* the cash option, and only 56 cars when drivers pay for parking.[21] The second row shows the average of the results from the two case studies of parking cash out (numbers 5 and 8). Commuters drove 77 cars to work when they were offered free parking *without* the cash option, and 62 cars when offered free parking *with* the cash option. The close match between the results in rows 1 and 2 suggests that parking cash out produces the predicted results.

The third row shows the results found in the two case studies where employers eliminated free parking. For every 100 employees, commuters drove 77 cars to work when employers offered free parking without the cash option, and only 53 cars when drivers paid for parking. These results show that driver-paid parking reduces vehicle trips more than parking cash out does. Two circumstances explain this result. First, commuters pay income tax on the in-lieu cash, which reduces the opportunity cost of taking a free parking space—after taxes, you have less cash than the actual value of the parking space. For example, if you are in the 30 percent tax bracket and can choose between tax-exempt free parking or $100 a month in taxable income, you will take the parking as long as you think it is worth more than $70 a month. If instead you are charged $100 a month for parking, you will take the parking only if you think it is worth more than $100 a month. For this reason, charging commuters $100 a month for parking reduces driving to work more than offering commuters $100 a month in lieu of free parking.

TABLE 4-4.
CASH-OUT RESULTS COMPARED WITH PREVIOUS RESEARCH (CARS DRIVEN TO WORK PER 100 EMPLOYEES)

	Employer pays for parking		
Estimation method	*Without* cash option	*With* cash option	Driver pays for parking
1. Mode-choice model of commuters to LA CBD	75	62	56
2. Two case studies of cash out in LA CBD	77	62	–
3. Two studies of effects of employer-paid parking in LA CBD	77	–	53

Row 1 refers to the model of commuting to the LA CBD (see Table 1-3).

Row 2 shows the average of Case Studies 5 and 8 in Table 4-2.

Row 3 shows the average of Case Studies 1 and 7 in Table 1-2.

Second, commuters may be influenced by the "endowment effect," which refers to situations where possession increases the value one places on a good.[22] Once you buy a house, for example, the lowest price at which you would be willing to sell it may be higher than the highest price you were willing to pay for it. In parking cash out, the value a commuter places on a parking space is the lowest price at which he or she is willing to "sell" the space back to the employer, and this price may be higher than the commuter would be willing to pay for it had the employer not provided it free to begin with. The endowment effect helps explain why new employees, who have not yet made their commuting choices, appear more open to choosing cash instead of free parking, while inertia makes subsequent change less likely. Employee turnover thus leads to a continuing decline in the drive-alone share after a cash-out program is in place.[23]

COST OF PARKING CASH OUT

Beyond examining how parking cash out affects commuters' travel choices, we can also examine how it affects employers' costs. In most cases, parking cash out is simply a more flexible use of money firms already pay to subsidize parking. Firms pay a new cost only for commuters who were previously offered a parking subsidy but did not take it, and we can estimate the new cost of subsidizing previous nondrivers in the eight case studies. Table 4-5 shows the changes in the firms' total spending per month per employee for both parking and cash payments in lieu of parking. The firms adopted a variety of programs, and 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 commuters who did not drive to work alone. As a result, the firm saved $70 a month per employee. The other seven firms either maintained or slightly reduced their parking subsidies while increasing the amount paid to nondrivers; these firms spent an average of $13 more a month per employee.

In most cases, parking cash out is simply a more flexible use of money firms already pay to subsidize parking.

Of the seven firms that spent more after cash out, two offered either a parking subsidy or its equivalent cash value: Case 2 spent $6 a month more per employee, while Case 3 spent $16 a month more. The other five firms voluntarily went beyond mere compliance with the cash-out requirement and offered commuters more than the cash value of any forgone parking subsidy; they spent from $8 (Cases 6 and 7) to $33 (Case 5) a month more per employee. The experiences of these five firms suggest that when parking cash out reveals the value of all parking subsidies and exposes the higher subsidies for solo driving than for ridesharing, employers may instead decide to offer higher subsidies for ridesharing.[24]

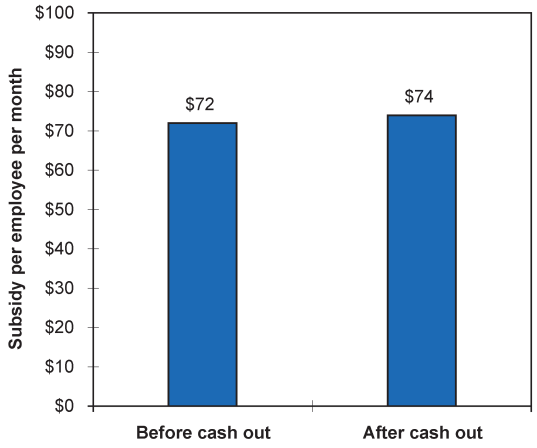
Considered together, the eight firms reduced their parking subsidies by almost as much as they increased their cash payments, and their total spending for both parking and cash in lieu of parking rose by only 3 percent. The average commuting subsidy per employee rose from $72 to $74 a month, so for these firms parking cash out was almost cost-neutral.[25] In any event, the labor market will in the long run tend to minimize the effect of parking cash out on total employee compensation because fringe benefits are typically traded off for cash wages.[26]

Another benefit of parking cash out is that it can replace less efficient rideshare incentives. When firms offer a parking subsidy without the cash option, they often try to encourage ridesharing with a collection of incentives intended to counter the parking subsidy itself. When the eight firms began to offer the straightforward choice between a parking subsidy or its cash value, five of them discontinued these other incentives (such as free carwashes for carpoolers), most of which were for transit and carpooling but not for walking or cycling to work. Ridesharing increased in all five

TABLE 4-5.
SUBSIDY PER EMPLOYEE BEFORE AND AFTER CASH OUT ($ PER MONTH)

Case/location	Before	After	Change	% Change
(1)	(2)	(3)	(4)=(3)-(2)	(5)=(4)/(2)
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%
Weighted average	**$72**	**$74**	**$2**	**3%**

Source: Shoup 1997. The case studies are listed in descending order of the change in solo driver share (see Table 4-2).



cases where firms deleted rideshare incentives other than parking cash out, which shows reduced spending on these other incentives are another benefit of cashing out. I have not estimated the firms' savings associated with the discontinued rideshare incentives, although they may be substantial. If these savings were included in the calculations, the firms' total spending to subsidize commuters may have actually declined. These savings will be especially important at firms offering both free parking and various rideshare incentives. If these firms offer parking cash out and eliminate all other rideshare incentives, they will probably reduce vehicle trips *and* save money because they are offering a more efficient rideshare program.

This minor change in the eight firms' total commuting subsidies after cash out suggests how an individual firm can cash out employer-paid parking at no cost: simply redistribute the existing commute subsidy equally among all commuters, independent of the commuters' travel choices. This redistribution will not increase the firm's total cost or reduce the commuters' average subsidy, but it will substantially reduce vehicle travel and vehicle emissions, save gasoline, and treat all commuters equally regardless of how they get to work.

Transfer Costs versus Real Costs

When assessing the cost of parking cash out, we must distinguish between two very different kinds of cost. First, when a firm makes cash payments to solo drivers who give up their rented parking spaces, the reduced payments to rent parking spaces fund the cash payments to commuters. Commuters simply make better use of the subsidies the firm already offers them. The firm incurs no net cost. But when firms make cash payments to commuters who were already ridesharing, the firms *do* incur a cost because the nondrivers have no parking spaces to cash out. In this second case, the firm's cost is a transfer payment to nondrivers, who were previously undercompensated when compared with otherwise identical solo drivers.

Chapter 2 explained why a firm's cost of parking cash out represents a transfer payment to commuters and why both commuters and their employers receive a benefit from this transfer payment. Many textbooks on cost-benefit analysis include similar explanations about why transfer payments do not consume resources and why analysts should not confuse transfer payments with real costs. For example, economist Edward Mishan wrote:

> 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. . . . [T]o the economy as a whole [transfer payments] are neither costs nor benefits; [they are] only a part of the pattern of *distributing* the aggregate product.[27]

Transfer payments do not consume any of the "economic pie," but they do change the size of the individual slices. When an employer offers parking cash-out payments to commuters who were already ridesharing, this redistributes income from the employer to these commuters, but it does not consume any resources. Because the case-study firms reduced parking subsidies and increased rideshare subsidies, most of the redistribution that took place was from solo drivers (who got a smaller slice of the subsidy pie) to nondrivers (who got a larger slice). After cash out, the eight firms spent only $2 more a month per employee ($24 a year) on the sum of parking subsidies and cash payments in lieu of parking subsidies.[28] By improving employee benefits, the extra cash-out income also helped employers to recruit and retain workers.

The firms' representatives all said that parking cash out is simple, easy to administer, and almost automatic.

Negligible Administrative Cost

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 parking cash out. This administrative overhead is a real cost, not a transfer payment to commuters. Nevertheless, the firms' representatives all said that parking cash out is simple, easy to administer, and almost automatic.[29]

> *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 cost of administering parking cash out, one firm's transportation coordinator said she spends approximately two minutes a month per employee on the cash-out program. The other firms' representatives reported the cost is imperceptible, and one likened it to the cost of making changes in the number of exemptions for employees' income tax withholding. All the firms' representatives said administering

the payroll taxes on cash subsidies in lieu of tax-exempt free parking causes no problems. Furthermore, payroll taxes on cash subsidies increased by only $1.63 a month per employee after cash out, and they are included in the firms' subsidy cost in Table 4-5.

California's cash-out requirement applies to the parking spaces firms rent but not to spaces they own. This raises the question of whether cash out increases administrative costs for employers who both rent and own parking spaces. Three of the case-study firms both rent and own parking spaces for commuters, and they offer the cash option to all commuters regardless of where they park. 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. The arrangement thus benefits both the employers and employees.

Does parking cash out create any special problems for firms with multiple work sites? Six of the eight firms have multiple work sites, but they offer cash out only at sites where they rent commuter parking spaces. None of the firms' representatives said having more than one work site creates any difficulty in cashing out their parking subsidies.

BENEFIT-COST ANALYSIS OF PARKING CASH OUT

We can now compare the benefits and costs of parking cash out. At the firm level, parking cash out provides benefits for both commuters and their employers. Previous nondrivers who begin to receive in-lieu cash are clearly better off. Former solo drivers who trade a parking space for cash are also better off (otherwise they would not have made the trade). The remaining solo drivers continue to park free, so they are no worse off (except in the case of firms that reduce the parking subsidies for solo drivers). And parking cash out benefits employers because it helps to recruit and retain workers. The firms' representatives commented:

Beyond the benefits to commuters and employers, parking cash out produces significant social benefits justifying California's cash-out requirement.

> *It's a good hiring incentive for us.* (Case 4)
>
> *[Cash out] is an excellent recruiting point because people count it as income.* (Case 5)
>
> *Employees are grateful and thankful and motivated. That's a plus for the company.* (Case 6)
>
> *[Cash out] made employees happy. It became a benefit we were offering to employees. We emphasize it in our new employee orientation.* (Case 8)

Beyond the benefits to commuters and employers, parking cash out produces significant social benefits justifying California's cash-out requirement. The legislation states two objectives: to reduce traffic congestion and air pollution. What are the reductions in VMT and emissions worth to society? We can value the VMT reductions by referring to the literature on the economic costs of traffic congestion. In 1992 Michael Cameron estimated that congestion costs for Los Angeles range from 10¢ to 37¢ per VMT. He also estimated a peak-period toll of 15¢ per VMT would raise average speeds to 35–40 miles an hour on Los Angeles freeways; without a toll, the congestion-related external costs of vehicle use are therefore presumably higher than 15¢ per VMT. Kenneth Small also recommended a peak-period toll of 15¢ a mile (in 1990 dollars) on congested freeways in Los Angeles. Using a large-scale transportation model with data for 1991, Elizabeth Deakin and Greig Harvey estimated that if the appropriate congestion charges were imposed wherever congestion appears on Southern California's highway network, they would average 10¢ a mile.[30] Taking a different approach, Patrick DeCorla-Souza and Anthony Kane in 1992

estimated the cost of new highway capacity needed to serve peak users in Los Angeles to be 20¢ per peak-hour VMT. If the benefits of reducing vehicle travel are valued at only 10¢ per VMT (the low end of the estimates for Los Angeles), the benefit of reducing VMT by 652 miles a year per employee is worth $65.20 a year per employee (see Table 4-6).[31]

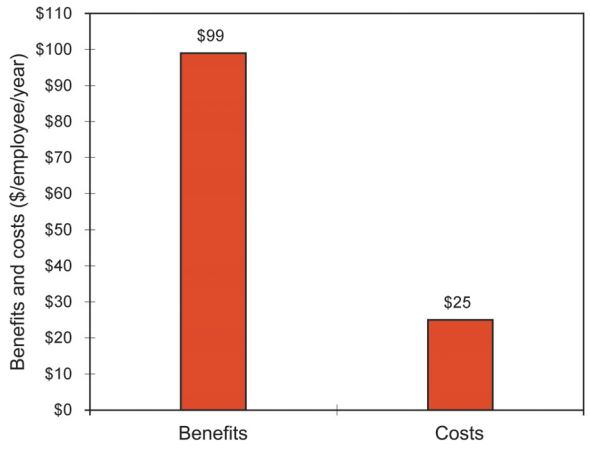
The value of reducing vehicle emissions is more difficult to estimate. One approach is to refer to the SCAQMD's official values for the "maximum allowed control cost" of proposed emission-reduction measures—the cost above which a control measure is considered too expensive to require. If the cost of reducing emissions by a proposed control measure is less than this value, the measure is considered cost-effective. Because the SCAQMD presumably does not require emission controls that cost more than the value of the emissions reduced, we can interpret the SCAQMD's maximum allowed control cost as the agency's estimate of the value of reducing emissions. In 1994 the SCAQMD's maximum allowed control costs for reducing emissions 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 PM_{10}.[32]

TABLE 4-6.
BENEFITS AND COSTS OF PARKING CASH OUT (PER EMPLOYEE PER YEAR)

Benefit	Amount	Value per unit	Value
(1)	(2)	(3)	(4)=(2)x(3)
VMT reduction	652 VMT	10¢ per VMT	$65.20
Emissions reduction			
ROG	0.819 kilograms	$19.80 per kilogram	$16.22
NO_x	0.683 kilograms	$18.70 per kilogram	$12.77
CO	7.2 kilograms	$0.385 per kilogram	$2.77
PM_{10}	0.5 kilograms	$4.40 per kilogram	$2.20
Subtotal			$33.96
Total benefits:			**$99.16**
Total costs:			**$24.53**

Benefit/cost ratio = ($99.16)/($24.53) = 4/1

Note: The employers' cost of $24.53 per employee per year is paid to commuters who were already ridesharing before the cash option was offered. The total benefits of $99.16 exclude any benefits to commuters or their employers; including these benefits would increase the benefit/cost ratio.



Using these figures to represent the value of emission reductions, Table 4-5 shows the reductions achieved by parking cash out are worth $33.96 a year per employee.[33]

Adding the benefits of congestion relief ($65.20) and reduced vehicle emissions ($33.96) gives total benefits of $99.16 a year per employee. In comparison, the firms' costs were $24.53 a year per employee, which increased the income of commuters who had not driven to work before parking cash out. The benefit/cost ratio for parking cash out is thus 4-to-1 ($99.16 ÷ $24.53). Congestion relief accounts for two-thirds of the total benefits, and pollution reduction for one-third.

California requires parking cash out to reduce congestion and air pollution, but it also provides benefits to commuters and their employers. Perhaps most important, commuters who were already ridesharing before cash out are better off because they begin to receive cash in lieu of the parking subsidies they had already declined. The firm's cost of $24.53 a year per employee (the denominator of the benefit/cost ratio) consists of payments to commuters who had not driven to work before parking cash out began, and is thus a transfer payment to these previous nondrivers. When this transfer payment to commuters is included as a benefit in the numerator of the calculation, the benefit/cost ratio increases to 5-to-1.[34]

DISTRIBUTION OF BENEFITS

Because the firms' parking subsidies declined by almost as much as their cash payments in lieu of parking subsidies increased, parking cash out was almost cost-neutral for the firms.[35] Nevertheless, cash out benefitted many groups—nondrivers, low-wage workers, women, minorities, and the public sector—beyond providing the public benefits of reduced congestion and cleaner air. The benefits to these groups are described below.

Cash out benefitted many groups—nondrivers, low-wage workers, women, minorities, and the public sector—beyond providing the public benefits of reduced congestion and cleaner air.

Nondrivers

Without parking cash out, the employer saves money when a commuter decides to forgo a parking space at work. With cash out, in contrast, the commuter who forgoes the parking space receives the money. One firm's representative explained the equity of parking cash out in this way:

> *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)

Parking cash out lets employers offer free parking to solo drivers and an equal benefit to nondrivers who leave their cars at home. In contrast, employer-paid parking without the option to cash out rewards only commuters who drive to work. Cash out levels the playing field by treating all commuters equally regardless of how they get to work.

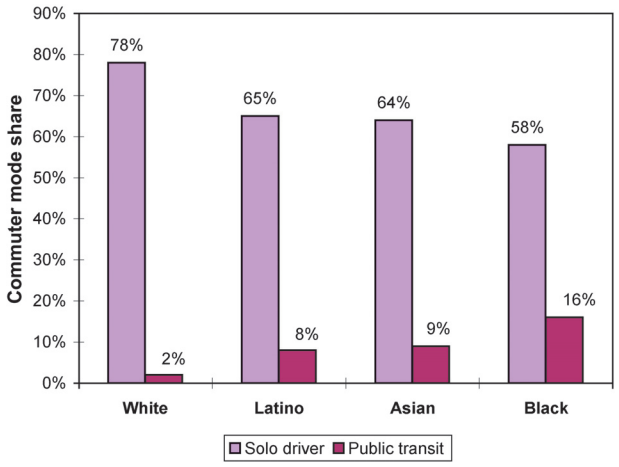
Low-Wage Workers

Higher-income commuters are more likely to drive to work alone, while lower-income commuters are more likely to carpool, ride public transit, or walk (see Table 4-7). Cash out therefore gives greater benefits to lower-income commuters for two reasons: first, they are less likely to drive to work, and second, their marginal tax rate on taxable cash is lower, so they keep more of the in-lieu cash as after-tax income. Parking cash out thus especially helps younger, less educated, and less skilled workers.

TABLE 4-7.
DEMOGRAPHICS OF TRAVEL TO WORK

	Solo Driver	Carpool	Transit	Other
Gender				
Men	77%	14%	3%	5%
Women	74%	16%	4%	6%
Age				
16–29	70%	18%	5%	7%
30–49	78%	14%	3%	5%
50–69	79%	12%	3%	5%
70+	73%	16%	5%	5%
Income				
Less than $20,000	66%	19%	6%	8%
$20,000–$39,999	76%	15%	3%	5%
$40,000–$59,999	78%	14%	2%	5%
$60,000–$79,999	79%	13%	3%	5%
$80,000+	77%	13%	4%	6%
Education				
Less than high school	64%	25%	5%	6%
High school	78%	15%	3%	5%
Bachelor degree	77%	12%	5%	6%
Graduate degree	77%	12%	4%	7%
Ethnicity				
White	78%	14%	2%	5%
Latino	65%	18%	8%	8%
Asian	64%	18%	9%	8%
Black	58%	17%	16%	9%
All commuters	76%	15%	4%	6%

Source: Mode shares for commuting to work are calculated from the *1995 Nationwide Personal Transportation Survey.*



Before they offered cash out, some of the case-study firms offered parking subsidies only to senior staff. Afterward, each firm offered the same subsidy to every commuter. California's cash-out law does not require firms to offer the same benefit to all commuters, but each firm did so after complying with

the cash-out law. Perhaps this occurred because cash out clearly exposes any inequality associated with parking subsidies. Offering the same subsidy to everyone naturally appears fairer than offering free parking only to some employees.

Women

Cash out can remove any gender bias associated with employer-paid parking. Consider the example of Case 1. In 1992, the firm offered commuters the choice between a parking subsidy of $110 a month or $55 a month in cash. The policy favored solo drivers but did not explicitly favor either men or women. Nevertheless, the firm's 1992 travel survey found that 78 percent of men and only 62 percent of women drove to work alone. However inadvertent, subsidizing parking more than ridesharing therefore subsidized men more than women. This outcome is predictable because the *1995 Nationwide Personal Transportation Survey* (*NPTS*) found that men are more likely than women to drive to work alone, while women are more likely to carpool or ride transit (see Table 4-7). Parking cash out thus allows employers to subsidize commuting without creating gender bias.

