POLICY BRIEF

Employer-Based Trip Reduction

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April 2025

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Project Description

This project reviews and summarizes empirical evidence for a selection of transportation and land use policies, infrastructure investments, demand management programs, and pricing policies for reducing vehicle miles traveled (VMT) and greenhouse gas (GHG) emissions. The project explicitly considers social equity (fairness that accounts for differences in opportunity) and justice (equity of social systems) for the strategies and their outcomes. Each brief identifies the best available evidence in the peer-reviewed academic literature and has detailed discussions of study selection and methodological issues.

VMT and GHG emissions reduction is shown by effect size, defined as the amount of change in VMT (or other measures of travel behavior) per unit of the strategy, e.g., a unit increase in density. Effect sizes can be used to predict the outcome of a proposed policy or strategy. They can be in absolute terms (e.g., VMT reduced), but are more commonly in relative terms (e.g., percent VMT reduced). Relative effect sizes are often reported as the percent change in the outcome divided by the percent change in the strategy, also called an elasticity.

Summary

Strategy Description

Employer-based trip reduction programs include one or more commuter benefits as an incentive to reduce single occupancy vehicle (SOV) commuting. The commuter benefits tend to be provided by employers or local and regional agencies and can include: alternative mode services (e.g., carpool facilitation, vanpool, carsharing), monetary incentives (e.g., mode-specific payments or subsidies, such as discounts for transit, and parking cash-out), worksite facilities supporting active travel (e.g., showers, lockers, and bicycle parking), flexible work hours, and information and marketing campaigns to encourage alternatives to SOV commuting. They can be provided to all employees, or target SOV commuting employees. These programs can be either mandatory or voluntary, depending on the specific local context.

Behavioral Effect Size

Work commuting per capita vehicle miles traveled (VMT) reduction from employer-based trip reduction programs ranges from 4% to 76%, depending on the specific type(s) of programs and the benefits provided, the geographic context of the study, and the scale of evaluation. Programs evaluated at the participant level show the strongest effects (up to 76%), at the workplace scale smaller effects (4-12%), and at the regional scale much smaller effects (1-2%).

DOI: 10.7922/G20G3HJN

Strategy Extent

Employer-based programs inherently accrue direct benefits at the employee scale, but also co-benefits for surrounding populations. States with legal requirements for these programs are likely to have many more employers implementing them and achieve greater VMT reduction and equity benefits. Limited evidence suggests these programs in general are cost effective, with two studies reporting 4:1 benefit to cost ratios for parking cash out and free transit service. Because these programs can be implemented quickly (compared to infrastructure and land use strategies), their potential for accruing benefits quickly is great.

Strategy Synergy

Many employer-based trip reduction programs use a synergistic set of incentives and communication strategies to change travel behavior. Combining increases in mode options with reductions in costs for alternative modes makes programs more effective. Additional synergies that are likely to improve the effectiveness of these programs include pairing with improvements to infrastructure for walking and bicycling and improving transit quality and access to work. These later synergies require partnerships between local governments and employers.

Equity Effects

While VMT reductions with associated emission reductions are inherently equity gains given current inequity in environmental harm, the context of employer-based trip reduction programs is important for understanding the magnitude of social equity benefits. Employer-based trip reduction programs can help lower employee transportation costs, freeing up resources for other purposes. Equity gains are more likely to occur when equity is a leading principle in the access and benefits of the programs to employees, when state laws require employers to provide such commuter benefits, and when care is given to support workers who live in car dependent situations because of historical racial and economic burdens. Equity gains are also more likely to accrue when employment programs are aimed at employers of priority populations, reducing emissions in historically burdened communities, and where incentives vary by need.

Strategy Description

Employer-based trip reduction programs use various approaches to reduce single-occupancy vehicle (SOV) travel to work and reduce the associated greenhouse gas (GHG) emissions. These programs are either encouraged or required by state, regional, or local governments or are offered voluntarily by employers.

Employer-based trip reduction programs typically include one or more of the following elements often termed “commuter benefits.” The specific type(s) of commuter benefits offered varies across employers.

• Alternative mode services such as carpool facilitation (e.g., a carpool matching service), preferential parking for carpoolers, vanpool service, carsharing program, guaranteed ride home for employees who commute by alternative modes, or employer-provided shuttle service,

• Financial incentives or subsides for employees who commute by carpool, vanpool, bike, walking or public transit or a cash allowance in lieu of a parking space at work (known as parking cash-out),

• Worksite facilities such as showers, lockers, or bicycle racks for active commuting,

• Alternative work schedules that include flexible work hours and/or a compressed work week, and

• Information and marketing such as a commuter information center or a transit promotion campaign.

Some states in the US require certain employers to offer commuter benefits to employees. For example, Washington state requires employers who have more than 100 employees at a single worksite to implement trip reduction programs (Washington state Commute Trip Reduction Law, RCW 70.94.521-555). California requires certain employers who are located in specific areas of the state and who provide subsidized parking for their employees to offer parking cash-out programs (California Health and Safety Code Section 43845).

Strategy Effects

Behavioral Effect Size

The selected studies, summarized in Table 1 (p. 11), show that employer-based trip reduction programs reduce vehicle miles traveled (VMT). The reduction ranges from 4% to 76% depending on the specific type(s) of benefits, the geographic area of the study, study design, and the scale of analysis.

Commute trip reduction programs in Washington state have been found to reduce commute VMT by 6% on average at participating worksites (Giniger et al., 2006). Parking cash-out programs implemented at several work sites in the Los Angeles metropolitan area reduced commute VMT by 12%, double the effects in Washington state (Shoup, 1997).

Effects of trip reduction incentives that are voluntarily offered by employers are also documented in the literature. Fitch et al. (2022) found that a conventional- and e-bike lending program offered by Google to its employees at two worksites in the San Francisco Bay area reduced SOV commute miles of participants by 76%. In another study conducted in the Bay area, an employer-based trip reduction pilot program was found to reduce total commute VMT by 40% for participating employees at four worksites (Martin et al., 2021).

Shin (2020) found that commute and non-commute VMT of workers with transit benefits (voluntarily offered by employers) was 30% less and 7% less, respectively, than those without transit benefits (adjusting for built environment characteristics near workplaces) in the Puget Sound region in Washington. Another study found that a wider array of employee commuter benefits voluntarily provided by employers only reduced commute VMT by 4.2%–4.8% for participating employees compared to non-participants at the same worksite (Herzog et al., 2006).

Beyond participant and workplace scale analysis, employer-based trip reduction programs have been found to reduce total morning peak VMT at a regional level by 1.3%–1.6% in two studies in Washington state (Giniger et al., 2006; Hillsman et al., 2001). This suggests that the scale of analysis is important for understanding benefits.

Some studies use indicators other than VMT such as vehicle trips and changes in commute mode share, among others, to evaluate the effectiveness of employer-based trip reduction incentives. For instance, Chen and Yang (2023) found that employer-provided transit passes reduced vehicle trip rates (number of vehicle trips per 100 employees at a worksite) by 11%–19%.

Several studies (summarized in Table 2, p. 13) show that employer-based trip reduction programs reduced the commute mode share at participating worksites of SOV commuting by 7%–20%, increased the mode share of public transit by 50%–108%, increased bicycling and walking by 39%, and changed carpooling share ranging from −19% to +64% (Brown et al., 2003; Dill & Wardell, 2007; Giniger et al., 2006; Shoup,

1997). More detailed information on results for effects other than VMT from the literature is provided in Table 2. (Because VMT effects are a primary focus area of this brief, information on VMT effects is presented in Table 1, and information on effects other than VMT is presented in Table 2.)

Co-Benefits

The overall purpose of employer-based trip reduction programs is to incentivize employees to switch from SOV to other commuting modes. Co-benefits of the mode shifts driven by these programs typically include reduction in automobile emissions and traffic congestion and reduced parking needs and costs. In addition, when employees shift to non-motorized commute modes, co-benefits could also include improvements in health resulting from increases in physical activity.