Minorities

Parking cash out also removes any ethnic bias associated with employer-paid parking. The *1995 NPTS* found minorities are less likely than other commuters to drive to work alone, and more likely to ride transit (see Table 4-7).[36] For example, 58 percent of black commuters drive to work alone, while 16 percent ride public transit. Among white commuters, in contrast, 78 percent drive to work alone, and only 2 percent ride public transit. Because parking cash out provides an equal benefit to commuters regardless of their mode choices, it removes any discrimination by gender, ethnicity, or any other demographic variable that may be related to work travel.

Avoiding bias in transportation policy is simple transportation justice.

Avoiding bias in transportation policy is simple transportation justice. Because employer-paid parking is a tax-exempt fringe benefit and commuting to free parking spaces at work accounts for 27 percent of all automobile travel in the U.S., parking cash out is all the more important: it promotes both tax equity and transportation justice, and can therefore insulate employers from any allegations of discrimination.

Public Sector

Employer-paid parking subsidies are tax-exempt whereas the cash in lieu of a parking subsidy is taxable. Commuters who cash out their employer-paid parking therefore pay more in federal and state income taxes. Because many commuters at the eight firms chose taxable cash, taxable income increased by $255 a year per employee. 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 tax revenue per employee increased by $48 a year after cash out.[37] 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 tax revenue per employee increased by $17 a year.[38] Parking cash out thus increased federal and state tax revenue by $65 a year per employee.

This increase in tax revenue represents a transfer to the government from commuters who would otherwise have received the full value of the cash-out payments. It also suggests a minimum value for a benefit not shown in Table 4-6—the benefit to commuters who cash out their parking subsidies because they think the cash is worth more than the free parking. As explained in Chapter 2, employer-paid parking creates a deadweight loss,

measured by the difference between what a firm pays to provide a parking space and the value a commuter places on receiving it. If an employer pays $100 a month to provide a free parking space and an employee values it at only $60 a month, parking cash out can remove a deadweight loss of $40 a month. This benefit of $40 a month in reduced deadweight loss is above and beyond the benefits of reducing air pollution and traffic congestion. A commuter who is in the 30 percent marginal tax bracket can take $100 in taxable cash, receive an additional $70 in after-tax income, and still be $10 better off than with free parking. The government captures $30 a month of the deadweight loss as tax revenue, and the commuter's benefit is $10 a month. The increase in tax revenue thus measures the minimum reduction in deadweight loss associated with cashing out a parking subsidy worth less to the commuter than it costs the employer.

Because federal and state income tax revenue per employee increased by $65 a year after parking cash out, this is a minimum estimate of the reduction in deadweight loss, and it should be added to the denominator of the benefit/cost ratio in Table 4-6. In addition to the $99 a year per employee for traffic congestion and emissions, parking cash out produced benefits of at least $65 a year in benefits that were transferred to the government in tax revenue, so the overall benefit/cost ratio is at least 7-to-1.[39]

Employers and employees both pay Social Security payroll taxes on the cashed-out parking subsidies, which are treated as taxable wages, but these additional tax payments will eventually increase the employees' Social Security benefits, which are based on each employee's taxable wages. Higher retirement incomes will therefore compensate commuters for the additional payroll taxes they and their employers pay on their cashed-out parking subsidies and produce yet another benefit of parking cash out.

Commuting to free parking spaces at work accounts for about 27 percent of total household VMT in the U.S., and about 14 percent of U.S. oil consumption. And because American motor vehicles consume one-eighth of the world's total oil production, parking cash out in the U.S. can noticeably reduce world oil demand.[40] In 2001 the U.S. imported $104 billion of petroleum, which accounted for 8 percent of total imports and equaled 29 percent of the nations's trade deficit.[41] A reduction in the demand for gasoline can therefore significantly reduce petroleum imports and improve the country's balance of trade. Quite aside from this financial benefit, reduced petroleum imports will also reduce the nation's energy dependence, a source of considerable consternation and security anxiety. Again, a seemingly mundane reform in parking policy can benefit virtually everyone in a big way.

A reduction in the demand for gasoline can therefore significantly reduce petroleum imports and improve the country's balance of trade. Quite aside from this financial benefit, reduced petroleum imports will also reduce the nation's energy dependence, a source of considerable consternation and security anxiety.

EMPLOYERS PRAISE PARKING CASH OUT

As mentioned earlier, the cash option increases employee benefits, and it therefore helps firms to recruit and retain workers. The firms' representatives reported these benefits:

> *The employees think it's fair.* (Case 2)
>
> *Since we moved to cash out, we've always received a good response.* (Case 4)
>
> *I would definitely recommend [parking cash out]. We've always found that cash works. Cash is always a good incentive.* (Case 4)
>
> *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)

> *If we decided to scratch the program, we would probably end up with at least 50 or 60 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, the employers' comments show it is not. The cash payments to commuters are mainly a more flexible use of a subsidy formerly devoted to parking. With the same resources, commuters have more choices. Therefore, the cash-out requirement is a *self-funded* mandate, not an *unfunded* one. This self-funding feature of parking cash out helps explain why employers approve of parking cash out even when they don't offer other rideshare incentives. One firm's experience clearly illustrates the advantage of parking cash out when compared with other rideshare incentives. After becoming exempt from the SCAQMD's trip-reduction regulations because its employment declined, the firm (not included in the eight case studies) immediately withdrew all its rideshare incentives *except* parking cash out. The firm sent this message to all staff explaining the reason for this decision:

> *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.*[42]

This firm's experience implies that parking cash out will have significant enduring effects.

The experience of the case-study firms also suggests the long-term benefits of parking cash out. In 1996 the SCAQMD began to exempt all firms with fewer than 250 employees from its trip-reduction regulations, so the case-study firms are no longer required to offer trip reduction programs or to submit reports to the SCAQMD. I revisited the case-study firms during 2001–2002 to ask whether their views on parking cash out had changed as they gained more experience with the program. Consider these three firms' comments:

> *When the regulations were changed and the minimum number of employees was raised to 250 from 100, we were no longer required to offer parking cash out to employees. We continue to offer the program because it brings so many benefits and costs so little, and our employees like the program so much.* (Case 2)

> *It's so simple to run the program that we decided to continue it. It doesn't cost the firm anything to do this, and it's a great employee benefit.* (Case 4)

> *We have a very large parking problem at our downtown Los Angeles work site. Parking is in such great demand that in addition to the lot adjacent to the building we rent two lots across the street. We are no longer required to offer parking cash out to our employees, but the program has been such a success that we now do so voluntarily. Parking cash out benefits our company in many ways, and it allows us to remain here at this location.* (Case 8)

Parking cash out is not just a sensible fringe benefit, but it also allows some employers to remain downtown where the scarcity of parking might otherwise force them to move to the suburbs.

This last comment suggests parking cash out is not just a sensible fringe benefit, but it also allows some employers to remain downtown where the scarcity of parking might otherwise force them to move to the suburbs. In this way, parking cash out can help cities retain employment in central locations well served by public transit.

Parking is a traditional part of most employers' fringe benefits, and cash out is logically related to employer-paid parking. Many other rideshare

benefits, in contrast, are not a traditional part of an employer's benefit package, and their usefulness, to put it charitably, is questionable. For example, the ridesharing publication for Southern California, *Crossroads*, recommends 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."[43] Programs like this accomplish little beyond fostering the impression employers are doing something to satisfy their obligations under clean air laws. Parking cash out, on the other hand, is a natural extension of traditional parking subsidies, and it easily fits in as a normal operating procedure for any business. It also uses a direct incentive: cash exerts a far more powerful influence on behavior than does an award for the best ridesharing egg. Once established, parking cash out is likely to become a permanent feature of the employer's benefit package.

The firms's representatives also said parking cash out costs little but is popular with employees, as these comments show:

> *There are perks that you can give employees to make them happy, and this particular perk doesn't cost us anything. As I said, the benefits of parking cash out far outweigh the costs. And it has helped us to mitigate our main problem, which is parking demand.* (Case 2)

> *It's great to reward people with cash when they get to work some other way than in a solo driven auto. And in a larger sense, we as a firm are happy to be doing our part toward cutting down on congestion and pollution in Los Angeles. I do a brief orientation to the firm for new employees, and when I tell them about parking cash out, their faces light up. Whether or not they participate, they seem to think it's great that the firm gives the employees the option of receiving cash.* (Case 4)

> *For the employees who participate in cash out, the money is a big incentive. They tell us that they are very happy to see the extra amount added into their paychecks. They feel like they are getting a bonus from the company. They tell us how important the extra income has been for them, and they appreciate saving the wear and tear on their vehicles. In fact, some do not even own vehicles. They rely solely on transit. And for many employees a portion of the subsidy is nontaxable.* (Case 8)

Cash exerts a far more powerful influence on behavior than does an award for the best ridesharing egg.

These comments suggest that once employers offer parking cash out, they and their employees like it. The main problem with cash out seems to be that most employers have never heard of it.

THE LEGISLATIVE ANALYST'S REPORT

The main reason most employers have never heard of California's parking cash-out requirement is that the state government has done little to publicize or enforce it. This may seem surprising because most of us assume once the legislature enacts a law, the executive branch will enforce it or at the very least tell people about it. Such was not the case, however, with the cash-out law. The nonenforcement of the law led to a study by California's Legislative Analyst's Office (LAO). The LAO provides fiscal and policy advice for the legislature and describes its mission in these words:

> The office serves as "eyes and ears" for the Legislature to ensure that the executive branch is implementing legislative policy in a cost-efficient and effective manner. The office carries out this legislative oversight function by reviewing and analyzing the operations and finances of state government.[44]

After examining the state's implementation of parking cash out, the LAO concluded that the state had done nothing to enforce the law and very little to make employers aware of it. "Almost ten years after this program was established," the LAO noted, "the Air Resources Board (which administers the program) has conducted little outreach to make employers aware of the program."[45] The LAO estimated that compliance would produce substantial benefits but found few employers complied with the law because most were unaware of it. Although the law applies only to firms employing more than 50 people and offering free parking in rented spaces, the LAO estimated it covers about 290,000 employer-paid parking spaces. According to the LAO, full compliance with the law would reduce vehicle travel by between 113 and 226 million VMT a year, reduce gasoline consumption by between 5 and 11 million gallons of gasoline a year, and reduce vehicle emissions for commuting by at least two tons a day. Each parking space cashed out would also generate an additional $258 a year in federal tax revenue and $50 in state tax revenue. The LAO concluded that the Air Resources Board should conduct greater outreach to firms to make sure they know the law's requirements.

Parking cash out makes a small positive contribution in several important areas—air quality, transportation efficiency, energy conservation, employee welfare, and state tax revenue—but makes no large contribution to any single agency's goals and thus has no major beneficiary to act as its advocate. If each individual state agency neglects the potential contribution of parking cash out because it makes only a small positive contribution to that agency's single goal, no one will look out for the state's total welfare. This seems to be what has happened in California.

The benefit/cost ratio of parking cash out is at least 4-to-1 and may be as high as 7-to-1. All these benefits result from subsidizing people—not parking.

California's experience suggests a state agency like the Air Resources Board is ill-equipped to enforce a parking cash-out requirement. The board does not deal with individual employers in its other activities and is unsure how to monitor and enforce compliance. Similar problems would probably arise if other states were to adopt parking cash-out requirements. For this reason, Chapter 6 proposes an alternative way to encourage employers to offer parking cash out: amend the federal Internal Revenue Code. Specifically, employer-paid parking should be a tax-exempt fringe benefit *only* if a commuter has the option to cash it out. This solution will avoid the need for every state to enact individual parking cash-out laws and to enforce these laws. A simple change in the tax code can produce major transportation benefits at low cost.

CONCLUSION: SUBSIDIZE PEOPLE, NOT PARKING

Many different commute policies can satisfy California's parking cash-out requirement. Therefore, predicting how this requirement will affect travel demand is difficult. Neither the eight case-study firms nor their employees are random samples, so these early outcomes may not predict exactly what will occur when other firms cash out their parking subsidies. Nevertheless, these outcomes offer valuable evidence about the likely effects of giving commuters the option to cash out their employer-paid parking subsidies. Results from the eight case studies show parking cash out reduces vehicle travel, vehicle emissions, and gasoline consumption. Employers praised parking cash out for its simplicity and fairness, and said it helps to recruit and retain workers. The benefit/cost ratio of parking cash out is at least 4-to-1 and may be as high as 7-to-1. In summary, parking cash out produces benefits for commuters, employers, taxpayers, the economy, and the environment. All these benefits result from subsidizing people—*not* parking.

ENDNOTES

1. This research was conducted for the California Air Resources Board. Shoup (1997) reports the complete case studies, describes the case-study methodology in detail, explains the derivation of every estimated change that occurred after cash out, and includes the full texts of the interviews with employers. The base year in each case is the year before the firm began to offer commuters the cash option. The mode shares were measured in the base year, and in the first, second, or third year after cash 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. The SCAQMD's Rule 2202 (On-Road Motor Vehicle Mitigation Options) and the guidelines for conducting the required surveys are available online at www.aqmd.gov/trans/index.html.
2. The full texts of the interviews are available in Shoup (1997).
3. Alan Pisarski (1996, 49) reports that, excluding those who work at home, the mode shares for commuting in the U.S. 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 case-study firms before cash out were solo driver (76%), carpool (14%), transit (6%), and walk plus bicycle (3%). The firms were therefore typical of the national pattern in their commuters' mode shares before cash out.
4. The vehicle trip rate is calculated from the mode shares of employees who commuted to work, so it refers to the number of vehicle trips per commuter. On an average day, 10 percent of the 1,694 employees were on vacation, sick, or did not commute for some other reason, so the average "attendance rate" was 90 percent. The eight firms' attendance rates ranged between 73 percent (at Case 2) and 95 percent (at Cases 3 and 6).
5. 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. 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. These two factors work in opposite directions, so the net effect is uncertain but probably small. Similarly, 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, cash out may over time lead commuters to own fewer vehicles. Again, the net effect on vehicle trips is uncertain and probably small.
6. Each firm's VTR per *commuter* is multiplied by the firm's attendance rate to obtain the VTR per *employee*, which takes into account vacations, sick days, and other absences from work. The VTR per employee is then multiplied by 252 work days per year (five days per week for 52 weeks, minus the conventional eight national holidays) to find the number of vehicle trips a year per employee. See Shoup (1997, Appendix 2) for an explanation of the difference between the VTR per commuter and the VTR per employee. The weighted average VTR per employee for the 1,694 employees before parking cash out was 0.75 vehicle trips a day per employee, and it fell to 0.67 vehicle trips a day per employee after parking cash out.
7. Southern California Association of Governments (1991). In calculating the VMT reductions associated with reducing a vehicle trip to work, the SCAQMD assumes the average one-way distance for each avoided vehicle commute trip is 15 miles.
8. Southern California Association of Governments (1996).
9. The individual responses to both the 1992 and 1994 surveys were available for Case Study 1. The average distance to work was 14.6 miles in 1992 and fell to 13.9 miles in 1994. This finding of a reduced average distance to work after cash 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 cash 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.

10. Fricker (1986, 34).

11. Fricker estimated an average circuity 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 the trip distances for each solo driver and carpooler were available for Case Study 1, we can estimate the circuity factor for commuters who travel from the same ZIP code. The estimated circuity factor is 1.035, which means that a carpooler travels 3.5 percent farther than a solo driver for the same trip. Fricker estimated circuity for carpoolers traveling to multiple work sites, so there was circuity 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 circuity on the work end of the commute trip. If we assume that half of the trip circuity occurs at the work end and the other half occurs at the home end, we can divide Fricker's circuity factor (1.071) in half, attributing half of the circuity to the home end and half to the work end. This leaves a circuity factor of 1.035; since each of the case studies' commuters all work at the same site, the circuity factor of 1.035 is in line with the previously published data. A circuity factor of 1.035 reduces by less than 1 percent the before-after change in VMT in the case studies, compared to no circuity in carpooling. A low circuity factor is expected because, in forming carpools, commuters (as if led by an invisible hand) naturally seek partners with noncircuitous trips to work. See Shoup (1997, A-21) for a sensitivity test which shows an assumed circuity factor of 1.00 (no circuity) leads to an estimated reduction of 2.32 VMT a day per employee; an assumed circuity factor of 1.12 (significant circuity) leads to an estimated reduction of 2.20 VMT a day per employee. This result implies circuity is a minor factor in estimating the VMT reduced by parking cash out and the effects of circuity in carpooling can be ignored in the present case.

12. Shoup (1997, Table 3-2).

13. Southern California Association of Governments (1996, 5). The survey was not conducted in 1995. The *1996 State of the Commute Survey* was based on a telephone survey of 2,925 commuters who work full time outside the home.

14. Table 4-1 showed that 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. Although Case 1 reduced parking subsidies without increasing rideshare subsidies, this firm experienced the average reduction in drive-alone share for all 1,694 employees. Therefore, this "outlier" case did not influence the average reduction in solo share found for the eight firms. Appendix A explains all the firms' subsidies before and after cash out.

15. 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 emission 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 emission factors from the 7G1.0 model would increase by 12 percent the estimate of vehicle emissions reduced after cash out. Therefore, the procedure used here (with

lower emission factors from the older 7F1.1 model) produces a conservative estimate of emission reductions after cash out. See Shoup (1997, Appendix 2) for a full explanation of the methodology and the emission factors used in this estimation.

16. This description of PM_{10} is taken from the California Air Resources Board's Web site at www.arb.ca.gov/html/brochure/pm10.htm.

17. California Air Resources Board (1990).

18. To 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 the average fuel efficiency of light-duty passenger vehicles in Southern California was 25 miles per gallon in 1996. The estimates of VMT reduced 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 cash out reduced fuel consumption in these earlier years.

19. The full fuel cycle includes the entire set of sequential processes or stages involved in the eventual use of fuel, including extraction, transformation, transportation, and combustion. Emissions generally occur at each stage of the fuel cycle (U.S. Department of Energy 1994, 79).

20. 26 x 19.6 x 1.57 = 800.

21. Chapter 1 showed the model's prediction that every 100 commuters will drive 75 cars to work when offered free parking *without* the option to cash out, and only 56 cars when drivers pay for parking. Shoup (1992, 58-60) showed the model's prediction that every 100 commuters will drive 62 cars per 100 commuters when firms offer free parking with the option to cash it out. Each commuter in the sample reported his or her annual income, which was used to calculate the marginal income tax rate each commuter would have paid on any taxable cash received in lieu of a parking subsidy. Commuters were assumed to react to an opportunity cost of $1 in the same manner as to an out-of-pocket cost of $1; that is, if a commuter forgoes the commute allowance in favor of free parking, that commuter has in effect "spent" the commute allowance on parking. Since the after-tax value of each commuter's parking subsidy is the "price" that commuter would "pay" for "free" parking, the after-tax value of each commuter's current parking subsidy (taking into account each commuter's marginal income tax rate) was used as the price of parking for that commuter to predict each commuter's probability of choosing each mode.

22. Hanemann (1991) explains the endowment effect. Income influences an individual's willingness to accept compensation for forgoing a benefit he or she has rights to receive, while the willingness to pay for the benefit can be strictly limited by income. If the benefit is small in relation to a person's income, however, the income constraint may not be important, although employee-paid parking is in some cases a substantial subsidy in relation to an employee's salary.

23. 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 one will pay for the good and accept for it (Adamowicz et al., 1993). This evidence suggests one's willingness to pay for parking and willingness to accept cash instead of parking will tend to be closer where public 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 drive-alone shares—22 and 16 percent—after cash 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 drive-alone share—8, 7, and 3 percent—occurred in the lower-density areas of Santa Monica and West Hollywood.

24. The firms' voluntary decisions to go beyond mere compliance with the cash-out law 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 only 15 percent of the actual $33 a month increase.

25. Richard Willson (1997) found a similar result in a study of two employers' trip-reduction programs in Glendale, California. For example, Nestlé USA began to charge solo drivers for parking and spent approximately $1 million a year for rideshare incentives—such as free carpool parking and subsidies for vanpool and transit users. The company's *net* saving was $80,000 a year, or $4.76 a month per employee.

26. Reynolds, Masters, and Moser (1998, 397–403) and Leibowitz (1983).

27. Mishan (1973, 60), emphasis in the original.

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

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

30. Cameron (1994), Small (1992), and Deakin and Harvey (1996, 7-8). Deakin and Harvey's estimate included tolls on the arterials and collector streets as necessary.

31. Because the 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 parking cash out.

32. South Coast Air Quality Management District (1995). These values imply a different weighting of emission reductions than implied by the California Air Resources Board's procedure of counting reductions in ROG, NO_x, and PM_{10} as equally valuable, and counting seven grams of CO as equivalent to one gram of the other three emissions.

33. We can also estimate the costs that vehicle emissions impose on society. 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 that Small and Kazimi did *not* estimate 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 is 4.7¢ per VMT, which is close to the SCAQMD numbers. Using other assumptions, Small and Kazimi estimated the cost is as high as 11.9¢ per VMT (for health costs alone). Therefore, the implied emissions-reduction benefit of $33.96 (5.2¢ per VMT) appears reasonable. In their comprehensive survey of the cost of motor vehicle use in the U.S., James Murphy and Mark Delucchi (1998) characterize Small and Kazimi's estimates of the cost of air pollution in Los Angeles as "detailed, original, and conceptually sound" (Murphy and Delucchi 1998, 38).