Several studies (summarized in Table 2) show that employer-based trip reduction programs reduce GHG emissions. For instance, the CTR Task Force 2005 Report estimated that Washington state's employer-based trip reduction program reduced statewide CO_2e emissions by 0.2%–0.6%. Using a simulation model, Herzog et al. (2006) found that CO_2 emissions were reduced by 4.1%–4.7% for participants of employer-based trip reduction programs compared to non-participants at the same work site. Parking cash-out programs implemented at several work sites in the Los Angeles metropolitan area reduced vehicle emissions for commuting by car by 12% per employee per year. This emissions reduction included reduction of CO_2 emissions by 367 kilograms, NO_x by 683 grams, CO by 7.2 kilograms, and PM_{10} by 500 grams per employee per year (Shoup, 1997). Another study in California found that an employer-based trip reduction pilot program reduced CO_2 emissions by 10.2 metric tons for participating employees at four worksites over the course of the program (approximately five months) (Martin et al., 2021). The magnitude of emissions reduction varies by the type of program — for example, reduction in emissions from vanpool programs is likely to be less than that for other comparable programs because of vans' high emissions rates.

Cost savings is another co-benefit. The University of Washington's commute trip reduction program enabled the university to avoid adding approximately 3,600 parking spaces during 1995–2005, resulting in cost savings of more than $100 million (Giniger et al., 2006).

Increase in physical activity resulting from active commuting is associated with health benefits (Gordon-Larsen et al., 2009). Transit use is also associated with greater physical activity due to the need for walking to and from transit stops at origins and destinations. One study found that transit users walked approximately 12.4 minutes more per day than non-transit users (Saelens et al., 2014). This evidence suggests that shifting from SOV to transit or active travel may result in important health benefits.

Strategy Extent

Scale of application: In areas such as Washington state where employers who meet certain criteria are legally required to implement trip reduction programs, these programs are more likely to be prevalent across that area. In regions where employers voluntarily implement trip-reduction programs, individual employers are likely to implement pilot programs at their worksite(s) and determine whether to continue those programs based on employees' feedback and funding availability.

Speed of change: Compared to infrastructure and land use strategies, employer-based trip reduction programs can be implemented in a relatively short period of time, and thus, these

programs have tremendous potential to generate benefits rapidly.

Limited evidence suggests that the benefits of these programs outweigh the costs—two studies in California found that the benefit-cost ratios of parking cash-out and free transit service were 4:1 (Brown et al., 2003; Shoup, 1997). In the study by Brown et al. (2003), quantified costs included fare payments by the employer to the bus service operator and administration costs, and quantified benefits included bus fare savings for users and reduced parking demand. In the study by Shoup (1997), the quantified costs included costs incurred by employers in giving parking cash-out to employees who were previously not using a parking space and hence, not taking a parking subsidy, and the quantified benefits included reduction in VMT and vehicle emissions resulting from the parking cash-out programs.

Equity Effects

Because most studies of employer-based trip reduction are at the participant or employer level, evidence for equity outcomes are rare in the literature. What is likely is that larger and well-funded employers of office-type jobs offer greater commuter benefits such that those who receive greater trip reduction incentives are those who receive relatively greater pay. This may suggest opportunities for investment in trip reduction programs at smaller employers; programs for people working in non-office type settings such as manufacturing, retail, and agriculture; and extension of programs such as shuttles or vanpools beyond employees to other local residents. For example, farmworker vanpool services offered by the California Vanpool Authority as part of the CalVans program are an affordable transportation option for farm workers to travel to agricultural sites (D'Agostino et al., 2021; B. Higgins, 2019; California Vanpool Authority, n.d.).

Access to employer-based trip reduction programs is only one potential equity concern. More generally, because these programs are incentives to reduce car use certain strategies only provide benefits to people who have reasonable alternative forms of transportation. This could have varying equity effects. For example, a low-income transit commuting employee would benefit directly from a transit incentive without the need to change behavior. But a low-income car commuter, who has no access to transit and in general relies on the car as a means of economic survival, cannot receive the program benefits. This may be a concern given the evidence that access to a car is a key means of upward economic mobility (Blumenberg & Pierce, 2017).

Development of trip reduction programs such as vanpools that extend beyond employees to other local residents could benefit disadvantaged or low-income individuals who need to rely on cars for commuting purposes but whose employers might not offer such programs. These programs could generate wider benefits for communities such as increased job access. Programs that are open to both employees and other local residents could be developed by large employers in partnership with local government agencies.

The secondary effects of reduction in car commute trips on equity depends primarily on local context. Where VMT reduction is in places of poor environmental conditions, such as high pollutant zones overlapping neighborhoods of economic disadvantage due to historical racism and other societal trauma, equity gains are more likely. If car commute reductions are in affluent and already well supported neighborhoods of good environmental conditions, priority populations receive fewer co-benefits from such programs. As such, employer-based trip reduction programs need to consider equitable access and benefits to employees and provide careful considerations to the community context, available travel options, and existing disparities.

An example of an employer-based trip reduction program that can potentially result in positive equity outcomes is parking cash-out. Shoup (1997) noted that employer-provided parking subsidies only benefit employees who drive to work. Thus, parking subsidies likely do not benefit different employee groups based on ethnicity and skill level equally. Because parking cash-out programs offer all employees the same subsidy, regardless of their commuting mode of transportation, cash-out programs are likely to generate equal benefits for all groups. In addition, Shoup (1997) found that before the parking cash-out program, some firms in the study offered higher parking subsidies to higher-paid employees. But after the firms began to offer the cash-out option, they started offering equal commuting benefits to all employees across all ranks.

Strategy Synergy

Employer-based trip reduction programs are nearly all synergistic in their design. They often encompass a suite of financial incentives that attempt to provide an array of travel options which nudge employees toward low VMT travel choices. That is, employees can receive different incentives to fit their commuting needs. Still further synergies are possible. Regions with greater transit accessibility and better biking and walking facilities are likely to experience greater VMT reductions from employer-based trip reduction programs; as the accessibility and quality of alternative transportation modes increases, the likelihood of people shifting from SOVs to alternative modes increases (Dill & Wardell, 2007). One study found that the average reduction in vehicle trips at worksites with high transit availability was almost double the reduction at worksites with low transit availability (Traveler Response to Transportation System Changes Handbook, Third Edition: Chapter 19, Employer and Institutional TDM Strategies, 2010).

The synergistic effects of the built environment and the effectiveness of employer-based trip reduction programs depend on the local land use and jobs-housing balance. Shoup (1997) found that parking cash-out programs resulted in largest reductions in solo driving shares in firms located in downtown Los Angeles, followed by firms located in a high-density regional center in West Los Angeles. Firms located in lower-density areas experienced the lowest reductions in solo driving shares. Hamre and Buehler (2014) found that people living in urban core areas had a higher likelihood of commuting by public transportation, walking or bicycling compared to people living in inner suburbs, likely due to the presence of higher levels of public transportation services and a more extensive active transportation network in urban core areas. While most evidence from the literature comes from urban and suburban commuters, trip reduction amongst rural residents also has the potential to reduce VMT to a large extent per participant given longer commute distances.

Confidence

Evidence Quality

Some of the selected studies included in Tables 1 and 2 used control groups in their analysis (Herzog et al., 2006; Shoup, 1997), while others did not do so (Giniger et al., 2006; Martin et al., 2021). As Higgins (1996) discussed, use of control groups strengthens the internal validity of the results of the study—it can be inferred that the changes observed in employees' travel behaviour are due to the employer-based trip reduction programs and not due to any other factors (e.g., economic changes).