34. ($99.16 + $24.53) ÷ ($24.53) = 5. Part of the $24.53 transfer payment to commuters who were already ridesharing will in turn be transferred to the federal and state governments as income taxes.

35. This aggregate result masks variation among individual firms. Five firms (2,3,4,6,7) maintained their existing parking subsidies and increased their rideshare subsidies, so income was transferred from firms to nondrivers. Two firms (5,8) reduced their parking subsidies and increased their rideshare subsidies, so income was transferred from solo drivers to nondrivers. One firm (1) reduced its parking subsidy and maintained its rideshare subsidy, so income was transferred from solo drivers to the firm.

36. Similarly, a 1996 survey of 2,925 commuters in Southern California found that 85 percent of white commuters and 84 percent of Asian commuters drove to work alone. In comparison, only 75 percent of Latino commuters and only 66 percent of black commuters drove to work alone. The survey also found that 12 percent of black, 7 percent of Latino, and 1 percent of both Asian and white commuters commuted by bus (Southern California Association of Governments 1996, 24).

37. The 1,694 employees' taxable commuting subsidies rose by $36,026 a month after cash out, or by $432,314 a year. The increase in taxable income was therefore $255 a year per employee. The average marginal income tax rate of all taxpayers in the U.S. who report a positive tax liability, weighted by the number of taxpayers paying each marginal tax rate, was 19 percent in 1996 (Shoup 1997). Using this 19 percent rate, the 1,694 employees' federal income tax payments increased by $82,140 a year, or $48 a year per employee.

38. The 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 revenue rises by one-third of the rise in federal income tax revenue; given the 19 percent federal marginal tax rate, this rule of thumb yields a 6.3 percent marginal tax rate for California.

39. As mentioned earlier, the employer's cost of $24.53 a year per employee must be counted as a benefit to commuters if it is counted as a cost to employers. The total benefits per employee per year are thus $99.16 (for reduced pollution and congestion) + $24.53 (in extra income for commuters) + $65 (for the government), or $188.69. The annual cost per employee is $24.53, and the benefit/cost ratio is $188.69/$24.53, or 7.7-to-1.

40. The *1995 Nationwide Personal Transportation Survey* found commuting VMT was 31 percent of total household VMT (Hu and Young 1999, Table 23), and the *2001 National Household Travel Survey* found commuting VMT was 28 percent of total household VMT (calculated from the travel-day file). Because 95 percent of all commuters park free at work, commuting to free parking spaces accounts for about 27 percent of total household VMT in the U.S. (28% x 95%). Transportation accounted for 67.3 percent of U.S. oil consumption in 2001, and highway transportation accounted for 75.5 percent of U.S. energy consumption for transportation. Therefore, highway transportation accounted for 51 percent of U.S. oil consumption (67.3% x 75.5%), and commuting to free parking spaces accounted for 14 percent of U.S. oil consumption (27% x 51%). See Davis and Diegel (2002, Tables 1.13 and 2.5) for the data on energy consumption for transportation in the U.S.

41. United States Census Bureau (2002a, Exhibits 1, 6, and 9). The U.S. also imported $190 billion of motor vehicles in 2001, which accounted for 14 percent of total imports and equaled 53 percent of the balance of trade deficit. A reduction in the demand for cars can thus further reduce the balance of trade deficit. Total imports were $1.36 trillion, total exports were $1 trillion, and the trade deficit was $358 billion in 2001.

42. Memo from John Anzulis of Pacific Holding Company, October 12, 1992.
43. *Crossroads,* March 1997.
44. This description of the Legislative Analyst's Office is available online at the agency's website at www.lao.ca.gov/LAOMenus/LAOFacts.aspx.
45. California Legislative Analyst's Office (2002, 1). While it was neglecting its responsibility to enforce the cash-out law, the ARB was intently focused on enforcing its electric-vehicle mandate that turned out to be an expensive flop and was later repealed.

CHAPTER 5

Parking Cash Out Compared with Five Alternatives

Senior decision makers think more like Soviet bureaucrats than good economists. They prefer to allocate scarce parking spaces by administrative fiat rather than the market.

—Jonathan Marshall

Three major advantages of parking cash out are its simplicity, effectiveness, and fairness. To show these advantages, we can compare parking cash out with five alternative ways to reduce solo driving to work: (1) offer conventional transportation demand management programs, (2) require employee trip-reduction programs, (3) remove the tax exemption for employer-paid parking, (4) increase the tax exemption for transit subsidies, and (5) tax workplace parking spaces.

ALTERNATIVE 1. OFFER TRANSPORTATION DEMAND MANAGEMENT PROGRAMS

Many firms offer transportation demand management (TDM) programs that aim to reduce solo driving to work. These programs subsidize ridesharing, but they can unintentionally subsidize solo driving even more. When I was on a team that evaluated one well-regarded TDM program in Los Angeles, for example, we found a surprising pattern: lower subsidies for higher occupancy vehicles.[1] The firm running the TDM program paid $100 a month per space to rent parking for commuters. It charged solo drivers $50 a month for parking, charged two-person carpools $25 a month, and allowed larger carpools to park free. Commuters in 10-person vanpools parked free and received $15 a month as well. Transit riders also received $15 a month. This *appears* to promote ridesharing because the price of parking decreased as vehicle occupancy increased. When compared with a policy of *no* commuting subsidies, however, the TDM program actually increased the number of vehicles commuters drove to work.

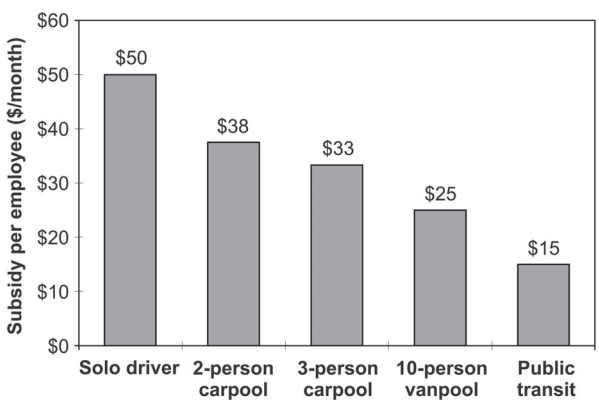
Perverse Incentives in TDM

How could a TDM program increase driving to work? Table 5-1 shows the perverse incentives inherent in this program (and in many similar to it). Because the firm paid $100 a month to rent each parking space, each solo driver received a parking subsidy of $50 a month (columns 4 and 5). Two-person carpools received a subsidy of $75 a month, so each person in the carpool received $37.50 a month. Three-person carpools received a subsidy of $100 a month, or $33.33 a month per person. A 10-person vanpool received a subsidy of $100 a month, and in addition each vanpooler

TABLE 5-1.
DISTRIBUTION OF SUBSIDIES IN A TDM PROGRAM

Travel mode	Market parking price	Parking charge	Subsidy per vehicle	Subsidy per employee	Share of employees	Share of subsidy	Subsidy ratio
(1)	(2)	(3)	(4)=(2)-(3)	(5)	(6)	(7)	(8)=(7)/(6)
Solo driver	$100	$50	$50	$50.00	48%	65%	135%
2-person carpool	$100	$25	$75	$37.50	6%	6%	100%
3-person carpool	$100	$0	$100	$33.33	11%	10%	91%
10-person vanpool	$100	$0	$100	$25.00	16%	11%	69%
Public transit				$15.00	18%	7%	39%

Source: Mehranian, Wachs, Shoup, and Platkin 1987.



was given a cash subsidy of $15 a month, so each person in the vanpool received $25 a month. Finally, each transit rider received $15 a month. Focusing on the *subsidy per employee* (column 5) for each commute mode, we can see the commuting subsidy decreased as vehicle occupancy increased. Commuters who walked or biked to work got nothing.

To evaluate the effects of this program, we compared the mode split of the firm's commuters with the mode split of a similar firm that subsidized neither parking nor ridesharing. While both firms had the same drive-alone share, the firm with the TDM program had more carpoolers and fewer transit riders. In other words, the TDM program—which cost $44,000 a month—simply increased carpooling and vanpooling at the expense of public transit ridership. When compared with the zero-cost policy of no commuting subsidies, the TDM program actually *increased* driving to work.

The structure of the parking subsidies in the TDM program explains why it increased driving. The 48 percent of commuters who drove to work alone received 65 percent of the total transportation subsidy (columns 6 and 7). In contrast, the 18 percent of commuters who rode public transit to work received only 7 percent of the total transportation subsidy. Each solo driver received 135 percent of the average subsidy, while each transit rider received only 39 percent of the average subsidy (column 8). Since the employer gave higher subsidies to commuters in lower-occupancy vehicles, it would be surprising if the TDM program did *not* increase driving to work.

When we presented the results of our study to executives at the firm offering the TDM program, we pointed out that commuters in higher-occupancy vehicles received smaller subsidies. The firm's executives told us we must have misunderstood the program because the higher-occupancy vehicles obviously received higher subsidies. We replied, yes, the higher-occupancy *vehicles* received higher subsidies, but *each commuter* in them received a smaller subsidy. Eventually we agreed to disagree, but during the course of the discussion we learned the firm's tax lawyer had devised the TDM program with "tax efficiency" in mind. Specifically, he did not want to abandon parking subsidies because they are tax-exempt compensation. The lawyer was not self-serving, however; he commuted by train and thus received only $15 a month.

Because most employers offer commuters only the choice between free parking and nothing, this firm's TDM was unusually generous to nondrivers. Solo drivers still received the greatest subsidy, but their share of the total subsidy was smaller than in many other TDM programs. For example, in 1983 the Greater Hartford Ridesharing Corporation surveyed commuter transportation subsidies provided by 11 major firms that together employed 50 percent of the downtown workforce in Hartford, Connecticut. Although only 36 percent of commuters drove to work alone, they collectively received 86 percent of the total subsidies. In contrast, 26 percent of commuters rode the bus to work and received only 4 percent of the total subsidies. On average, the annual subsidy was $716 per solo driver and $50 per bus rider.[2] The distribution of travel subsidies in the Los Angeles TDM program in comparison was certainly more sensible, but the results are bound to be disappointing when TDM programs primarily subsidize parking.

Most TDM programs have three counterproductive characteristics: (1) they offer no subsidy for walking or bicycling to work, (2) they fail to take advantage of the economies of scale in ridesharing, and (3) they reward dishonesty.

Three Problems with Conventional TDM Programs

Most TDM programs have three counterproductive characteristics: (1) they offer no subsidy for walking or bicycling to work, (2) they fail to take advantage of the economies of scale in ridesharing, and (3) they reward dishonesty. These characteristics combine to undermine the effectiveness

of TDM programs, and to produce unintended (but not unpredictable) problems.

No subsidy for walking or bicycling to work. Most conventional TDM programs offer no subsidy for walking or cycling, which are the two most environmentally benign travel modes. If the goal of TDM is to reduce vehicle travel, those who walk or bike to work should receive at least the same subsidy as a solo driver.

Few economies of scale. Because most TDM programs restrict commuters to carpool partners within their own firm, they fail to take advantage of potential economies of scale in carpooling. The firm offering the TDM program described in Table 5-1 had 1,200 employees, but even that large number of potential carpool partners is small relative to the 175,000 office workers who commute to downtown Los Angeles. Furthermore, most firms employ far fewer than 1,200 employees.

Carpooling benefits from economies of scale: if more people are searching for a carpool partner, it is easier to find one. And to find a suitable match in terms of origin, destination, work schedule, personality, and other factors, you need a large population of potential carpoolers. Because employer-based TDM programs restrict the pool of potential carpoolers to fellow employees of the same firm, they inevitably lead to less carpooling than can be achieved if all commuters in a region were offered the option to cash out their parking subsidies.

Incentives for dishonesty. Conventional TDM programs may invite some commuters to lie to their employers. If a solo driver persuades a cyclist or transit rider to sign up as a "carpool" member, the solo driver gets a free or discounted parking space. Most people familiar with rideshare programs are aware of this "phantom carpool" problem. As an illustration, after I made a presentation at the U.S. Department of Transportation headquarters in Washington several years ago, a staff member gave me a ride to my hotel. When I asked him how much he paid to park, he blushed, confessing he got his parking space free by forming a phantom carpool with two transit riders. "Everyone does it," he admitted.

By allowing everyone to cash out their parking subsidies, cash out gives everyone (including those who walk or bike) the same subsidy regardless of how they travel.

Parking Cash Out Solves These Problems

Parking cash out solves several problems associated with conventional TDM programs. By allowing everyone to cash out their parking subsidies, cash out gives everyone (including those who walk or bike) the same subsidy regardless of how they travel. Thus the subsidy *per person* does not decline with higher-occupancy vehicles, as it does in the TDM program shown in Table 5-1. Second, parking cash out gives commuters the option to take their parking subsidy in cash and use the money to carpool with employees of other companies in the region. Parking cash out therefore increases the pool of potential carpool partners, which leads to more carpooling than would occur if commuters were subsidized only for carpooling with fellow employees of the same firm. Third, parking cash out creates no incentive to game the system at the expense of others; commuters get either a parking subsidy, a transit subsidy, or cash, and there is no need to dissemble. Ensuring that a TDM program works as intended is therefore far less complicated with parking cash out than with other rideshare incentives.

ALTERNATIVE 2. REQUIRE EMPLOYEE TRIP-REDUCTION PROGRAMS

If employers do not voluntarily offer TDM programs, governments can impose trip-reduction mandates of the sort implemented in Southern California in 1988.[3] To reduce vehicle emissions, the South Coast Air Quality Management District (SCAQMD) requires employers of more than 250 employees at

any work site to submit a plan to increase the Average Vehicle Ridership (AVR) of the commuter vehicles arriving at the site. The target AVR varies by the firm's location: 1.75 persons per vehicle in the Los Angeles Central Business District (CBD); 1.5 for the medium-density areas outside the CBD; and 1.3 for outlying areas. The employer is free to choose whatever method it likes to reach the required target, so long as the method is approved by the SCAQMD (which must deem it reasonably certain of success).[4]

At first glance, allowing firms to select whatever incentives they prefer in order to reduce vehicle trips may seem better than requiring cash out. Some firms, for example, may wish to offer transit passes, to let employees telecommute, or to offer preferential parking for carpools. But as with any government intervention, cost-effectiveness is an important issue. In 1992, the SCAQMD commissioned the accounting firm of Ernst & Young to survey Southern California's 5,763 regulated work sites (with a total of 1,541,000 employees) to estimate (1) the annual TDM costs incurred by employers and (2) the resulting reduction in the number of peak-hour automobile trips. According to the results, the employers spent an average of $105 a year per employee to comply with the mandate and reduced one peak-hour automobile commute trip for every 29 employees. Employers therefore spent approximately $3,000 a year for every peak-hour car trip reduced—an astonishingly high price.[5]

Ernst & Young found that while the employers' annual costs ranged widely—from less than $25 to more than $750 per employee—the coefficient of correlation between the cost of the program and the resulting reduction in vehicle trips was only 0.17. The variation in spending thus explained only 3 percent of the variation in trip reductions. Higher spending, in other words, did not necessarily lead to fewer trips. And why not? One probable explanation is that reducing automobile commuting is much more expensive at some sites than at others, but equivalent reductions are mandated at all of them. Money must therefore be spent everywhere, rather than only in those places where it is likely to do the most good.

To illustrate this point, consider the cost-effectiveness differences of TDM programs at downtown and suburban locations. If a firm in a downtown office building offers TDM subsidies, it saves the cost of an expensive parking space when a commuter shifts from solo driving to ridesharing. But if a firm at a suburban site with ample free parking subsidizes ridesharing, it saves nothing when commuters shift away from solo driving, so the subsidy becomes a net cost increase. Furthermore, even large subsidies for ridesharing at a suburban site may not reduce solo driving if the area has poor transit access and a low density of potential carpool partners. Compared with the relatively small amount of money that can shift commuters away from solo driving downtown, spending a large amount of money for TDM at suburban sites goes essentially to funding an unwinnable battle. Despite this problem, the SCAQMD mandates trip reductions even where they are extremely expensive to achieve. In contrast, parking cash out provides the strongest incentive to rideshare at locations where parking is most expensive, which is exactly where congestion and pollution problems are usually worst and mass transit is most accessible. Parking cash out at these sites will increase ridesharing at low cost to the employer and will thus be cost-effective. Cash out may not help in suburban areas where the market price for parking is zero but (unlike other TDM strategies) at least it won't cost anything.

Cash out may not help in suburban areas where the market price for parking is zero but (unlike other TDM strategies) at least it won't cost anything.

Many required TDM programs also involve a considerable administrative burden. Kenneth Green, for example, studied one TDM program offered to comply with the SCAQMD's trip-reduction requirement and found spending on administration (for salaries, equipment, facilities, travel,

and training for the firm's transportation coordinators) consumed 72 percent of its budget while only 28 percent reached commuters as incentives and subsidies.[6] The firm spent $1.3 million to encourage ridesharing in 1992 and 1993, but ridesharing among its employees declined during these two years. In contrast, the case studies of parking cash out found the administration costs were negligible, almost all the firms' spending reached commuters as rideshare subsidies, and ridesharing increased significantly as a result.

ALTERNATIVE 3. REMOVE THE TAX EXEMPTION FOR EMPLOYER-PAID PARKING

The tax-exemption for free parking clearly subsidizes solo driving to work. If the goal is to reduce solo driving, it seems sensible to remove this tax exemption. It would be politically difficult, however, to begin taxing a fringe benefit so many commuters enjoy: among the 91 percent of commuters who drive to work, about 95 percent park free when they get there. Any proposal to tax this traditional fringe benefit would arouse public outrage, especially since so many influential decision makers in the highest tax brackets themselves receive large parking subsidies. Removing the tax exemption for employer-paid parking would be good transportation and tax policy, but the only successful step in this direction so far has been to cap the tax-exempt subsidy amount. The cap, which is indexed for inflation, was $195 a month in 2004. Because most employer-paid parking subsidies are less than $195 a month, however, the cap affects only a few commuters.

Requiring parking cash out is at least an intermediate step toward reforming the tax exemption for employer-paid parking, with both transportation and revenue benefits. The cash option will both reduce solo driving and increase the tax base when commuters trade tax-exempt free parking for taxable cash. The "sunshine" feature of cash out will also inform commuters and policy makers about the cash value of existing parking subsidies, which can now be estimated only roughly. This information may lead employers to rethink their commuter subsidies; when employers begin to offer cash out, they tend to offer the same subsidy to all commuters.

If employer-paid parking remains tax-exempt, perhaps the tax exemption for employer-paid transit passes should be increased.

ALTERNATIVE 4. INCREASE THE TAX EXEMPTION FOR TRANSIT SUBSIDIES

If employer-paid parking remains tax-exempt, perhaps the tax exemption for employer-paid transit passes should be increased. The tax exemption for employer-provided transit passes and vanpool subsidies was limited to $100 a month in 2004 (a little more than half the tax exemption for parking subsidies). Raising this exemption would make it tax-efficient for employers to offer larger transit and vanpool subsidies to counterbalance the large parking subsidies they also offer.

Although raising the tax exemption for transit and vanpools seems fair and reasonable, this policy has three drawbacks: (1) it would reduce federal and state income taxes, (2) it would do little to counteract the influence of parking subsidies, and (3) public transit is already seen as a heavily subsidized mode, while the much larger subsidies to parking are hidden and ignored. Although most transit passes cost less than $100 a month (less than the current tax exemption), employers offer transit subsidies to only 3 percent of workers in the United States.[7] Increasing the exemption, then, seems unlikely to affect most commuters. If employers do not take advantage of a tax exemption covering the entire cost of most transit passes, there is no reason to believe a larger exemption will change their behavior. A parking cash-out requirement, however, will give all commuters the option to convert their parking subsidies into transit subsidies, which

employers can offer on a tax-exempt basis up to $100 a month. Parking cash out will therefore increase transit ridership by much more than would an increase in the tax exemption for transit subsidies. When more transit riders begin to bump up against the $100-a-month limit on the tax exemption for their commuting subsidies, the case for raising the exemption will grow stronger.