Another difference in the design of the selected studies is the scale of analysis—while some studies had a narrower regional focus and investigated the effects of employer-based trip reduction programs at 1–8 worksites (Brown et

al., 2003; Fitch et al., 2022; Herzog et al., 2006; Martin et al., 2021; Shoup, 1997), other studies evaluated the effects at worksites or at the worker/employee level across an entire metropolitan region or across multiple counties (Dill & Wardell, 2007; Giniger et al., 2006; Shin, 2020).

Compared to studies that focused on only a few worksites, regionwide studies have higher external validity—the results can be extrapolated to employers or workers across a region. The sample of data used for analysis in regionwide studies is more likely to be representative of the employers or workers in the region. However, the internal validity of regionwide studies is likely to be weaker because other factors such as built environment characteristics (e.g., land use, level of transit accessibility) that might not have been adjusted for in the regionwide analyses could also influence employees' travel mode choices.

Most studies that report effects of employer-based trip reduction programs are based on survey data. One study (Martin et al., 2021) was based on a mix of survey data and observed trip data collected by a smartphone app. Because there might be discrepancies between the travel behaviour reported in surveys and actual travel behaviour, there is a need for future studies to examine the effects of employer-based trip reduction programs based on observed commute data instead of solely relying on survey data.

Caveats

Studies typically tend to focus on worksites with a relatively large number of employees, and thus, evidence for small worksites is scant. More data on commuter benefit(s) programs is typically available for large worksites for the following three reasons: i) state laws, ii) employers with large worksites are more likely to have funding to voluntarily offer commuter benefits to employees, iii) some employer-based programs such as vanpooling are more feasible to implement at large worksites—limited evidence shows that employees at small worksites are less likely to use vanpools, presumably because vanpooling and other shared ride programs are easier to implement when the program can draw from a large employee pool (Concas et al., 2005). Greater data availability and the need for large sample sizes for statistical purposes drive the greater focus on large worksites in the literature.

While employer-based programs have been found to have positive effects (such as reduce VMT) at an aggregate level in multiple worksite evaluations, effects at individual worksites can vary substantially (Giuliano et al., 1993; Lagerberg, 1997).

Some studies (e.g., Martin et al. (2021); Herzog et al. (2006)) evaluated the effects of employer-based programs comprising multiple benefits at the program level, but not for each type of benefit separately. In such cases, it is difficult to separate the effect of specific incentives.

In some cases, employer-based trip reduction programs might not achieve the desired VMT reduction goals. In one study in the San Francisco Bay area, employer-provided bus services were found to encourage employees to live farther away from their workplaces than they otherwise would (Dai & Weinzimmer, 2014). In addition, some commute mode shifts resulting from employer-based trip reduction programs may not be from SOVs to a more sustainable mode, but instead could be from one relatively low-carbon mode to another (e.g., carpool to employer-provided bus) — the latter scenario is likely to result in lower VMT reductions than the former scenario.

Induced travel is another factor that influences the effects of employer-based trip reduction programs. As some SOV commute trips are removed from the road network, the resulting reduction in traffic congestion might encourage other people to take SOV trips that would have otherwise either not been made or been made

by non-SOV modes. Because of induced travel, VMT reduction for a region overall might be less than the VMT reduction at participating worksites (Lagerberg, 1997).

Technical & Background Information

Study Selection

Many studies over the past three decades have examined the effects of employer-based trip reduction programs. Most studies report the effects with indicators such as commute mode share, vehicle trip rate, average vehicle ridership, and emissions; relatively few studies have examined the effects of these programs on VMT. The following criteria were used to select studies for this brief: published preferably within the last 20 years (studies older than 20 years were included only when they examine and report effects for which there is not more recent research), examined the effects of employer-based trip reduction programs or benefits in the US, reported quantitative effects, had an appropriate study design, and used statistical methods for analysis.