ALTERNATIVE 5. TAX WORKPLACE PARKING SPACES

Another possible alternative to a parking cash-out requirement would be to tax parking spaces directly. Many American cities, such as San Francisco and Los Angeles, have parking taxes, but none applies specifically to commuter parking spaces. In 2000, the U.K. gave local authorities the power to tax workplace parking spaces, and the policy is being considered in several cities.[8]

Although a tax on workplace parking spaces may seem a promising way to reduce solo driving to work, the policy has several flaws. To begin with, the U.K.'s policy of exempting employer-paid parking from income taxation at the national level and then encouraging local authorities to tax commuter parking spaces is contradictory, to say the least. A more direct policy would be to remove the tax incentive for free parking at work. Furthermore, requiring developers to provide on-site parking spaces and then taxing these parking spaces to offset the resulting increases in traffic congestion is also contradictory. Removing the off-street parking requirements or limiting the number of parking spaces, would be far simpler and would in addition lead to denser, more vibrant land-use patterns. Finally, levying a tax on parking spaces does not guarantee employers will pass the tax along to commuters. And if the tax did increase the price of commuter parking, it would actually increase the advantage of tax-exempt employer-paid parking: the more parking costs, the greater the advantage of offering the available parking spaces as a tax-exempt fringe benefit. Although workplace parking levies will clearly raise revenue, they are at best a very indirect way to reduce traffic congestion and will leave many parking spaces free to the solo drivers who use them. The primary goal of workplace parking levies may indeed be to raise revenue with the secondary goal of reducing traffic congestion being used as the justification.

Although a tax on workplace parking spaces may seem a promising way to reduce solo driving to work, the policy has several flaws.

Although a workplace parking levy is not a good *substitute* for parking cash out, it can be a good *complement*. The British government's 1998 White Paper on the proposed tax explains, "in the past, development was allowed with extensive parking provision, considerably in excess of the standards advocated in current Government practice."[9] Stating that excess parking was previously *allowed* when in fact it was *required* by local governments is misleading. Nevertheless, workplace parking levies accompanied by removal of off-street parking requirements would reduce the parking supply and thereby begin to reverse the damage done by previous mistakes in planning policies.

THE BRIGHTEST AND THE BEST

In contrast with these five alternative policies, parking cash out simplifies life for commuters and employers. Jonathan Marshall of the *San Francisco Chronicle* explains how nonmarket methods of allocating scarce parking spaces can create confusion, inefficiency, and even real hardship for employees. To illustrate this problem, he describes the parking policies at one of the nation's great academic research centers—the Lawrence Berkeley Laboratory (see sidebar). As Marshal makes clear, even the brightest employers create many unfortunate but not unforeseeable problems when they resist using prices to allocate parking spaces.

PARKING WOES BAFFLE UC SCIENTISTS

By Jonathan Marshall
Economics Editor, *San Francisco Chronicle*, November 26, 1992

Some of the brightest minds in the world work at Lawrence Berkeley Laboratory in the hills above the main University of California campus. From theoretical physics to nuclear chemistry, few problems faze them. But one challenge confounds even the greatest intellect: parking.

The lab has fewer than 1,900 parking spaces to serve a staff that varies between 3,000 and 4,000. After angering staff members for a decade, the daily frustration of too many cars chasing too few spaces provoked a stormy battle with the lab's directors this fall—without being resolved.

In a sense, the parking flap offers a lesson in simple economics for the world-class scientists.

True to the age-old laws of supply and demand, when goods are underpriced or free, demand usually outstrips supply and queues form. Without prices to assess the true value of a resource—in this case, parking—people will not use it efficiently.

Lab employees tell endless stories about the enormous price that parking woes exact in lost time, mounting irritation and even paranoia and about the failure of bureaucratic schemes to make even a dent in the problem.

When the lab's associate director, Rod Fleischman, issued an edict last September to "solve" the problem by revising the rights of 24 different classes of lab users, a raucous protest beat him down and new regulations were largely rescinded, leaving many of the old problems in place.

Now, the administration doles out the best spaces to senior staff members on the basis of a pay-and-status formula that a lab spokesman said is too arcane even to attempt explaining to an inquiring reporter.

"God forbid you should need to move your car," says Lynn Yarris, a lab spokeswoman. "If you get a phone call saying your kid has lost an arm, you try to put them on hold until the end of the day."

Consensus on a solution remains as elusive as the quark.

But some lab employees have begun arguing that parking is not first and foremost an administrative issue or social issue, but an economic problem.

Communism vs. Free Market

The reason for all the discontent, according to these critics, is that senior decision makers think more like Soviet bureaucrats than good economists: They prefer to allocate scarce parking spaces by administrative fiat rather than the market.

"We all know that communism and control by scarcity isn't as effective as competitive pricing," says Art Rosenfeld, a renowned expert on energy conservation who expends considerable energy of his own prodding higher-ups on the issue.

Rosenfeld proposed that the administration charge enough for parking to balance supply and demand. Parking close to major buildings could cost more than distant spaces. Fees would be adjusted to leave a small percentage of spaces generally open, to accommodate unexpected demand and the needs of those who leave the lot temporarily.

Getting Squatters Out

A pay system lets you do errands and reserve spaces," he says. "The only way to get squatters out is to charge high prices."

Like many staff members, Rosenfeld's assistant, Debbie Giallombardo, curses the current system but fears that parking fees would simply further tax her modest salary. "I'm already trashed enough by the lab," she complains.

Rosenfeld's answer is to rebate equally to all employees whatever revenue the system generates so lower-paid members of the staff would not suffer financially. "If I pay a lot of money to reserve a space, others will get a rebate," he says.

Affluent employees would be in a position to afford the best parking, he concedes, but at least they would have to pay for the privilege.

Parking charges would also encourage more employees to take BART or AC Transit and ride the lab's transit shuttle to work, Rosenfeld notes.

Wasting Time

For now, the lab is hanging tough with its plan to continue offering free parking. The administration hopes to relieve congestion by taking away the parking rights of new graduate students, a move that one senior lab scientist warned in a recent memo would "penalize, and waste the time of, one of the most productive parts of the (lab) population."

But the lab has not ruled out charging for parking "if this doesn't make a substantial improvement," said lab spokesman Art Tressler. While the review continues, meanwhile, so does the complaining.

Says Giallombardo: "It's amazing that this one little issue can cause so much commotion."

The parking woes at the Lawrence Berkeley Laboratory continued unabated from 1992 (when Marshall wrote his article) until 1997, when a new parking director was appointed. Parking remains free for all employees, and it is still distributed according to rank, but the "shortage" has been solved by removing permits for new graduate research assistants; all students who already had permits were "grandfathered," but the natural turnover of research assistants eventually phased out their permits. The senior scientists successfully dodged a market solution to their parking problem.

CONCLUSION: TRUTH IN TDM

California's parking cash-out law merely requires employers to treat a nondriver at least as well as a solo driver. Any travel subsidy goes either for a free parking space, or for in-lieu cash for a commuter. In contrast, many so-called TDM programs offer free parking to solo drivers, smaller subsidies for commuters who carpool or ride transit, and nothing at all for those who walk or bike to work. Therefore, one simple (although indirect) function of a parking cash-out requirement is to expose the muddle of many well intentioned but misguided TDM programs. Advocating ridesharing while offering free parking is like denouncing smoking while offering free cigarettes. We will never reduce traffic congestion, air pollution, and energy consumption if we continue to offer free parking and call it transportation demand management.

ENDNOTES

1. Atlantic Richfield, a firm nationally recognized for promoting ridesharing, offered the program in downtown Los Angeles. See Mehranian, Wachs, Shoup, and Platkin (1987) for the evaluation. Atlantic Richfield was subsequently acquired by BP Amoco.
2. The purpose of the survey was to estimate the firms' expenditures on subsidies to each mode of commuter transportation. Firms reported their expenditures for parking facilities (including the ownership cost, leasing cost, and maintenance cost), for carpool incentives, for vanpool services, and for bus programs. They also reported payments made by employees for each of these categories. The difference between the firms' cost and the employees' payment was then calculated as the firms' subsidy for each mode. Solo drivers received the lion's share of transportation subsidies because six of the firms offered free parking, four firms offered subsidized parking, and only one firm did not subsidize parking. The average market price for parking in downtown Hartford was $58 a month. The firms' total annual expenses for parking were $10.7 million, but commuters paid only 7 percent of that amount; firms subsidized the other 93 percent of the cost of parking.
3. The federal 1990 Clean Air Act Amendments included a mandate similar to the one in California , but it was repealed in 1995. Rutgers law professor Craig Oren (1998a,b,c) explains the many problems with the federal mandate and why it was repealed.
4. The regulation is available online at www.aqmd.gov/trans/rideshare.html.
5. Although this estimate was derived from a survey and must be treated with caution, the SCAQMD sponsored and published the study, which suggests $3,000 a year per reduced vehicle trip does not greatly overestimate the cost of complying with the SCAQMD's mandate. Because some trips were merely shifted from the peak to off-peak rather than shifted from an automobile to another travel mode, the cost per car trip reduced was even greater than $3,000 a year.
6. Green (1994, 56).
7. United States Census Bureau, *2003 Statistical Abstract of the United States* (Table 648). The share of workers with access to subsidized transit passes declined from 4 percent in 1999 to 3 percent in 2000.

8. Ison and Wall (2000). The Transport Act 2000 authorized the workplace parking levies.
9. United Kingdom Department for Transport (1998, Chapter 4).

CHAPTER 6

The Politics of Parking Cash Out

Policy is negotiated, not formulated.
—David Jones

If the benefits of parking cash out far exceed the costs, why must California *require* firms to offer cash-out programs? Why don't firms do it voluntarily? This chapter explains why California adopted its cash-out law and proposes two minor changes in the Internal Revenue Code that would encourage all employers to offer parking cash out.

RATIONALE FOR A CASH-OUT REQUIREMENT

Individually rational behavior sometimes leads to collectively undesired outcomes. Problems stemming from the divergence between individual and collective interests have been variously referred to as free-rider problems, public-goods problems, the prisoners' dilemma, or the tragedy of the commons. As Harvard economist Thomas Schelling writes:

> 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.[1]

Employers may not realize free parking increases traffic congestion and air pollution or that parking cash out would help solve these problems. And even if employers do know parking cash out reduces traffic congestion and air pollution, these benefits accrue to everyone in a region, not exclusively to each individual employer who offers cash out. Individual employers cannot be expected to consider regional benefits when deciding how to structure compensation for their employees. Employers won't consider themselves better off if they are the only ones to offer programs benefitting the whole region, and they may even consider themselves worse off because they have to pay the cost. We can therefore interpret a cash-out requirement as a social contract that reduces traffic congestion and improves the region's environment, including the business climate: all firms are better off if they cooperate than if they go their separate ways. These regional benefits are the primary economic rationale for California's cash-out law. The law does not prohibit, tax, or even discourage employer-paid parking. Instead, it requires employers who subsidize parking to offer commuters the fair-market value of that subsidy in cash.

We can therefore interpret a cash-out requirement as a social contract that reduces traffic congestion and improves the region's environment, including the business climate: all firms are better off if they cooperate than if they go their separate ways.

WHY CALIFORNIA ENACTED THE PARKING CASH-OUT LAW

California enacted its parking cash-out law in 1992, shortly after the U.S. Department of Transportation published the report on *Cashing Out Employer-Paid Parking*.[2] For a transportation policy, this transition from recommendation to legislation was amazingly fast. Other transportation pricing reforms—such as congestion tolls and emissions fees—have been thoroughly studied and widely recommended for many years but adopted in only a few cities. Why was parking cash out enacted so quickly? Four aspects of the cash-out policy contributed to its political appeal. Specifically, it is (1) incremental, (2) potentially Pareto optimal, (3) efficient, and (4) fair.

Incremental Change

Problem solving often entails finding the next feasible step toward an ultimate goal, and parking cash out is not revolutionary. Instead, it is a modest move toward efficient transportation pricing and requires little change in the way most employers conduct their business. Employers can continue to offer tax-exempt parking subsidies as long as they allow commuters to choose taxable cash instead. Commuters can continue to park free if they drive to work but also gain a new option: additional income if they choose alternative transportation.

Legislative hearings on the proposed cash-out requirement led to an important feature of the law ultimately enacted. Critics pointed out that

since cities require developers to provide on-site parking, the state should not require employers to pay commuters not to use the required spaces. This argument led the legislature to exempt employers who own their own parking spaces, as well as employers who have a long-term parking lease that does not allow them to reduce the number of spaces they rent. The cash-out requirement therefore applies only to employers who rent a variable number of parking spaces from a third party, and as a result the employer breaks even when a commuter forgoes a rented parking space and takes the cash instead.

Pareto Optimality

Parking cash out makes many people better off while making few, if any, worse off. Commuters are better off because they get a flexible new fringe benefit, one that allows each person to choose the commute option best for her or him. Employers are better off because offering the new fringe benefit costs them little or nothing, and helps to attract and retain workers. The government is better off because tax revenues increase with no change in the tax rates. Finally, society is better off with less traffic and cleaner air.

Economists describe a change as "Pareto optimal" if it makes some people better off without making others worse off—a great asset in public policy. At one California Assembly hearing where I proposed parking cash out, a burly union official spoke just after me. He began by saying he knew of cases where a whole factory would go out on strike if the employer removed a Coke machine from the shop floor. He also told the Assembly Members that free parking for workers is a nonnegotiable right. I was relieved, however, when he concluded, "But I like what the professor just said." He liked the idea workers would continue to get free parking if they drive to work but could also cash it out and spend the additional income however they wanted. Offering the option to cash out free parking means a commuter who takes the free parking in effect pays for it by forgoing the cash, but this situation did not bother him because it provides a new benefit without taking away an old one. Just as greater flexibility and expanded choice are assets in labor negotiations, "parking cash out" sounds much better than "charging for parking." Most policies, however good, will harm a few people, while other policies, however awful, will help a few people. Parking cash out, however, comes close the desired but elusive goal of Pareto optimality.

Parking cash out makes many people better off while making few, if any, worse off.

Efficiency and Equity

Parking cash out creates a large efficiency gain consisting of (1) the public benefits of reduced congestion and air pollution, (2) increased welfare for commuters who cash out their parking subsidies at no additional cost to their employers, and (3) increased tax revenue. The eight case studies discussed in Chapter 4 found the benefit/cost ratio of parking cash out was at least 4-to-1, and probably much higher, making it a very efficient policy.

A standard practice in benefit-cost analysis is to focus on efficiency and to neglect transfers that redistribute the economic pie without increasing its size. From a political perspective, however, distribution and equity are often paramount. Although the redistribution associated with parking cash out is minor (consisting mainly of the cash payments to commuters who were previously offered a parking subsidy but did not drive to work), it contributed significantly to parking cash-out's political success.

When I testified at a California Senate hearing, the issue that aroused the legislators' greatest interest in parking cash out was not its economic efficiency but rather its equity implications. As described in Chapter 4,

employer-paid parking not only favors solo drivers but also embodies an inherent bias against women and minorities. In the one case study where data were available on the commuter's gender, for example, 78 percent of men and only 62 percent of women drove to work alone before the employer began to offer parking cash out. Employer-paid parking therefore oversubsidized men and discriminated against women. In general, employer-paid parking discriminates against any group of workers—defined by gender, ethnicity, income, age, or any other demographic factor—who drive to work less than others do. Offering commuters the option to cash out employer-paid parking treats all workers equally, which is a powerful political argument in favor of the cash option.

Parking cash out can also promote equity because revealing the explicit cash value of employer-paid parking exposes the distribution of commuting subsidies. Before cash out, for example, some of the case-study firms in Chapter 4 offered higher (but hidden) parking subsidies to higher-paid staff. In contrast, although California's cash-out law does not *require* firms to offer a uniform transportation benefit to all commuters, all eight firms chose to do so after cash out highlighted the size and distribution of the firms' parking subsidies. When subsidies are hidden, so too are the imbalances between them, and these imbalances do not have to be justified. When the subsidies are out in the open, however, inequality is apparent and the prospect of justifying it is uncomfortable at best; it is far easier, as in these cases, to remedy the imbalance by treating everyone the same.

These features of parking cash out—incremental change, Pareto optimality, efficiency, and equity—help explain *why* California enacted its parking cash-out requirement. *How* it enacted the requirement is another story.

In general, employer-paid parking discriminates against any group of workers—defined by gender, ethnicity, income, age, or any other demographic factor—who drive to work less than others do.

HOW CALIFORNIA ENACTED THE PARKING CASH-OUT LAW

Four factors contributed to the passage of California's cash-out law: (1) prior research consistently showed employer-paid parking increases solo driving, (2) a precedent suggested the cash-out requirement was legal, (3) university researchers worked closely with state officials to develop the proposal, and (4) the legislative drafters negotiated with employers to resolve objections and forestall potential opposition to the law.

Research

Research has consistently shown that employer-paid parking increases solo driving to work. The studies summarized in Table 1-2, for example, show employer-paid parking stimulates, on average, a 36 percent increase in driving to work. The accumulated evidence convinced more and more people employer-paid parking increases traffic congestion, fuel consumption, and air pollution.

Precedent

Los Angeles's Transit Subsidy Ordinance, enacted in 1989, provided a legal precedent for California's parking cash-out requirement. This ordinance requires employers who subsidize parking for *any* employee to offer a $15-per-month transit subsidy to *all* employees who do not drive to work. If a city can enact such a requirement, a state should likewise be able to require employers to offer cash in lieu of a parking subsidy.

Cooperation

Although research results and legal precedents helped build the case for parking cash out, it was cooperation between academics and bureaucrats that put parking cash out on California's legislative agenda. The Public

Policy Program of UCLA Extension sponsors an annual conference at Lake Arrowhead to examine the interrelationships among transportation, land use, and the environment. This conference regularly attracts academics, elected officials, agency administrators, union leaders, business representatives, and environmental activists to discuss policy problems and propose potential solutions. I presented a preliminary version of the parking cash-out proposal at one of these conferences in 1988 and received valuable feedback in the form of questions and concerns from the politicians and employers who attended. I then revised the proposal to address these concerns. As a direct result of the cooperation and communication fostered by these conferences, the cash-out bill was eventually enacted in 1992 as Assembly Bill 2109. The bill was introduced by Assemblyman Richard Katz, chairman of the Assembly Transportation Committee, whose chief aide, John Stevens, participated in the conference that debated the original cash-out proposal.

Negotiation

In discussing the first draft of the cash-out legislation, employers pointed out that because cities require developers to provide ample on-site parking for all new buildings and the cost is typically embedded in the lease rates for the buildings, the state should not require employers to offer commuters cash for not using these spaces. In response, the cash-out requirement was scaled back to apply only to employers who rent parking spaces from a third party. Furthermore, a provision was added to require local governments to reduce parking requirements when a developer implements cash out. These amendments ensured the cash-out requirement would not be an unfunded mandate for employers. Instead, parking cash out became a self-funding program because employers who pay nondrivers in lieu of parking save money on the reduced cost of rented spaces.

Parking cash out became a self-funding program because employers who pay nondrivers in lieu of parking save money on the reduced cost of rented spaces.

With these amendments to the original cash-out proposal, the Senate passed the bill with a large bipartisan majority. The Assembly, on the other hand, passed it on a strict partisan vote.[3] When I later asked a Republican member of the Assembly why he opposed the market-oriented bill, he said the vote came late in the year and no one had adequate time to study it. After I explained the law, he liked it and said he would have supported it had he understood it.

When the bill reached Republican Governor Pete Wilson, his aides in the Office of Policy Research were initially concerned the bill would intrude into collective bargaining and employers' decisions regarding employee compensation. Nevertheless, his advisors in the Department of Transportation and the Air Resources Board (some of whom had attended the Lake Arrowhead conference) supported the bill. In addition, the lobbyists who had initially testified against earlier drafts of the bill also reported the bill had been sufficiently amended to address their objections. Governor Wilson signed the legislation in fall 1992.

FAILED ATTEMPT TO REPEAL THE CASH-OUT LAW

Although California enacted its parking cash-out law in 1992, two arcane rules in the Internal Revenue Code hampered the program until 1998 (see Chapter 3). These tax rules prevented California from enforcing the law and discouraged employers from complying with it because doing so would have caused large tax increases for both employers and employees. This lack of enforcement and compliance gave the impression the law wasn't working. Some employers also expressed concerns that betrayed a serious misunderstanding of what the law actually required. For example, in 1997 the California Chamber of Commerce wrote:

> The program does not consider the different circumstances under which small businesses operate. In particular, small businesses that are located in rural areas are not able to provide an incentive for employees to take public transportation because the area may lack infrastructure.[4]

Concern that the law will harm small businesses in rural areas seems far-fetched because the cash-out requirement applies only to employers who: (1) have 50 or more employees, (2) rent parking spaces, (3) can reduce what they pay for these parking spaces if a commuter chooses cash, and (4) are located in an area that violates the state's air pollution standards. Not surprisingly, the Chamber of Commerce failed to respond when it was asked to identify a single small business in a rural area that would be subject to the cash-out requirement.

Another business lobby, the Council for Environmental and Economic Balance (CEEB), expressed similarly far-fetched concerns. It wrote:

> Where collective bargaining agreements exist which require the employer to provide free parking for employees, the collective bargaining agreement conflicts with a mandatory cash-out program.[5]

But the cash-out law requires only that employers who provide free parking must also offer the option of cash in lieu of the free parking. This does not conflict with a collective bargaining agreement to provide the free parking itself. CEEB did not respond when it was asked to identify a single collective bargaining agreement that prohibits offering commuters the option to take the cash value of free parking.

In 1996, an attempt was made to repeal the state's parking cash-out law. A Senator from Orange County introduced a bill (SB 731) with two goals: (1) to repeal the parking cash-out law and (2) to permit "the burning, in a respectful and dignified manner, of an unserviceable American flag that is no longer fit for display." Although these two issues seem unrelated, they were joined in one bill because both parking cash out and flag burning affect air quality. Perhaps joining the two issues was also meant to suggest that parking cash out was un-American and that repealing it would be a patriotic gesture, but the two issues were eventually divided into separate bills. The legislature enacted the flag burning law by a unanimous vote but did not repeal the cash-out requirement.[6]

Other states could enact cash-out laws similar to California's, but a better approach is to amend the federal Internal Revenue Code in two simple ways.

REQUIRE CASH OUT AS A CONDITION FOR TAX EXEMPTION

Other states could enact cash-out laws similar to California's, but a better approach is to amend the federal Internal Revenue Code in two simple ways: (1) require cash out as a condition for tax-exempt employer-paid parking and (2) allow the inclusion of employer-paid parking in "cafeteria plans" for fringe benefits.

Although the tax code now allows parking cash out, it still favors solo driving to work because employer-paid parking is tax exempt while the in-lieu cash is taxable. When all the avoided federal and state income and payroll taxes are considered, the tax exemption for employer-paid parking typically saves employers and employees about 42 percent of the cost of parking at work.[7] This large tax saving shows why employer-paid parking is such a "tax-efficient" fringe benefit. Firms strive to maximize their *after-tax* income, and a culture of tax efficiency now permeates much private behavior. Firms that offer free parking are simply carrying out a policy embedded in the Internal Revenue Code. The *tax code* is flawed, not the employers' or their employees' behavior. It should not be necessary for every state to enact a parking cash-out requirement to counteract a damaging incentive in the federal tax code.

A minor 22-word amendment to the federal tax code will solve this problem. Parking cash out can be required by putting a condition on the Internal Revenue Code's definition of parking subsidies that qualify for a tax exemption: specifically, employer-paid parking should be treated as a tax-exempt fringe benefit only if commuters have the option to cash it out. The nonitalic text quoted below is the existing definition of employer-paid parking that qualifies for a tax exemption, and the *italic* text is my proposal:

> Section 132(f)(5)(C): QUALIFIED PARKING – The term "qualified parking" means parking provided to an employee on or near the business premises of the employer . . . *if the employer offers the employee the option to receive, in lieu of the parking, the fair market value of the parking.*

If this minor amendment is adopted, *employers* will decide whether their parking subsidies are tax exempt. If an employer offers commuters a fair deal—free parking *or* its fair market value—the free parking will remain a tax-exempt benefit. Commuters can continue to park free, or they can convert the tax-exempt free parking into a transit subsidy. They can also take cash in lieu of the parking, pay taxes on the additional income, and use the remaining after-tax cash for any purpose they choose. But if an employer offers commuters an unfair deal—free parking or nothing—the free parking does not merit a public subsidy and should not receive a tax exemption.

This amendment will give commuters more travel choices and will reduce the economic and environmental costs of employer-paid parking. Commuters who trade their free parking for public transit or cash will not only help themselves but also reduce traffic congestion and air pollution for everyone else. The amendment will also significantly increase income tax revenue when commuters voluntarily choose taxable cash in lieu of tax-exempt free parking.

If an employer offers commuters an unfair deal—free parking or nothing—the free parking does not merit a public subsidy and should not receive a tax exemption.

Note that I do *not* propose to tax the value of employer-paid parking. Instead, I propose to place an important condition on the tax-exemption for employer-paid parking. This condition will not prohibit, tax, or even discourage employer-paid parking, but it *will* level the playing field between solo driving and other methods of commuting. It will also align private incentives with the public interest: firms can continue to offer tax-exempt free parking, but the new cash option will reduce traffic congestion, air pollution, and energy consumption.

There is a subtle but essential difference between *eliminating* the tax exemption for employer-paid parking and requiring the cash-out option as a *condition* for the tax exemption. Free parking without the cash option explicitly discriminates in favor of solo drivers and implicitly discriminates against both women and minorities. This discriminatory offer does not merit a tax exemption. But that is no reason to remove the tax exemption for *all* employer-paid parking. Employers can easily offer commuters the choice between free parking *or* its fair-market value, and free parking offered in this way does merit a tax exemption. Because the cash-out condition is so easy to meet, most employer-paid parking will remain a tax-exempt benefit. Nevertheless, the cash-out condition has several key advantages. First, it will remove much of the unfairness and inefficiency associated with employer-paid parking. Second, it will automatically apply to all employers. Third, a proposal to put a fair condition on the tax exemption is politically much easier to defend than would be a proposal to repeal it outright.

The Fair-Market Value of Employer-Paid Parking

The Internal Revenue Service has already issued its rule for determining the fair-market value of employer-paid parking. In general, the fair-market value

THE FAIR MARKET VALUE OF EMPLOYER-PAID PARKING

Generally, the value of parking provided by an employer to an employee is based on the cost (including taxes or other added fees) that an individual would incur in an arm's-length transaction to obtain parking at the same site. If the cost is not ascertainable, then the value of parking is based on the cost that an individual would incur in an arm's-length transaction for a space in the same lot or a comparable lot in the same general location under the same or similar circumstances . . . . Employer-provided parking that is available primarily to customers of the employer, free of charge, will be deemed to have a fair market value of $0.

Source: Internal Revenue Service Notice 94-3, p. 330.

of employer-paid parking is the cash value that would be paid in an arm's-length transaction to obtain parking at the same site or at a nearby site (see sidebar).[8]

Despite this clear definition of employer-paid parking's fair-market value, collecting the income taxes due on parking subsidies exceeding the tax-exempt cap has been difficult, even from federal employees. For example, in 1994 the *New York Times* reported:

> In a true arm's-length transaction, based on what a parking space might go for at auction, the outdoor spots on West Executive Avenue next to the White House, where the really important people park, are probably worth thousands of dollars a month. But that is beside the point. Surely no one will ever be required to make that calculation. Asked about this on the day after an ice storm last week, Laura D'Andrea Tyson, the chair of President Clinton's Council of Economic Advisors, said "You see me scraping the ice last night, and you tell me that this is worth more than $155."[9]

Tyson was supposed to pay income taxes on the value of her free parking above the tax-exempt value of $155 a month. If even the chair of the President's Council of Economic Advisors will not admit the fair-market value of her free parking space, assessing and collecting the income taxes due on other employees' parking subsidies will be even harder. In contrast, the option to cash out employer-paid parking should be a popular fringe benefit, and commuters who do not drive to work will naturally ask employers to pay them the fair-market value of a free parking space they do not take.

Parking cash out thus gives commuters a completely new interest in accurately assessing the fair-market value of workplace parking, and this interest will help to enforce the cap on tax-exempt parking subsidies. As it stands now, commuters who drive to work alone *want* their employers to undervalue their free parking if the fair-market value of this benefit would otherwise lead to a tax liability. In contrast, parking cash out will encourage employees to insist on accurate estimates of the fair-market value of their free parking spaces because they will be entitled to take this value in cash if they do not drive to work. A parking cash-out requirement in the tax code will thus help to assess and collect the taxes due on employer-paid parking subsidies exceeding the tax-free limits. Environmentalists, bicyclists, and similar interest groups can publicize and promote the parking cash-out requirement, and also help monitor employers' compliance.

The IRS definition of the fair-market value of workplace parking automatically excludes employers from the cash-out requirement wherever the market price of parking is zero. Parking is usually expensive only in the most congested areas, so a parking cash-out requirement will encourage ridesharing where it does the most good.

Transition Rules

A cash-out requirement can be implemented in stages. Here are five possible stages that will ease the transition to market-rate parking for employers and commuters:

1. *Unbundled parking*. The requirement to offer parking cash out can begin with firms that lease parking spaces for commuters if the parking spaces are leased separately (unbundled) from the office space. This is what California's law requires, and it is hard for any reasonable person to oppose parking cash out in this instance.

2. *All leased parking*. Next, the requirement can be extended to cover all leased parking spaces, regardless of the lease arrangements. Many parking

spaces currently bundled in the firms' leases for their premises can easily be unbundled as leases come up for renewal. The government will not need to mandate this unbundling because the requirement for firms to offer parking cash out for all leased spaces will lead employers themselves to request unbundling in their office leases. Where the bundled parking spaces have a zero market value, the firms will not have to offer commuters anything in lieu of free parking.

3. *All employer-paid parking.* Later, firms that own their parking spaces can be required to offer commuters the cash option. Some firms can finance this by making the cashed-out spaces available to the public for a fee. Other firms can convert the excess spaces to nonparking uses. Again, if the parking spaces have no market value, the firms will not have to offer commuters anything in lieu of free parking.

4. *Reduced parking requirements.* After parking cash out is required and commuters begin to take advantage of it by driving less, cities can reduce or eliminate the parking requirements for employment sites. The cost savings from constructing fewer parking spaces can then fund the cash-out option for employer-owned parking spaces.

5. *Equal tax treatment for all commuting subsidies.* Finally, if parking cash out becomes a popular fringe benefit, people may begin to ask, If employer-paid parking for someone who drives to work is tax exempt, why is the equivalent benefit for a nondriver taxed as income? The next reform could then be to equalize the tax exemption for parking subsidies and all other commuting benefits, or even to give a greater tax exemption for commuters who do not drive to work alone.

With this phased implementation, employers, commuters, developers, and cities will have enough time to prepare for the transition to a fairer and more efficient tax treatment of commuting benefits. At each stage, the parking cash-out requirement in the tax code should be self-enforcing because all commuters who do not drive to work alone will want to receive the full benefits to which they are entitled. Nondriving commuters will thus want to ensure their employers do not undervalue the free parking spaces because this undervaluation would deny nondrivers part of their compensation.

Potential for Parking Cash Out

We can estimate both the immediate and the long-term potential for parking cash out. Suppose the first stage of a cash-out requirement begins with the case where firms pay out-of-pocket cash to rent parking spaces for commuters. Chapter 2 showed firms in the U.S. rent approximately 6 million parking spaces that can easily be cashed out. Based on the case-study results in Chapter 4, Table 6-1 presents an estimate of how offering 6 million commuters the option to cash out their employer-paid parking will affect vehicle travel, fuel consumption, vehicle emissions, and tax revenue. Column 2 shows the average benefits produced per person offered the option to cash out employer-paid parking, while column 3 shows the per-person effects in column 2 multiplied by 6 million persons. These results suggest offering 6 million commuters the option to cash out their employer-paid parking will reduce commuter travel by 3.9 billion vehicle miles a year, save 156 million gallons of gasoline a year, and reduce CO_2 emissions by 2.2 million metric tons a year. To put these benefits in perspective, the average vehicle travel for commuting in the U.S. is 6,492 miles a year per household.[10] Therefore, reducing 3.9 billion VMT a year by

parking cash out is equivalent to eliminating all vehicle travel and vehicle emissions for commuting by 600,000 households (3.9 billion VMT ÷ 6,492 VMT per household). Given the likelihood the commuter's fuel is imported, parking cash out will also reduce America's dependence on foreign oil. Finally, income tax revenue will increase by $390 million a year as commuters voluntarily trade their tax-exempt parking subsidies for taxable cash. These estimates refer only to the first stage of cash out, which applies to rented parking spaces where the leases allow firms to vary the number of spaces they rent—only 7 percent of *all* employer-paid parking spaces. When parking cash out is offered by additional firms in subsequent stages, it will lead to much greater reductions in VMT.

Generalizing results from Southern California to the nation must be viewed with caution, but the mode shares at the case-study firms before cash out were almost identical to the nationwide averages found in the 1990 Census (see Chapter 4). Also, the clichés, "California loves cars" and "Los Angeles doesn't have good public transit," suggest getting drivers out of their cars is more difficult in Los Angeles than elsewhere, in which case parking cash out will produce even greater benefits in the rest of the nation than estimated here.[11]

Reforming the tax exemption for employer-paid parking will not only produce major benefits in the U.S., but can also serve as a model for other countries. Although employer-paid parking is more common and better documented in the U.S., it occurs around the world. Cash out can therefore become a cheap and effective way for cities in many countries to reduce traffic congestion, energy consumption, and air pollution while increasing workers' incomes and government revenue.

Fiscal Impacts of Parking Cash Out

When commuters choose taxable cash in lieu of tax-exempt free parking, tax revenues increase. In the case studies presented in Chapter 4, state and federal tax revenues increased by $65 a year per employee offered the option to cash out their free parking. At this rate, offering commuters the

TABLE 6-1.
EFFECTS OF OFFERING THE OPTION TO CASH OUT SIX MILLION RENTED PARKING SPACES

	Change	
Variable	**Per person**	**U.S. total**
(1)	(2)	(3)=(2)x6,000,000
Vehicle trips per day	–0.09	–540,000
VMT per year	–652	–3,912,000,000
Kilograms of NO_x emissions per year	–0.68	–4,098,000
Kilograms of ROG emissions per year	–0.82	–4,914,000
Kilograms of PM_{10} emissions per year	–0.5	–3,000,000
Kilograms of CO emissions per year	–7.2	–43,200,000
Kilograms of CO_2 emissions per year	–367	–2,202,000,000
Gallons of gasoline consumed per year	–26	–156,000,000
Income tax revenue	+$65	+$390,000,000

See the conclusion of Chapter 4 for the per-person changes shown in Column 2.

option to cash out 6 million free parking spaces will increase state and federal income tax revenues by $390 million a year ($65 x 6,000,000).[12]

On the other side of the ledger, parking cash out will reduce gasoline consumption and therefore reduce gasoline tax revenue. At the federal gasoline tax rate of 18.4¢ a gallon, reducing gasoline sales by 156 million gallons a year will reduce federal tax revenue by $29 million a year. At the average state gasoline tax rate of 19.1¢ a gallon, states will lose $30 million a year.[13] The total loss of gasoline tax revenue will thus be $59 million a year. But parking cash out reduces gasoline tax revenue only by reducing vehicle travel and road use, and in turn the need for spending on highways. Further, parking cash out produces the greatest reduction in VMT during the morning and evening rush hours (the incongruous name we use to describe the time when traffic slows to a crawl). By reducing the demand for additional highway investment needed to serve only the peak-hour demand, parking cash out can actually *improve* highway finance. Therefore, the net effect of reduced gasoline tax revenue and reduced peak-hour VMT should be a fiscal surplus.

The fiscal impact of parking cash out will be very different from that of the Corporate Average Fuel Efficiency (CAFE) standards.[14] Higher fuel efficiency reduces gasoline consumption and gasoline tax revenue *without* reducing VMT. Indeed, higher fuel efficiency makes driving even cheaper and therefore increases VMT. The CAFE standards thus not only reduce gasoline tax revenue but also *increase* the demand for driving and highway spending. In contrast, parking cash out *reduces* the demand for driving and highway spending because it encourages all the alternatives to solo driving.

ALLOW EMPLOYER-PAID PARKING IN CAFETERIA BENEFIT PLANS

My second proposal deals with "cafeteria plans" that allow employees to select their fringe benefits from a menu of available alternatives. The options employers can offer in a cafeteria plan include most fringe benefits—health insurance, dental insurance, pension contributions, and the like—that are not taxable income to employees if provided outside a cafeteria plan. Section 125(a) of the Internal Revenue Code authorizes cafeteria plans as follows:

> Section 125(a): Cafeteria plans – No amount shall be included in the gross income of a participant in a cafeteria plan solely because, under the plan, the participant may choose among the benefits of the plan.[15]

By reducing the demand for additional highway investment needed to serve only the peak-hour demand, parking cash out can actually improve highway finance.

Including employer-paid parking in a cafeteria plan would allow commuters to give up their free parking in exchange for the other nontaxable benefits, but a quirk in the Internal Revenue Code excludes employer-paid parking from these plans. Section 125(f) of the Code specifically prohibits employers from including employer-paid parking in cafeteria plans:

> Section 125(f): Qualified benefits defined – For purposes of this section, the term "qualified benefit" means any benefit which . . . is not includible in the gross income of the employee by reason of an express provision of this chapter (other than section 106(b), 117, 127, or 132).

Because section 132 refers to the tax exemption for employer-paid parking, the tax code prohibits including employer-paid parking in any cafeteria plan.[16] In other words, employers cannot allow commuters to surrender their free parking in exchange for health insurance or any other fringe benefit offered in a cafeteria plan. Free parking at work is the most common tax-exempt fringe benefit offered to workers in the U.S., and it is unwise to prohibit commuters from taking another fringe benefit in lieu of the free parking. Why not allow commuters the option to choose health insurance instead of free parking at work?

This question suggests another reform of the Internal Revenue Code: delete "*132*" from Section 125(f). This minor change will allow employers to include parking subsidies in their cafeteria plans and thus allow commuters the option to choose other tax-exempt benefits (such as health insurance) in lieu of free parking. As a result, it will both reduce solo driving to work *and* improve employees' health, dental, or eye care at no cost to employers. Improved health will also benefit employers by reducing the incidence of major illnesses and sick days for their employees.

Even in the unlikely event they wanted to, few commuters could reduce their health insurance to get free parking in a cafeteria plan because most commuters already park free at work. In contrast, many commuters might give up their free parking for health insurance, or better health insurance, or simply an employer-paid contribution toward health insurance. The accounting firm KPMG Peat Marwick has estimated the total annual capital plus operating cost of employer-provided "free" parking to be between $31.5 billion and $52.1 billion a year.[17] Including employer-paid parking in cafeteria plans could thus become an important new source of finance for health insurance and pensions, without new government spending or regulations.[18]

Including employer-paid parking in cafeteria plans will: (1) reduce solo driving to work, (2) improve employers' benefit packages, and (3) increase the number of workers with health insurance or another fringe benefit. Simply deleting the reference to Section 132 from Section 125(f) of the Internal Revenue Code will help achieve all these objectives.

CONCLUSION: ALIGN THE TAX CODE WITH OUR OBJECTIVES

Surely we will eventually have to reform the tax incentive for employer-paid parking. Sooner or later, when our dependence on foreign oil becomes even more precarious, when traffic congestion and air pollution become even more intolerable, and when we run out of room for new freeways, we will have to ask ourselves why our tax code strongly favors free parking and solo driving. The only real question is the magnitude of the mayhem we create before we amend the tax code.

Sooner or later, when our dependence on foreign oil becomes even more precarious, when traffic congestion and air pollution become even more intolerable, and when we run out of room for new freeways, we will have to ask ourselves why our tax code strongly favors free parking and solo driving.

The Internal Revenue Code inadvertently creates serious problems: it encourages employers to give free parking to most commuters in the U.S., and the free parking in turn encourages most commuters to drive to work alone. To solve this problem, the tax exemption for employer-paid parking can be amended in two ways. First, employer-paid parking should qualify as a tax-exempt fringe benefit *only* if the employer offers commuters the option to take taxable cash in lieu of the parking itself. Employers can continue to offer tax-exempt free parking as long as they offer commuters the option to cash it out. If an employer offers free parking *without* the option to cash it out, the parking subsidy should not be tax-exempt: employers themselves will thus choose whether their parking subsidies are tax-exempt. Second, employers should be allowed to include parking subsidies in cafeteria benefit plans so that commuters can choose to give up free parking in exchange for other tax-exempt fringe benefits.

These two tax reforms—require the cash-out option as a condition for the tax-exempt status of employer-paid parking and include parking subsidies in cafeteria plans—will significantly reduce the tax incentives for solo driving. These minor reforms will conserve gasoline, improve air quality, reduce traffic congestion, increase tax revenue without increasing tax rates, and increase employee benefits without increasing employers' costs. All these economic and environmental advantages will result from giving commuters more choices about how they want to spend their own income and more information about the costs of these choices.