Methodological Considerations

The selected studies differ in study design and scale of evaluation—while some studies were before- and after-intervention comparisons, other studies compared workers with and without benefits. The different evaluation scales across studies include the participating employee scale, the participating worksite scale, and the regional scale. For instance, Fitch et al. (2022) and Martin et al. (2021) compared scenarios before and after the implementation of employer-based trip reduction benefits for participating employees, Brown et al. (2003), and Shoup (1997) were before-after studies at participating worksite(s), and Hillsman et al. (2001) was a before-after study at the regional level. Ghimire and Lancelin (2019), Hamre and Buehler (2014), and Shin (2020) compared workers with and without employer-provided benefits across a region using regionwide travel survey datasets.

Among before-after studies, while some studies used control groups (comprising employees who did not receive employer-provided benefits) in their analysis (Herzog et al., 2006; Shoup, 1997), other studies did not do so (Giniger et al., 2006; Martin et al., 2021). Use of control groups strengthens the validity of causal inferences drawn from studies.

The selected studies also vary based on whether they evaluated a specific type of employer-provided benefit or an employer-based program comprising multiple benefits. For example, Fitch et al. (2022), Shoup (1997), and Brown et al. (2003) evaluated the effects of one specific type of benefit, but Martin et al. (2021), and Herzog et al. (2006) evaluated programs that included multiple benefits. In multiple-benefit program evaluations, it is difficult to isolate the effects of specific types of benefits. Some studies such as Chen & Yang (2023) and Shin (2020) reported the effects resulting from employer-based programs in the form of absolute values of reduction observed in the outcome variable of interest (such as VMT or vehicle trip rate). In such cases, we computed the relative percentage change in the outcome variable using the mean value of the variable that was reported in the study.

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Table 1. Effects on VMT of Employer-based Trip Reduction: Results from Studies

Study	Study Location	Intervention(s)	Study Year(s)	Effect Type	Effect Size
Fitch et al. (2022)	Mountain View and Sunnyvale, California	Bike and e-bike lending	2015–2019	Single Occupancy Vehicle (SOV) miles from commute trips of participants	76% reduction
Martin et al. (2021)	Cupertino, Menlo Park, Mountain View, and Palo Alto, California	Software platforms that automate employer commute programs, mobile multimodal trip planning and payment app, financial incentives for using non-SOV commute modes	2019	Total commute VMT of participants over the program duration (about 5 months)	Reduced by 40%
Shin (2020)	Puget Sound region, Washington	Public transit subsidy	2014	Commute VMT per worker per day	Reduced by 2.19 miles (30% reduction)
				Non-commute VMT per worker per day	Reduced by 0.83 miles (7% reduction)
Georggi et al. (2007)	Seattle, Washington	Washington state Commute Trip Reduction (CTR) program (information on specific incentives offered by participating employers not stated)	2003	Total VMT (AM peak)	Reduced by 17,297
				Total VMT (PM peak)	Reduced by 14,511
CTR Task Force 2005 Report (Giniger et al., 2006)	Washington State	Washington state Commute Trip Reduction (CTR) program (information on specific incentives offered by participating employers not stated)	2005	VMT from commute trips at participating worksites	5.9% reduction
				Total VMT (AM peak) regionwide	1.6% reduction

Table 1 - continued

Study	Study Location	Intervention(s)	Study Year(s)	Effect Type	Effect Size
Herzog et al. (2006)	Denver, Houston, San Francisco, and Washington, D.C. metropolitan areas	Financial incentives	2004	Commute VMT of participants	4.2%–4.8% reduction
		Services (e.g., guaranteed ride home and carpool matching), and informational campaigns (but no financial incentives)			7%–8% reduction
		Financial incentives, services (e.g., guaranteed ride home and carpool matching), and informational campaigns			15%–17% reduction
Hillsman et al. (2001)	Seattle metropolitan area, Washington	Washington state Commute Trip Reduction (CTR) program (information on specific incentives offered by participating employers not stated. Examples of interventions include compressed workweek, vanpooling, and telework.)	1998–1999	Total VMT (AM peak) regionwide	1.3% reduction
				Freeway VMT (AM peak) regionwide	1.1% reduction
Shoup (1997)	Los Angeles metropolitan area	Parking cash-out	1992–1995	Commute VMT per employee per year	Reduced by 12%