ENDNOTES

1. Schelling (1978, 127-28).
2. Shoup (1992).
3. The lone Republican who voted for the bill was best known for his desire to split California into two separate states, North and South, so perhaps he hoped parking cash out would further that goal.
4. Letter from the California Chamber of Commerce to the Senate Environmental Quality Committee on April 29, 1997.
5. Letter from the Council for Economic and Environmental Balance to the Senate Environmental Quality Committee on April 29, 1997.
6. Flag burning became an issue in response to complaints about the smoke from a flag-burning ceremony at an American Legion Hall. The flag burning allegedly violated California's air quality regulation that prohibits outdoor fires for disposing of waste materials. The California Air Resources Board advised the Legion that outdoor fires are allowed as recreational activity, and therefore ceremonial flag burning is allowed as recreation. The purpose of SB 731 was to create a more dignified basis for burning American flags no longer fit for display. According to the legislative analyst's summary, "This bill draws a distinction between what type of flag burning should be exempt from air pollution laws according to the condition of the flag and the manner in which it is burned, rather than its relative smoke emissions. Under this bill, a flag would need to have been burned 'in a respectful and dignified manner' and have been 'unserviceable' and 'no longer fit for display' in order to qualify for exemption. Presumably, an air pollution control officer would be charged with determining the condition of the flag and the intent of those who burned it. As a practical matter, it would seem difficult to judge from the remains of a flag what its condition had been and in what manner it had been burned" (Lawrence Lingbloom, Assembly Natural Resources Committee Analysis of SB 638. California Legislature. Sacramento, 1997).
7. See Chapter 3.
8. This definition of the fair-market value of employer-paid parking is included in Internal Revenue Service Notice 94-3, p. 330. The tax exemption was $155 in 1994 and is indexed for inflation. An arm's-length transaction is one where the buyer and seller are independent agents, and one person does not direct the bargaining on behalf of both (or all) parties. An arm's-length transaction may occur between two related or affiliated parties if it is conducted as though they were unrelated, so that there is no question of a conflict of interest.
9. *New York Times* (February 19, 1994).
10. Hu and Young (1999, Table 5).
11. Chapter 4 spelled out the methods used to estimate the results of cashing out employer-paid parking subsidies in California, so a reader can judge the methods and if necessary modify the estimates for the rest of the country. To achieve national benefits of even half these estimates would be a major feat, so a marginally more precise estimate shouldn't alter anyone's evaluation of whether offering commuters the option to cash out employer-paid parking is a good idea.
12. In the case studies, California tax revenue increased by $17 a year per person offered the option to cash out employer-paid parking, but California has a higher income tax rate than most other states. Federal and state income tax revenues increased because some commuters chose taxable cash instead of a tax-exempt parking space.
13. United States Department of Transportation (2001, Table MF-121T).
14. Agras and Chapman (1999) discuss CAFE standards and gasoline taxes as complementary ways to reduce vehicle emissions.
15. Title 26, Subtitle A, Chapter 1, Subchapter B, Part III, Section 125.

16. Perhaps transportation benefits were excluded from cafeteria plans because the code formerly prohibited employers from offering commuters cash in lieu of a transportation benefit. Employees can choose taxable cash in lieu of tax-exempt benefits in a cafeteria plan, so including a transportation benefit in a cafeteria plan would have been inconsistent with the prohibition against offering cash in lieu of the transportation benefit. But TEA-21 removed the prohibition against offering cash in lieu of transportation benefits, so there is no longer any reason to exclude employer-paid parking from cafeteria plans. In the Internal Revenue Code, section 106b refers to medical savings accounts, section 117 refers to scholarships, and section 127 refers to educational assistance.
17. KPMG Peat Marwick (1990) and Association for Commuter Transportation (1996). KPMG Peat Marwick estimated the tax revenue forgone as a result of tax-exempt parking subsidies for the Association for Commuter Transportation (1996).
18. Not everyone will trade free parking for another benefit, of course; London's *Financial Times* reported on a life insurance company's survey indicating potential employees view free parking at work as even more important than a company pension ("Parking Rated Higher than Pensions in Staff Survey," *Financial Times,* March 3, 1990). Nevertheless, offering the option to convert free parking into another fringe benefit should appeal to many commuters.

APPENDIX A

Converting Traffic Congestion into Cash

The information needed to understand a problem depends on one's idea for solving it.

—Melvin Webber

A simple model can illustrate how freeway tolls will convert traffic congestion into cash. The model is roughly based on the traffic flows observed on the I-405 freeway in West Los Angeles (see Table G-1). Column 1 shows the density of cars per mile in a lane. As more cars enter the freeway and the density increases, the average speed (in column 2) declines because drivers become more cautious when cars must follow closer together. The traffic flow (in column 3) increases until it reaches a maximum of just more than 1,900 cars an hour, which occurs at a density of about 60 cars per mile and a speed of 32 miles an hour. If more cars enter the freeway and density increases further, the increasing congestion begins to reduce flow (in the "backward-bending" part of the speed-flow relationship termed "hypercongestion," as shown in the upper part of the figure beneath the table). For example, the flow can be 1,790 cars an hour with a density of 40 cars per mile and a speed of 45 miles an hour (at point C in the figure), but if more cars crowd onto the road and density increases to, say, 100 cars per mile, the speed falls to 17 miles an hour and the flow declines to 1,670 cars an hour (at point B). Hypercongestion thus reduces both speed *and* flow. The benefits of tolls are easiest to see when traffic would be hypercongested without tolls.

In our example, the uncongested flow of 1,790 cars an hour traveling at 45 miles an hour is better than the hypercongested flow of 1,670 cars an hour traveling at 17 miles an hour because more people get where they want to go, and they travel faster. With hypercongestion, fewer people get where they want to go, and they travel slower. Alas, hypercongestion with high density and low flow at low speed occurs frequently on Los Angeles freeways.[1]

The dysfunctional nature of hypercongestion can be seen by looking at the time (in column 4) it takes a car in the traffic flow to go one mile at different flow rates. In our example, with a flow of 1,790 cars an hour traveling at 45 miles an hour, it takes 1.3 minutes for each car to go one mile, while in the hypercongested flow of 1,670 cars an hour traveling at 17 miles an hour it takes 3.6 minutes per mile. Hypercongestion slows everybody down and reduces total travel.

We can calculate a solo driver's cost of traveling a mile by assuming the vehicle's fuel cost per mile and the driver's value of time spent in travel. Column 5 shows the cost per mile of travel if we assume the vehicle's fuel cost is 10¢ a mile and the driver's value of time is 15¢ a minute ($9 an hour). At 45 miles an hour a driver's cost of travel is 30¢ a mile (10¢ + 1.3 × 15¢), while at 17 miles an hour it is 64¢ a mile (10¢ + 3.6 × 15¢). If only a few drivers want to travel on the freeway even when speeds are high, congestion is not a problem, or not much of one. Column 6 illustrates the assumed relationship between the cost of travel and the number of drivers who want to travel along the freeway when demand is low.[2] The low demand curve crosses the cost curve at point A in the figure at 1,240 cars an hour where the speed is 62 miles an hour and the cost of travel is 25¢ a mile. No need for tolls here.

Problems arise, however, if travel demand is high. Column 7 illustrates the travel demand during peak hours. The high-demand curve crosses the cost curve at point B, with a flow of 1,670 cars an hour at a speed of 17 miles an hour and a time-and-fuel travel cost of 64¢ a mile. Compare point B with the alternative point C where the flow is 1,790 cars an hour, speed is 45 miles an hour, and the time-and-fuel cost is only 30¢ an hour. Point C is far better than point B, but if we are at point C and the demand is high, more drivers will crowd onto the road and push the speed down until the flow is hypercongested. Point C can be a stable equilibrium if 1,670 drivers are willing to travel on the road at the low speed of 17 miles an hour. Hypercongestion is a serious problem; without it, we could have both a higher flow *and* a lower time-and-fuel cost of travel.

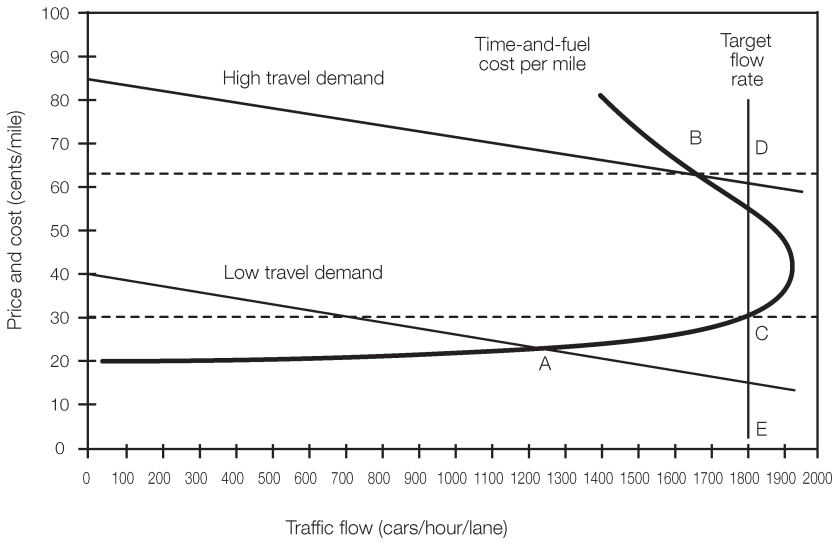
How can we avoid hypercongestion at the time of peak travel demand? By charging a toll for driving during the peak hours. Suppose we aim to achieve a stable flow of

Table A-1.
Density, Speed, Flow, Time, Cost, and the Demand for Freeway Travel

Density (cars/mile)	Speed (miles/hour)	Flow (cars/hour)	Travel time (minutes/mile)	Travel cost (cents/mile)	Travel demand (cents/mile)	
					Low	High
(1)	(2)	(3)=(1)×(2)	(4)=60(2)	(5)=10+15×(4)	(6)	(7)
10	73	730	0.8	22	31	76
20	62	A 1,240	1.0	25	25	70
30	53	1,580	1.1	27	20	65
40	45	C 1,790	1.3	30	18	63
50	38	1,900	1.6	34	16	61
60	32	1,930	1.9	38	16	61
70	27	1,910	2.2	43	16	61
80	23	1,850	2.6	49	17	62
90	20	1,770	3.0	56	18	63
100	17	B 1,670	3.6	64	19	64
110	14	1,560	4.2	73	21	66
120	12	1,440	5.0	85	22	67
130	10	1,330	5.9	98	23	68
140	9	1,210	6.9	114	25	70

Columns 6 and 7 show the prices that lead to the demand for the travel flow in Column 3.

Travel Cost on Travel Demand



about 1,800 cars an hour at about 45 miles an hour. Whenever flow nears 1,800 cars an hour anywhere on the freeway and the speed declines toward 45 miles an hour, introducing a toll can keep the traffic at the target flow rate without any further decline in speed. (This policy is similar to the pricing strategy on the I-15 Express Lanes in San Diego, as explained in Chapter 12.) In the figure, the vertical line ECD shows the target flow rate of 1,800 cars an hour; whenever the demand curve crosses the average cost curve to the left of point C, the toll is zero. But when demand rises and the flow approaches the target rate at point C, the toll kicks in and varies to keep the flow at a steady 1,800 cars an hour at a speed of 45 miles an hour.[3] When demand rises to the high level shown in the figure, the toll would rise to 33¢ a mile (the price indicated by the line CD), the cost of fuel and time would be 30¢ a mile (line CE), and the total cost to the traveler would be 63¢ a mile (line DE).

A toll of 33¢ per mile may seem high, but the tolls on existing congestion-priced roads in California are even higher at the peak hours. On the I-15 Express Lanes in San Diego, for example, the peak-hour charge for an eight-mile trip on a weekday is $4, or 50¢ a mile. On the Route 91 Express Lanes in Orange County, the peak-hour charge for a 10-mile trip on Friday afternoon is $6.25, or 62.5¢ a mile. Many people are willing to pay the price for a quick trip, and keeping congestion in check makes the freeway system much more productive—more people can get where they are going in a shorter time.

In the high-demand case, we can choose between two traffic situations—without and with tolls. Table G-2 shows how the tolls affect solo drivers. *Without* the toll, a solo driver's total cost of time and fuel is 64¢ a mile. *With* the toll, the driver's total cost of time, fuel, and the toll is 63¢ a mile, so the driver saves 1¢ a mile; the flow is also 8 percent higher. The toll thus slightly reduces the driver's cost of travel and slightly increases the flow. But there is a far bigger benefit: the toll revenue. The toll is 33¢ a mile, so the public revenue is 33 times the savings to drivers. Instead of spending time stuck in traffic, drivers spend money for a faster trip, and the revenue is available to pay for public services. With a toll of 33¢ a mile and a flow of 1,800 cars an hour, one lane-mile of the freeway will generate $594 an hour in toll revenue (1,800 cars × 33¢ per mile). With 40 cars per mile, the toll is about $15 an hour per car ($594 ÷ 40). A 45-mile trip at the peak hour would take one hour at 45 miles an hour, and the toll would be $15 for the trip (45 miles × 33¢ per mile). In comparison, without the toll, the trip would take 2 hours and 40 minutes at 17 miles an hour in hypercongested traffic (45 miles ÷ 17 miles an hour). A solo driver would thus pay $15 to reduce travel time by 100 minutes, or 15¢ per minute saved ($9 an hour), which is the assumed value of time savings for a solo driver.

We can also examine how the tolls affect carpoolers. Table G-3 shows the travel cost per person in a three-person carpool. Note how little carpooling saves *without* tolls. In hypercongested traffic with a speed of 17 miles an hour, each person in a three-person carpool suffers a time cost of 54¢ a mile, and the fuel cost of 10¢ a mile is split three ways, so each person's individual cost of time and fuel is 57¢ a mile, compared with the solo driver's cost of 64¢ a mile. Carpooling thus reduces the cost of automobile travel on the untolled road by only 10 percent. Now look at the case *with* tolls. At 45 miles an hour, each person in a three-person carpool incurs a time cost of 20¢ a mile, while the

Table A-2.
Solo Driving *With* and *Without* Congestion Tolls

	SOLO DRIVER					
	Speed (miles/hour)	Flow (cars/hour)	Fuel cost ($/mile)	Time cost ($/mile)	Toll ($/mile)	Total cost ($/mile)
	(1)	(2)	(3)	(4)	(5)	(6)=(3)+(4)+(5)
Without tolls	17	1,670	0.10	0.54	0.00	0.64
With tolls	45	1,787	0.10	0.20	0.33	0.63
Change	+18	+117	0	–0.34	+0.33	–0.01

Table A-3.
Carpooling *With* and *Without* Congestion Tolls

	PER PERSON IN A THREE-PERSON CARPOOL					
	Speed (miles/hour)	Flow (cars/hour)	Fuel cost ($/mile)	Time cost ($/mile)	Toll ($/mile)	Total cost ($/mile)
	(1)	(2)	(3)	(4)	(5)	(6)=(3)+(4)+(5)
Without tolls	17	1,670	0.03	0.54	0.00	0.57
With tolls	45	1,787	0.03	0.20	0.11	0.34
Change	+18	+117	0	–0.34	+0.11	–0.23

money costs of 43¢ a mile for fuel and tolls are split three ways, so each person's total cost of travel is only 34¢ a mile. Compared with the carpooler's cost of 57¢ per mile on the untolled road, carpooling thus reduces the cost of automobile travel on the tolled road by 23¢ a mile, or by 46 percent. The tolls thus strongly encourage travelers to carpool and ride public transit, so the flow of *people* along the freeway will increase even more than the flow of *cars*.

Consider how the tolls would reduce the cost of an average 30-mile round-trip commute to work in Southern California. If the tolls reduce the time-and-money cost of travel in a three-person carpool by 23¢ a mile, each person in the carpool saves $6.90 a day (23¢ × 30 miles) or $138 a month after the tolls are introduced. Because each person in the carpool saves 34¢ a mile in time cost and pays only 11¢ a mile for the 33¢-a-mile toll split three ways, congestion tolls are a great bargain for carpoolers.

Traffic congestion is far more complicated than a simple model can show, but the principles of congestion pricing do not depend on the specifics of each case. The target flow rate during peak hours will depend on the circumstances, but it should always be less than the rate at which hypercongestion sets in. The tolls literally convert wasted time into real money.

Use of the Toll Revenue

Despite their obvious theoretical advantages, congestions tolls have been hard to sell to voters and therefore to politicians because drivers oppose paying for roads that are now free. As a way to generate political support for tolls on congested freeways, Chapter 19 proposed returning the revenues to the cities thorough which the freeways pass. Consider how this idea might work in Southern California, which has the worst traffic congestion in the U.S.[4] Los Angeles County's 882-mile freeway system passes through 65 of the county's 88 cities. Suppose California charges congestion tolls on these freeways and distributes the resulting revenue to these 65 cities on a per-capita basis to compensate them for the freeways' harmful effects. In political reality, the toll-revenue distribution formula would be much more complicated than this simple proposal, but the important point is to create a formula that will energize elected officials to demand the use of tolls to reduce traffic congestion and generate municipal income.[5] Distributing the toll revenues to cities with freeways can illustrate the proposal to create politically effective claimants for the toll revenue.

Sharing the toll revenue among cities with freeways can be justified on two grounds. First, freeways remove large swaths of land from cities' property tax rolls, and motorists pay no sales taxes as they drive through the city. The toll revenue can therefore be considered payments in lieu of the property and sales taxes the cities would otherwise receive. Second, drivers pollute the air as they pass through cities, the roar of traffic violates the surrounding neighborhoods, and the freeways themselves are often ugly. The toll revenue can therefore be justified as compensation to those who must live with this air, noise, and visual pollution. One obvious use of the revenue is to build soundwalls to protect the residents of the cities penetrated by the intrusive freeways. In thinking about congestion tolls, every mayor, councilmember, and interest group will know the toll revenue from the freeways within their borders will stay in their city, while most of the drivers who pay the tolls will only be passing through. By reducing traffic congestion, the tolls will also improve air quality in these cities. Residents will therefore benefit from the tolls because their environment will improve and they will get better public services. This toll-sharing policy can thus remove a political obstacle to congestion pricing: the beneficiaries will become easier to organize.

The average per capita income is only $20,100 a year in the 66 cities *with* freeways, but is $35,100 a year in the 22 cities *without* freeways, so congestion tolls will transfer money to poorer cities from richer ones (see Table G-4). A city doesn't need to have a freeway running through it to suffer from external costs, however. The four poorest cities without freeways (Cudahy, Huntington Park, La Puente, and Temple City) could be included among the recipient cities because freeways pass close by all four, and their per-capita incomes are below the average of other recipient cities. If so, the per capita would be $20,000 a year in the 70 "recipient" cities, and $47,000 a year in the remaining 18 "donor" cities.[6] High-income cities without freeways won't receive any toll revenue, but think of it this way: would they prefer to have freeways so they could share the revenue? Probably not. The tolls can make a big contribution to public finance in low-income cities bearing an unfair share of the freeways' costs.

Table A-4.
Per Capita Incomes of Cities in Los Angeles County ($ per person per year)

66 Cities *with* Freeways

City	Income/Capita	City	Income/Capita	City	Income/Capita
Agoura Hills	$39,700	El Segundo	$34,000	Norwalk	$14,000
Alhambra	$17,500	Gardena	$17,300	Palmdale	$16,400
Arcadia	$28,400	Glendale	$22,200	Paramount	$11,500
Artesia	$15,800	Glendora	$26,000	Pasadena	$28,200
Azusa	$13,400	Hawaiian Gardens	$10,700	Pico Rivera	$13,000
Baldwin Park	$11,600	Hawthorne	$15,000	Pomona	$13,300
Bell	$9,900	Industry	$9,900	Redondo Beach	$38,300
Bell Gardens	$8,400	Inglewood	$14,800	Rosemead	$12,100
Bellflower	$16,000	Irwindale	$13,100	San Dimas	$28,300
Burbank	$25,700	La Canada Flintridge	$52,800	San Fernando	$11,500
Calabasas	$48,200	La Mirada	$22,400	San Gabriel	$16,800
Carson	$17,100	La Verne	$26,700	Santa Clarita	$26,800
Cerritos	$25,200	Lakewood	$22,100	Santa Fe Springs	$14,500
Claremont	$28,800	Lancaster	$16,900	Santa Monica	$42,900
Commerce	$11,100	Lawndale	$13,700	Signal Hill	$24,400
Compton	$10,400	Long Beach	$19,100	South El Monte	$10,100
Covina	$20,200	Los Angeles	$20,700	South Gate	$10,600
Culver City	$29,000	Lynwood	$9,500	South Pasadena	$32,600
Diamond Bar	$25,500	Maywood	$8,900	Torrance	$28,100
Downey	$18,200	Monrovia	$21,700	Vernon	$17,800
Duarte	$19,600	Montebello	$15,100	West Covina	$19,300
El Monte	$10,300	Monterey Park	$17,700	Westlake Village	$49,600
				Average	**$20,100**

22 Cities *without* Freeways

City	Income/Capita	City	Income/Capita	City	Income/Capita
Avalon	$21,000	La Puente	$11,300	Rolling Hills Estates	$51,800
Beverly Hills	$65,500	Lomita	$22,100	San Marino	$59,200
Bradbury	$57,700	Malibu	$74,300	Sierra Madre	$41,100
Cudahy	$8,700	Manhattan Beach	$61,100	Temple City	$20,300
Hermosa Beach	$54,200	Palos Verde Estates	$69,000	Walnut	$25,200
Hidden Hills	$94,100	Rancho Palos Verdes	$46,300	West Hollywood	$38,300
Huntington Park	$9,300	Rolling Hills	$111,000	Whittier	$21,400
La Habra Heights	$47,300			**Average**	**$35,100**

Source: U.S. Census 2000
The two groups' average incomes are weighted by the cities' populations.

Both federal and state laws will have to be changed to permit congestion tolls, and distribution of the revenue will be more complicated than simply giving it to cities with freeways.[7] Motorists will pay the tolls, after all, and using some of the revenue to improve the freeways may reduce the motorists' opposition to the tolls without significantly reducing the cities' support. The tolls may have to be high to clear congestion at specific bottlenecks, for example, and some of the revenue can be used to increase capacity at these locations.[8] But because they will reduce traffic congestion, the tolls might also substitute for other transportation investments that make sense only if the roads remain free. For example, between 2005 and 2030 the Southern California Association of Governments (SCAG) proposes spending $47 billion for transportation improvements (including $13 billion for road improvements and $29 billion for a high-speed rail system). In its bottom-line summary of the results, SCAG estimates that in 2030 the region's average vehicle occupancy rate will fall from 1.4374 persons per car without the investments to 1.4364 persons per car with them.[9] In comparison, congestion tolls can

yield billions of dollars a year in revenue, immediately increase travel speeds, and significantly increase the average vehicle occupancy rate.

Because congestion tolls can eliminate the need for some astronomically expensive rail and highway projects, they can free up gasoline taxes to maintain the existing transportation system. All things considered, congestion tolls can greatly improve transportation finance even if most of the revenue is distributed to cities. The right use of the revenue is a *sine qua non* for congestion tolls, and it is more a matter of politics than economics.

Estimates of the Toll Revenue

Using a transportation model calibrated for Southern California, Elizabeth Deakin and Greig Harvey estimated the revenue that would result from congestion tolls in the Los Angeles region: $3.2 billion in 1991, rising to $7.3 billion in 2010.[10] Kenneth Small estimated that congestion tolls in Los Angeles would have produced $3 billion, net of collection costs, in 1991.[11] These estimates are conservative compared to the Texas Transportation Institute's estimate that the total costs of traffic congestion in Los Angeles were $8.4 billion in 1991 and $12.8 billion in 2001.[12]

Congestion tolls in Los Angeles County would generate several billion dollars a year and substantially improve local public finances. Because 9.2 million people live in the 70 toll-recipient cities and the unincorporated area, each $1 billion would produce about $110 per capita in municipal revenue. If the congestion tolls yield $5 billion a year net of collection costs, for example, they would generate about $550 per capita for the recipient cities. Because the 70 toll-recipient cities' general revenues averaged $577 per capita in 2001, the tolls would almost double these cities' general revenues, and the poorest cities would gain the most in proportion to their income.[13] The toll revenue for Maywood, for example, would amount to 6 percent of the city's per-capita income ($550 ÷ $8,926), while cities with per-capita income greater than $53,000 a year would receive nothing because they have no freeways. This pattern of revenue distribution would help redress the wide disparities among rich and poor cities in parks, police protection, and other public services.

Nonresidents, such as tourists and trucks driving through the region, will also pay tolls, so the total revenues will exceed the residents' payments.[14] And because these nonresidents will save valuable time, even they will be better off if their time savings are worth more than their toll payments. The time saved will be especially valuable for goods movement on trucks to the ports of Los Angeles and Long Beach, which have the two largest volumes of container cargo in the U.S. Trucks from throughout the country converge on the overburdened freeways leading to these ports, making Southern California the nation's colon for foreign trade. In response to congestion tolls, port-bound trucks will either pay for peak-hour driving or shift to off-peak hours, and the region's residents will benefit in either case.

Will tolls on the freeways divert some drivers onto the parallel surface streets? Speed on the freeways will increase in response to the congestion tolls—that is the reason for the tolls—and the traffic flow can increase rather than decrease. If the tolls increase speed and traffic flow on the freeways, it is hard to argue they will also increase traffic on the parallel surface streets. Instead, shorter travel times on the faster freeways may draw traffic off the surface streets. But if traffic tolled off the freeways does crowd the parallel surface streets, congestion tolls will also be appropriate on these streets to keep them flowing freely. Residents could be exempt from paying tolls on surface streets in their own city but would pay for driving on congested streets in other cities. Just as parking spaces can provide public revenue for neighborhoods, congested surface streets can create public revenue for cities, and in both cases the revenue will be paid by nonresidents. Any spillover traffic from the tolled freeways can thus provide even more revenue for low-income cities.

Income Distribution and Political Support

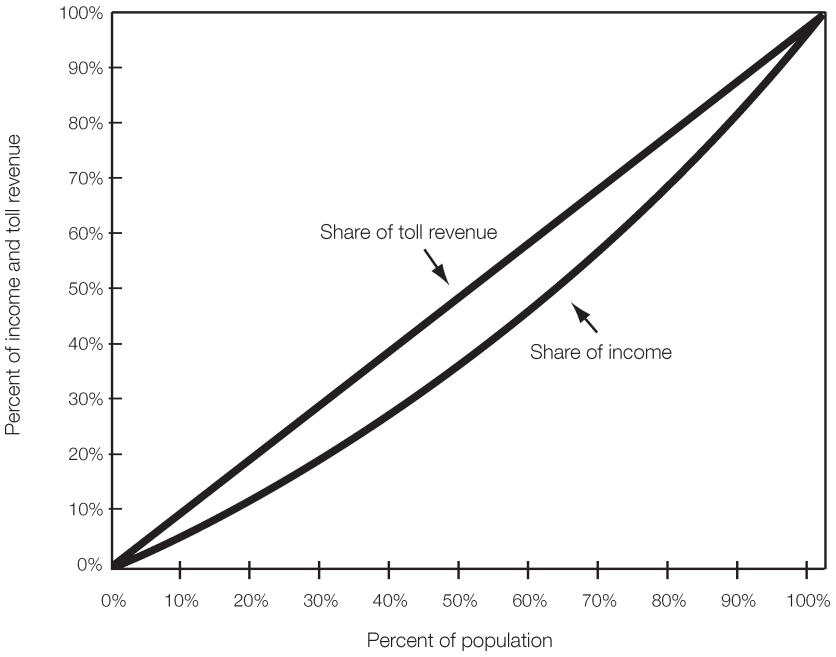
Deakin and Harvey estimated that higher-income motorists will pay most of the tolls because the highest-income quintile (the top 20 percent of the income distribution) own 3.1 times more cars than the lowest-income quintile and drive 3.6 times more vehicle miles per day.[15] Because higher-income motorists also drive more during the peak hours, the highest-income quintile will pay five times more in tolls than the lowest-income

quintile.[16] Thus the tolls will transfer money from high-income motorists to low-income cities. But high-income motorists will also benefit. Travel speeds will increase after tolling begins, and drivers who place a high value on saving time are better off as a result of the tolls and the time savings taken together. After all, when we are driving to work, hurrying to catch a plane, or rushing to the hospital for an emergency, do we want the freeways congested by low-value, discretionary trips easily made at off-peak hours? Most people would surely be willing to forego a few of their least essential peak-hour, single-occupant vehicle trips if they could, in exchange, drive much faster for all their other peak-hour trips, and congestion tolls offer exactly that bargain. In addition, the tolls will convert congested traffic into cash for low-income cities and turn wasted time into public services.

Distributing the toll revenue on a per-capita basis will moderate the region's income inequality. Figure G-1 shows the distribution of personal income and toll revenue in Los Angeles County. The horizontal axis measures the cities' cumulated share of the county's population, arrayed according to increasing per-capita incomes. The vertical axis measures the cities' cumulated share of the county's total income and toll revenues. The upper and lower curves show toll revenue and income as a function of population.[17] The 20 percent of the population who live in the 33 poorest cities receive 12 percent of the county's income but 21 percent of the toll revenue. In contrast, the 20 percent of the population who live in the 43 richest cities receive 30 percent of the county's income but only 17 percent of the toll revenue. The 1 percent of the population who live in the eight richest cities receive 4 percent of the county's income and no toll revenue.

These distributional results refute any objections to congestion tolls on the grounds they will harm the poor. A few poor people who live in the richest cities and drive during congested hours may lose a little, but the great majority will save time, breathe cleaner air, and gain better public services at a lower cost. When we consider the whole population, the congestions tolls will clearly be progressive, not regressive, because the lowest-income people don't own cars and won't pay tolls but will receive better public services. Even when we consider only drivers and ignore the better public services in low-income cities, the results can still be progressive because peak-hour driving is lowest among the poorest drivers. Almost everyone can win from congestion tolls.

University of Southern California transportation economist Genevieve Giuliano says the conventional complaint about congestion tolls—they are regressive and will harm the poor—may actually be motivated by a baser and more short-sighted reason: drivers simply oppose paying to use roads they believe should be free.[18] Returning the toll revenue to cities with freeways can turn this typical debating ploy around. Politicians can support congestion tolling on the high-minded grounds that it will reduce traffic,



improve the environment, and help the poor even if another reason is more important—their cities need the money, and they deserve it!

Returning the revenue to cities with freeways will create far greater political support than would using it to reduce general taxes because any tax cut would be small and hard to perceive. Many people would also doubt that taxes would be reduced at all. And if taxes are not reduced, any increase in general public spending—regardless of its worth—would also be hard to perceive, while drivers will pay the tolls every day. In either case, the benefits of reduced taxes or increased general spending would be so indirect, distant, delayed, and diffuse that most people may disregard them entirely. In contrast, returning the toll revenue to cities with freeways will produce direct, proximate, immediate, and concentrated benefits that can embolden politicians from cities with freeways to insist on congestion charges. No one will have to organize the beneficiaries—cities—because they are already organized.

Using some of the revenue to finance transportation, if done in the right way, might further increase the political appeal of congestion tolls. For example, the Los Angeles Metropolitan Transportation Authority (MTA) funds public transportation and a wide array of transportation projects including bikeways, pedestrian facilities, and local road and highway improvements throughout the county. Most of its tax support comes from an added 1¢ sales tax rate throughout the county, which generated $1.1 billion in 2003.[19] Thus, if $1.1 billion of congestion toll revenue were allocated to the MTA, the sales tax rate in the county could be reduced by 1¢, from the current 8.25 percent to 7.25 percent.[20] The congestion tolls, by themselves, would greatly improve transportation, and if the toll revenue were $5 billion a year, $3.9 billion a year would still be available to cities.

The 70 cities with freeways plus the county (representing the unincorporated territory) could become a lobby for the congestion tolls, and they already have a strong influence in the legislative process. To show the importance of this potential coalition, consider an alternative use of the toll revenue—a revenue-neutral reduction in the gasoline tax. Reducing the gasoline tax may seem reasonable because it would compensate motorists who are paying the tolls and would not take more money for the government. But those who would receive the toll revenue—motorists—are not organized as a political entity. Millions of motorists would benefit from the lower gas tax but not by enough to make a strong political demand for the congestion tolls. At best, the reduction in gasoline taxes would mollify motorists but would not create a coalition to support the tolls.[21] If the revenue is distributed to cities with freeways, however, many elected officials may decide to buy into the congestion tolls because they have been bought off by the resulting revenue.

A purely economic analysis of congestion tolls misses the key political point. Unless the revenue provides benefits to interest groups who will support road pricing, congestion tolls will remain difficult in practice no matter how efficient and fair in theory. If the revenue goes to cities with freeways, politicians will not have to say they are going to charge everyone for driving in congested traffic and then figure out how to spend the money. Instead, they can propose a fair way to deal with three problems at once—traffic congestion, the environmental costs of freeways, and the fiscal distress of low-income cities. Drivers will pay the tolls only when they get a direct individual benefit—faster travel—and cities with freeways will get better public services—such as parks, police protection, sidewalk repairs, and soundwalls. Many people will have good reason to champion road pricing.

1. In its *2004 Regional Transportation Plan*, the Southern California Association of Governments (2004, Appendix C, Exhibit C.5) shows that large sections of the freeway system have average speeds ranging from 15 to 24 miles per hour during the PM peak (3 p.m. to 7 p.m.). Although hypercongestion is a complex phenomenon difficult to model, many people are familiar with travel on freeways at low speed in closely spaced traffic. Small and Chu (2003) and Verhoef (2003) explore the complex nature of hypercongestion.
2. Columns 6 and 7 show the marginal willingness to pay for a mile of travel on the freeway as a function of the number of cars in the flow (in column 3) during periods of low and high demand. These values are plotted as the two demand curves.

3. Small and Chu (2003, 329) say the speed-flow relationship is often quite flat until capacity is reached. The optimal flow is thus frequently near to capacity, suggesting that the marginal cost curve becomes almost vertical near capacity. If so, the line CDE can be considered the marginal cost curve after point D is reached. Lindsey and Verhoef (2000) explain that the maximum feasible flow on any road segment depends on factors such as the number and width of traffic lanes, grade, road curvature, speed limit, weather, vehicle types, and the behavior of individual drivers.
4. According to the Texas Transportation Institute's *2003 Urban Mobility Study*, Los Angeles has the worst traffic congestion in the United States. In 2001, 88 percent of peak-hour VMT was in congested traffic. The TTI estimated 667 million person-hours and 1 billion gallons of gasoline were wasted in congested traffic, and these figures more than tripled since the first estimates in 1982. The estimated cost of congestion was 1,005 per person in 2001.
5. Like a city, Los Angeles County would receive toll revenue in proportion to the length of freeways in the unincorporated area.
6. Removing the four poorest cities from the "without freeways" group sharply increases the weighted-average income per capita of the 18 remaining cities because the four poorest cities have large populations while most of the richer cities have small populations. Avalon, which would be the poorest remaining city without a freeway, is on Catalina Island 26 miles off the coast, and it would be unaffected by the congestion tolls.
7. In practice, the formula for distributing the toll revenue might resemble the federal formulas for distributing gasoline tax revenues to states.
8. Just as high prices for curb parking will reveal where investment in off-street parking is justified, high congestion tolls will reveal where investments in additional road capacity are and are not justified. The tolls thus have another benefit: they will provide an excellent guide for investment decisions. If tolls reveal where investment is most productive, the existing gasoline tax revenue may be more than enough to finance it. In this case, all the congestion toll revenue can be distributed to cities.
9. Southern California Association of Governments 2004, Appendix C, p. C-29. Although one would expect the average vehicle occupancy rate to increase, not fall, as a result of these investments, the decline of 0.01 persons per car predicted 25 years in the future obviously has no statistical significance.
10. Deakin and Harvey (1996, Tables 7-14 and 7-18).
11. Small (1992, 371).
12. See the Texas Transportation Institute's *2003 Urban Mobility Study*, which is available online at http:mobility.tamu.edu/ums/mobility_data/tables/los_angeles.pdf.
13. The cities' general revenues are taken from the California State Controller's Office, *Cities Annual Report, Fiscal Year 2000-2001*. General revenues are defined as revenues that cannot be associated with any particular expenditure; examples include property taxes, sales taxes, and business license fees. General revenues do not include fees and charges for direct services, such as the revenue from municipally owned electric utilities. The population of Los Angeles County is 9.5 million, of whom 990,000 live in unincorporated areas.
14. In calculating the net revenue distributed to cities, however, the toll collection costs must also be considered. If these collection costs are less than the tolls paid by nonresidents, the cities will earn more revenue than the regions' residents pay.
15. Deakin and Harvey (1996, Tables 8-1 and 8-3). At the national level, in 2002 the highest-income quintile of households owned 2.9 times more cars than the lowest-income quintile (U. S. Bureau of Labor Statistics, 2004, Table 1).
16. Deakin and Harvey (1996, 8-6). And because men are more likely then women to drive in congested conditions, men will also pay more in tolls (Deakin and Harvey 1996, 8-7).

17. The Lorenz curve for distribution of income among individuals would lie below the curve for the distribution of income among cities because the average income in 88 cities mask the inequality of individual incomes within each city. A curve showing the distribution of toll payments among individuals would also lie below the curve for the distribution of the revenue because both VMT and the propensity to drive in congested traffic increase with income.
18. Giuliano (1992).
19. See the Los Angeles County Metropolitan Authority's financial statements on their website at www.metro.net/about_us/finance/propositions.htm.
20. Although the congestion tolls would provide 1.1 billion a year to the MTA, note that using the toll revenue to replace the sales tax would provide a benefit to everyone in the County, not just to motorists. What might look like throwing a bone to motorists would, in reality, be a tax cut for everyone, most of whom happen to be motorists.
21. In their study of the gasoline tax in Britain and the United States, Ian Parry and Kenneth Small (2002) estimated the optimal tax rate is about 1 per gallon, or 2.5 times the current U.S. tax rate. Using the congestion toll revenue to reduce the gasoline tax would thus do nothing to remedy the undertaxation of gasoline. Because collection costs will undoubtedly be higher for congestion tolls than for gasoline taxes, the reduction in gasoline taxes would be less than the toll payments.

APPENDIX B

List of References

Adamowicz, Wiktor L., Vinay Bhardwaj, and Bruce Macnab. 1993. "Experiments on the Difference between Willingness to Pay and Willingness to Accept." *Land Economics* 69, no. 4 (November): 416–427.

Adiv, Aaron. 1982. "Commuter's Versus Analyst's Perception of Automobile Travel Cost." *Transportation Research Record* 890: 18–24.

Agras, Jean, and Duane Chapman. 1999. "The Kyoto Protocol, CAFÉ Standards, and Gasoline Taxes." *Contemporary Economic Policy* 17, no. 3: 296–308.

American Automobile Manufacturers Association. 1988. *AAMA Motor Vehicle Facts and Figures*. Detroit: American Automobile Manufacturers Association.

Arnold, Peri, Charles Walcott, and Bradley Patterson. 2000. *The White House Office of Management and Administration*. [Accessed November 4, 2004]. Available at www.whitehouse2001.org/files/manadmin/ManAdmin-OD.PDF.

Association for Commuter Transportation. 1996. *Commuter Choice Initiative*. Washington, D.C.: United States Department of Transportation / United States Environmental Protection Agency.

Baker, Laurence. 1987. "Company Cars: Their Effects on Journey to Work in Central London." *Traffic Engineering and Control* 28, no. 10 (October): 530–536.

Brinkley, David. 1988. *Washington Goes to War*. New York: Alfred A. Knopf.

Buchanan, James. 1965. "An Economic Theory of Clubs." *Economica* 32, no. 125 (February): 1–14.

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: California Air Resources Board.

California Legislative Analyst's Office. 2002. "A Commuter's Dilemma: Extra Cash or Free Parking." [Accessed October 28, 2004]. Available at www.lao.ca.gov/2002/parking/031802_cash_or_parking.pdf.

Cameron, Michael. 1994. *Efficiency and Fairness on the Road*. Oakland, Calif.: Environmental Defense Fund.

Cape Town City Council, Town Planning Branch. 1993. Report No: 77. Cape Town, South Africa: Cape Town City Council, Town Planning Branch.

Center for Urban Transportation Research. 1989. *Factors Related to Transit Use*. Tampa: University of South Florida.

Cohen, Lee, Eugene Steurele, and Adam Carasso. 2004. "Redistribution under OASDI: How Much and to Whom?" In *Strengthening Community: Social Insurance in a Diverse America*, edited by Kathleen Buto, Martha Patterson, William Spriggs, and Maya Rockeymoore. Washington, D.C.: Brookings Institution Press, pp. 103–113.

Commuter Transportation Services Inc. 1988. *1988 Commuter Survey*. Los Angeles: Commuter Transportation Services Inc.

Coombe, Denvil, Peter Guest, John Bates, Paul Masurier, and Colin Maclennan. 1997. "Study of Parking and Traffic Demand, 1: The Research Programme." *Traffic Engineering and Control* 38, no. 2 (February): 62–67.

Dasgupta, M., R. Oldfield, K. Sharman, and V. Webster. 1994. *Impact of Transport Policies in Five Cities*. Project Report 107. Crowthorne, Berkshire: Transport Research Laboratory.

Davis, Stacy, and Susan Diegel. 2002. *Transportation Energy Data Book: Edition 22*. Oak Ridge, Tenn.: Oak Ridge National Laboratory.

Deakin, Elizabeth, and Greig Harvey. 1996. *Transportation Pricing Strategies for California: An Assessment of Congestion, Emission, Energy, and Equity Impacts.* Sacramento: California Air Resources Board.

Dowling, Richard, Dave Feltham, and William Wycko. 1991. "Factors Affecting Transportation Demand Management Program Effectiveness at Six San Francisco Medical Institutions." *Transportation Research Record* 1321: 109–117.

Enoch, Marcus. 2002. "UK Parking Cash Out Experience, and Lessons from California." *Traffic Engineering and Control* 43, no. 5 (May): 184–187.

Ernst & Young. 1992. "Regulation XV Cost Survey." Diamond Bar, Calif.: South Coast Air Quality Management District, August.

Feeney, Bernard. 1989. "A Review of the Impact of Parking Policy Measures on Travel Demand." *Transportation Planning and Technology* 13: 229–244.

Ferguson, Erik. 1991. "Ridesharing, Firm Size, and Urban Form." *Journal of Planning Education and Research* 10, no. 2: 131–141.

Fisher, Ronald. 1972. "Shirley Highway Express Bus on Freeway Demonstration Project." *Highway Research Record* 415: 25–37.

Fricker, Jon. 1986. "Circuity Factor Values in Ridesharing: A Detailed Update." *Transportation Research Record* 1082: pp. 34–40.

Garrett, Mark, Hiroyuki Iseki, and Brian Taylor. 2000. "Measuring Cost Variability in the Provision of Transit Service." Presented at the annual meeting of the Transportation Research Board, Washington, D.C., January 9–13.

Gillen, David, 1977a. "Estimation and Specification of the Effects of Parking Costs on Urban Transport Mode Choice." *Journal of Urban Economics* 4, no. 2 (April): 186–199.

_____. 1977b. "Alternative Policy Variables to Influence Urban Transport Demand." *Canadian Journal of Economics* 10, no.4 (November): 686–695.

Giuliano, Genevieve. 1992. "An Assessment of the Political Acceptability of Congestion Pricing." *Transportation* 19, no. 4: 335–358.

Green, Kenneth. 1994. *Costs of Compliance with Environmental Regulations: A Case Study of Rule 1501 Compliance Efforts at Five Hughes Aircraft Company Business Units*. PhD diss., University of California, Los Angeles.

Groninga, Curtis, and William Francis. 1969. *The Effects of the Subsidization of Employee Parking Costs on Human Behavior*. Los Angeles: School of Public Administration, University of Southern California.

Hamilton, Andrew. 2000. "Comments of the San Diego Air Pollution Control District." San Diego, Calif.: Air Pollution Control District. July 27.

Hanemann, W. Michael. 1991. "Willingness to Pay and Willingness to Accept: How Much Can They Differ?" *American Economic Review* 81, no. 3 (June): 332–341.

Hensher, David, and Jenny King. 2001. "Parking Demand and Responsiveness to Supply, Pricing and Location in the Sydney Central Business District." *Transportation Research Part A* 35: 177–196.

Hess, Daniel. 2001. "Effect of Free Parking on Commuter Mode Choice: Evidence from Travel Diary Data." *Journal of the Transportation Research Board* 1753: 35–42.

Higgins, Thomas. 1992. "Parking Taxes: Effectiveness, Legality, and Implementation, Some General Considerations." *Transportation* 19: 221–230.

Hirsch, Fred. 1976. *Social Limits to Growth*. Cambridge, Mass.: Harvard University Press.

Ho, Amy. 1993. "Parking Cash-Out Client Survey Results." Memorandum to Los Angeles Commuter Transportation Services, March 30.

Hu, Patricia, and Jennifer Young. 1992. *Summary of Travel Trends, 1990 Nationwide Personal Transportation Survey*. Report No. FHWA-PL–92–027. Washington, D.C.: United States Department of Transportation.

_____. 1999. *Summary of Travel Trends, 1995 Nationwide Personal Transportation Survey*. Report No. FHWA-PL–00–006. Washington, D.C.: United States Department of Transportation.

Ison, Stephen, and Stuart Wall. 2000. "An Efficient Transport System to Support a Competitive Economy: the Role of Workplace Parking Charges." In *Dimensions of Competitiveness*, edited by Lester Lloyd-Reason and Stuart Wall. Cheltenham, UK: Edward Elgar.

_____. 2002. "Attitudes to Traffic-Related Issues in Urban Areas of the UK and the Role of Workplace Parking Charges." *Journal of Transport Geography* 10, no. 1 (March): 21–28.

Jones, Peter. 1992. *Review of Available Evidence on Public Reactions to Road Pricing*. London Transportation Unit of the U.K. Department of the Environment.

KPMG Peat Marwick. 1990. "Dimensions of Parking." Prepared for the U.S. Department of Transportation, Urban Mass Transportation Administration, Office of Budget and Policy, September 10.

Kwon, Young-Jong, and Young-In Kwon. 2001. "Elements for the Effective Use of Park-and-Ride Facilities in the Seoul Metropolitan Areas, Korea," Paper Number 01:2737 presented at the 80th Annual Meeting of the Transportation Research Board, Washington, D.C., January.

Leibowitz, Arleen. 1983. "Fringe Benefits in Employee Compensation." In *The Measurement of Labor Cost*, edited by Jack Triplett. Chicago: University of Chicago Press.

Lindsey, Robin, and Erik Verhoef. 2000. "Congestion Modeling." In *Handbook of Transport Modelling*, edited by David Hensher and Kenneth Button. New York: Pergamon, pp. 353–373.

Mansfield, Edwin. 1983. *Economics*. 4th ed. New York: Norton.

Mehranian, Maria, Martin Wachs, Donald Shoup, and Richard Platkin. 1987. "Parking Cost and Mode Choice among Downtown Workers: A Case Study." *Transportation Research Record* 1130: 1–5.

Meyer, Michael, and Eric Miller. 2001. *Urban Transportation Planning*. 2nd ed. New York: McGraw-Hill.

Miller, Gerald. 1991. *The Impacts of Parking Prices on Commuter Travel*. Washington, D.C.: Metropolitan Washington Council of Governments.

Miller, Gerald, and Carol Everett. 1982. "Raising Commuter Parking Prices—An Empirical Study." *Transportation* 11: 105–129.

Mishan, Edward. 1973. *Economics for Social Decisions, Elements of Cost-Benefit Analysis*. New York: Praeger Publishers.

Murphy, James, and Mark Delucchi. 1998. "A Review of the Literature on the Social Cost of Motor Vehicle Use in the United States." *Journal of Transportation and Statistics* 1, no. 1 (January): 15–42.

National Association of Industrial and Office Parks/Educational Foundation. 1986. *Parking for Industrial and Office Parks.* Arlington, Va.: National Association of Industrial and Office Parks/Educational Foundation.

Neuenschwander, René, Sylvia Strub, and David Kramer. 2000. "Swiss Overview." *COST 342: Parking Policy Measures and their Effects on Mobility and the Economy*. [Accessed October 28, 2004]. Available at ftp:ftp.cordis.lu/pub/cost-transport/docs/342–19-ch.pdf.

O'Fallon, Carolyn, Charles Sullivan, and David Hensher. 2003. "Constraints Affecting Mode Choices by Morning Car Commuters." *Transport Policy* 11, no. 1 (January): 17–29.

Oren, Craig. 1998a. "Getting Commuters Out of Their Cars: What Went Wrong?" *Stanford Environmental Law Journal* 17, no. 1 (January): 141–243.

_____. 1998b, "Detail and Implementation: The Example of Employee Trip Reduction." *Virginia Environmental Law Journal* 17, no. 2 (winter): 123–186.

_____. 1998c. "How a Mandate Came from Hell: The Makings of the Federal Employee Trip Reduction Program." *Environmental Law* 28, no. 2: 267–374.

Parry, Ian, and Kenneth Small. 2002. "Does Britain or the United States Have the Right Gasoline Tax?" Discussion Paper 02-12. Resources for the Future, Washington, D.C. March 2002.

PCR. 1996. "Implementation of Parking Cash Out—Employer Characteristics and Implementation Costs." Diamond Bar, Calif.: South Coast Air Quality Management District.

Pisarski, Alan. 1996. *Commuting in America II: The Second National Report on Commuting Patterns and Trends*. Landsdowne, Va.: Eno Transportation Foundation.

Port Authority of New York and New Jersey. 1984. "1984 Trans-Hudson Auto Survey." New York: Port Authority of New York and New Jersey.

Proost, Steff, and Kurt Van Dender. 2001. "The Welfare Impacts of Alternative Policies to Address Atmospheric Pollution in Urban Road Transport." *Regional Science and Urban Economics* 31: 383–411.

Reynolds, Lloyd, Stanley Masters, and Coletta Moser. 1998. *Labor Economics and Labor Relations*. 11th ed. Saddle River, N.J.: Prentice Hall.

RIDES for Bay Area Commuters Inc. 2001. *Commute Profile 2001, A Survey of San Francisco Bay Area Commute Patterns*. Oakland, Calif.: RIDES for Bay Area Commuters Inc.

Rutherford, G. Scott, Shauna Badgett, John Ishimaru, and Stephanie MacLachlan. 1994. "Transportation Demand Management: Case Studies of Medium-Sized Employers." *Transportation Research Record* 1459: 7–17.

Rye, Tom, Tom Cowan, and Stephen Ison. 2004. "Expansion of a Controlled Parking Zone (CPZ) and Its Influence on Modal Split: the Case of Edinburgh, Scotland and Its Relevance to Elsewhere." Paper presented at the annual meeting of the Transportation Review Board, January.

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

Schelling, Thomas. 1978. *Micromotives and Macrobehavior*. New York: W. W. Norton and Company.

Shoup, Donald. 1992. *Cashing Out Employer-Paid Parking*. Report No. FTA-CA–11–0035–92–1. Washington, D.C.: U.S. Department of Transportation.

_____. 1995. "An Opportunity to Reduce Minimum Parking Requirements." *Journal of the American Planning Association* 61, no. 1: 14–28.

_____. 1997. *Evaluating the Effects of Parking Cash Out: Eight Case Studies*. [Accessed on October 28, 2004]. Available at www.arb.ca.gov/research/abstracts/93–308.htm#93–308.

Shoup, Donald, and Mary Jane Breinholt. 1997. "Employer-paid Parking: A Nationwide Survey of Employers' Parking Subsidy Policies." In *The Full Social Costs and Benefits of Transportation*, edited by David Greene, David Jones, and Mark Delucchi. Heidelberg: Springer-Verlag, pp. 371–385.

Shoup, Donald, and Don Pickrell. 1980. *Free Parking as a Transportation Problem*. Washington, D.C.: U.S. Department of Transportation.

Shoup, Donald, and Richard Willson. 1992. "Employer-Paid Parking: The Problem and Proposed Solutions." *Transportation Quarterly* 46, no. 2 (April): 169–192.

Small, Kenneth. 1992. "Using the Revenues from Congestion Pricing." *Transportation* 19: 359–381.

Small, Kenneth, and Xuehao Chu. 2003. "Hypercongestion." *Journal of Transport Economics and Policy* 37: 319–352.

Small, Kenneth, and Camilla Kazimi. 1995. "On the Costs of Air Pollution from Motor Vehicles." *Journal of Transport Economics and Policy* 29, no. 1: 7–32.

Smith, Adam. 1759 [2002]. *The Theory of Moral Sentiments*. Cambridge, U.K.: Cambridge University Press.

South Coast Air Quality Management District. 1995. *Best Available Control Technology Methodology Report*. Diamond Bar, Calif.: South Coast Air Quality Management District.

Southern California Association of Governments. 1991. *1991 Southern California Origin-Destination Survey—Summary Findings*. Los Angeles.

_____. 1996. *1996 State of the Commute Report*. Los Angeles.

Southern California Association of Non-Profit Housing. 2004. *Parking Requirements Guide for Affordable Housing Developers*. [Access November 4, 2004]. Available at www.scanph.org/publications/Pubs2004/Parking%20Requirements%20Guide_forweb.pdf.

Surber, Monica, Donald Shoup, and Martin Wachs 1984. "Effects of Ending Employer-Paid Parking for Solo Drivers." *Transportation Research Record* 957: 67–71.

Texas Transportation Institute. 2003. *2003 Annual Mobility Report*. [Accessed October 28, 2004]. Available at http:mobility.tamu.edu/.

Transit Cooperative Research Program. 2000. *Traveler Response to Transportation System Changes, Interim Handbook*. Washington, D.C.: Transit Cooperative Research Program.

_____. 2003. *Strategies for Increasing the Effectiveness of Commuter Benefits Programs*. Report 87. Washington, D.C.: Transportation Research Board.

Transport Canada. 1978. *The Effects of the Imposition of Parking Charges on Urban Travel in Ottawa*. Summary Report TP–291. Ottawa: Transport Canada.

United Kingdom Department for Transport. 1998. *A New Deal for Transport: Better for Everyone*. London: Department for Transport.

_____. 2002. *Making Travel Plans Work*. London: Department for Transport.

United Kingdom Ministry of Transport. 1963. *Traffic in Towns, A Study of the Long Term Problems of Traffic in Urban Areas*. London: Her Majesty's Stationery Office.

United States Bureau of Labor Statistics. 1999. "The Parking Perk." *Monthly Labor Review Online*, 122, no. 10. (October): 2–3. [Access November 4, 2004]. Available at www.bls.gov/opub/mlr/1999/10/precis.htm.

United States Department of Energy. 1994. *Emissions of Greenhouse Gases in the United States 1987–1992*. DOE/EIA–0573. Washington, D.C.: Energy Information Administration.

United States Department of Transportation. 1995. *1995 Nationwide Personal Transportation Survey*. Washington, D.C.: U.S. Dept. of Transportation.

_____. 2001. *Highway Statistics 2001.* [Accessed October 28, 2004]. Available at www.fhwa.dot.gov/ohim/hs01/index.htm.

_____. 2003. *NHTS Highlights Report*. [Accessed November 1, 2004.] Available at www.bts.gov/publications/national_household_travel_survey/highlights_of_the_2001_national_household_travel_survey/pdf/entire.pdf. _the_2001/.

United States Environmental Protection Agency. 1993. *The Climate Change Action Plan*. Washington, D.C.: U.S. Environmental Protection Agency.

_____. 1995. *National Air Quality and Emissions Trends Report, 1995*. 1995. [Accessed November 1, 2004]. Available at www.epa.gov/airtrends/aqtrnd95/report/index.html/.

Van Hattum, David, Cami Zimmer, and Patty Carlson. 2000. "Implementation and Analysis of Cashing Out Employer-Paid Parking by Employers in the Minneapolis–St. Paul Metropolitan Area." Final report submitted to the Minnesota Pollution Control Agency and the U.S. Environmental Protection Agency by the Downtown Minneapolis Transportation Management Organization, June 30**.**

Verhoef, Erik. 2003. "Inside the Queue: Hypercongestion and Road Pricing in a Continuous Time—Continuous Place Model of Traffic Congestion." *Journal of Urban Economics* 54, no. 3: 531–565.

Verhoef, Erik, Peter Nijkamp, and Piet Rietveld. 1996. "Regulatory Parking Policies at the Firm Level." *Environment and Planning C: Government and Policy* 14: 385–406.

Vivier, Jean. 1999. "Etat de L'Art." In *Parking Policy*. Brussels: UITP Documentation Centre, pp. 6–17.

Westin, Richard, and David Gillen. 1978. "Parking Location and Transit Demand." *Journal of Econometrics* 8: 75–101.

Wigan, Marcus. 1977. "Traffic Restraint as a Transport Planning Policy 3: The Effects on Different Users." *Environment and Planning A* 9, no. 10: 1177–1188.

Williams, Jon. 1991. "Free and Paid Commuter Parking in the Washington Region." Paper presented at the annual meeting of the Transportation Research Board, Washington, D.C..

Willson, Richard. 1991. Estimating the Travel and Parking Demand Effects of Employer-Paid Parking. *Regional Science and Urban Economics* 22: 133–145.

_____. 1997. "Parking Pricing without Tears: Trip Reduction Programs" *Transportation Quarterly* 51, no. 1 (winter): 79–90.

Willson, Richard, and Donald Shoup. 1990a. *The Effect of Employer-Paid Parking in Downtown Los Angeles: A Study of Office Workers and Their Employers*. Los Angeles: Southern California Association of Governments.

_____. 1990b. "Parking Subsidies and Travel Choices: Assessing the Evidence." *Transportation* 17: 141–157.

Young, William. 2000. "Modeling Parking." In *Handbook of Transport Modeling*, edited by David Hensher and Kenneth Button. New York: Pergamon, pp. 409–420.

Young, William, Russell Thompson, and Michael Taylor. 1991. "A Review of Urban Car Parking Models." *Transport Reviews* 11, 1: 63–84.

RECENT PLANNING ADVISORY SERVICE REPORTS

MAKING GREAT COMMUNITIES HAPPEN

The American Planning Association provides leadership in the development of vital communities by advocating excellence in community planning, promoting education and citizen empowerment, and providing the tools and support necessary to effect positive change.

478. Manufactured Housing: Regulation, Design Innovations, and Development Options. Welford Sanders. July 1998. 120pp.

479. The Principles of Smart Development. September 1998. 113pp.

480/481. Modernizing State Planning Statutes: The Growing Smart[SM] Working Papers. Volume 2. September 1998. 269pp.

482. Planning and Zoning for Concentrated Animal Feeding Operations. Jim Schwab. December 1998. 44pp.

483/484. Planning for Post-Disaster Recovery and Reconstruction. Jim Schwab, et al. December 1998. 346pp.

485. Traffic Sheds, Rural Highway Capacity, and Growth Management. Lane Kendig with Stephen Tocknell. March 1999. 24pp.

486. Youth Participation in Community Planning. Ramona Mullahey, Yve Susskind, and Barry Checkoway. June 1999. 70pp.

489/490. Aesthetics, Community Character, and the Law. Christopher J. Duerksen and R. Matthew Goebel. December 1999. 154pp.

493. Transportation Impact Fees and Excise Taxes: A Survey of 16 Jurisdictions. Connie Cooper. July 2000. 62pp.

494. Incentive Zoning: Meeting Urban Design and Affordable Housing Objectives. Marya Morris. September 2000. 64pp.

495/496. Everything You Always Wanted To Know About Regulating Sex Businesses. Eric Damian Kelly and Connie Cooper. December 2000. 168pp.

497/498. Parks, Recreation, and Open Spaces: An Agenda for the 21st Century. Alexander Garvin. December 2000. 72pp.

499. Regulating Home-Based Businesses in the Twenty-First Century. Charles Wunder. December 2000. 37pp.

500/501. Lights, Camera, Community Video. Cabot Orton, Keith Spiegel, and Eddie Gale. April 2001. 76pp.

502. Parks and Economic Development. John L. Crompton. November 2001. 74pp.

503/504. Saving Face: How Corporate Franchise Design Can Respect Community Identity (revised edition). Ronald Lee Fleming. February 2002. 118pp.

505. Telecom Hotels: A Planners Guide. Jennifer Evans-Crowley. March 2002. 31pp.

506/507. Old Cities/Green Cities: Communities Transform Unmanaged Land. J. Blaine Bonham, Jr., Gerri Spilka, and Darl Rastorfer. March 2002. 123pp.

508. Performance Guarantees for Government Permit Granting Authorities. Wayne Feiden and Raymond Burby. July 2002. 80pp.

509. Street Vending: A Survey of Ideas and Lessons for Planners. Jennifer Ball. August 2002. 44pp.

510/511. Parking Standards. Edited by Michael Davidson and Fay Dolnick. November 2002. 181pp.

512. Smart Growth Audits. Jerry Weitz and Leora Susan Waldner. November 2002. 56pp.

513/514. Regional Approaches to Affordable Housing. Stuart Meck, Rebecca Retzlaff, and James Schwab. February 2003. 271pp.

515. Planning for Street Connectivity: Getting from Here to There. Susan Handy, Robert G. Paterson, and Kent Butler. May 2003. 95pp.

516. Jobs-Housing Balance. Jerry Weitz. November 2003. 41pp.

517. Community Indicators. Rhonda Phillips. December 2003. 46pp.

518/519. Ecological Riverfront Design. Betsy Otto, Kathleen McCormick, and Michael Leccese. March 2004. 177pp.

520. Urban Containment in the United States. Arthur C. Nelson and Casey J. Dawkins. March 2004. 130pp.

521/522. A Planners Dictionary. Edited by Michael Davidson and Fay Dolnick. April 2004. 460pp.

523/524. Crossroads, Hamlet, Village, Town (revised edition). Randall Arendt. April 2004. 142pp.

525. E-Government. Jennifer Evans–Cowley and Maria Manta Conroy. May 2004. 41pp.

526. Codifying New Urbanism. Congress for the New Urbanism. May 2004. 97pp.

527. Street Graphics and the Law. Daniel Mandelker with Andrew Bertucci and William Ewald. August 2004. 133pp.

528. Too Big, Boring, or Ugly: Planning and Design Tools to Combat Monotony, the Too-big House, and Teardowns. Lane Kendig. December 2004. 103pp.

529/530. Planning for Wildfires. James Schwab and Stuart Meck. February 2005. 126pp.

531. Planning for the Unexpected: Land-Use development and Risk. Laurie Johnson, Laura Dwelley samant, and Suzanne Frew. February 2005. 59pp.

532. Parking Cash Out. Donald C. Shoup. March 2005. 119pp.

For price information, please go to www.planning.org or call 312-431-9100 and ask for the Planners Book Service. The web site also contains a complete subject and chronological index to the PAS Report series.