Table 2. Other Effects Associated with Employer-based Trip Reduction: Results from Studies[1]

Study	Study Location	Intervention(s)	Study Year(s)	Effect Type	Effect Size
Chen & Yang (2023)	Washington State	Public transit pass	2001–2002, 2003–2004, 2005–2006, 2015–2016, 2017–2018	Vehicle trip rate (number of vehicle trips per 100 employees at a worksite)	Reduced by 7–12 units (11%–19% reduction)
Martin et al. (2021)	Cupertino, Menlo Park, Mountain View, and Palo Alto, California	Software platforms that automate employer commute programs; mobile multimodal trip planning and payment app; financial incentives for using non-SOV commute modes	2019	CO_2 emissions for participants over the program duration (about 5 months)	Reduced by 10.2 metric tons
Ghimire & Lancelin (2019)	Atlanta metropolitan area, Georgia	Free or subsidized transit pass	2011	Odds of commuting by public transit at least once a week	156% higher odds
Hamre & Buehler (2014)	Washington, D.C. region	Public transportation benefits	2007–2008	Predicted probability of mode choice	Probability of commuting by public transportation increases from 22.3% to 76.1%
		Facilities for walking and biking			Probability of commuting by bike increases from 0.5% to 1%, and probability of commuting by walking increases from 1.4% to 2.1%

[1] Percentage changes in mode shares reported in this table are relative percentage changes. For example, a change in SOV's mode share from 76% to 62% is reported as "−18.4%" in the table above.

Table 2 - continued

Study	Study Location	Intervention(s)	Study Year(s)	Effect Type	Effect Size
Dill & Wardell (2007)	Portland, Oregon	Passport program (subsidized transit pass, guaranteed ride home)	Not specified	Commute mode share at participating worksites	SOV: −18.4% (from 76% to 62%) Carpool: −20.2% (from 8.4% to 6.7%) Transit: +107.7% (from 13% to 27%)
		Human Resource incentives (flex time, compressed work week, guaranteed ride home, or company car)			SOV: −11.8% (from 76% to 67%) Carpool: −19.3% (from 8.8% to 7.1%) Transit: +69.2% (from 13% to 22%)
		Marketing programs			SOV: −8.1% (from 74% to 68%) Carpool: −13.1% (from 8.4% to 7.3%) Transit: +57.1% (from 14% to 22%)
Georggi et al. (2007)	Seattle, Washington	Washington state Commute Trip Reduction (CTR) program (information on specific incentives offered by participating employers not stated)	2003	AM peak CO emissions,	Reduced by 1,109 kg
				PM peak CO emissions	Reduced by 1,545 kg
				AM peak fuel consumption	Reduced by 3,489 gallons
				PM peak fuel consumption	Reduced by 4,314 gallons

Table 2 - continued

Study	Study Location	Intervention(s)	Study Year(s)	Effect Type	Effect Size
CTR Task Force 2005 Report (Giniger et al., 2006)	Washington State	Washington state Commute Trip Reduction (CTR) program (information on specific incentives offered by participating employers not stated)	2005	Annual GHG emissions	Reduced by 74,000 tons of CO equivalent
				Commute mode share at participating worksites	SOV: −7.2% (from 70.8% in 1993 to 65.7% in 2005)
				Annual fuel consumption	Reduced by 5.8 million gallons
Herzog et al. (2006)	Denver, Houston, San Francisco, and Washington, D.C. metropolitan areas	Financial incentives	2004	CO_2 emissions of participants	4.1%–4.7% reduction
		Services (e.g., guaranteed ride home and carpool matching), and informational campaigns (but no financial incentives)			7%–8% reduction
		Financial incentives, services (e.g., guaranteed ride home and carpool matching), and informational campaigns			15%–17% reduction

Table 2 - continued

Study	Study Location	Intervention(s)	Study Year(s)	Effect Type	Effect Size
Brown et al. (2003)	Los Angeles	Fare-free transit service at UCLA	2000–2002	Campus commute mode share	SOV: −20% Bus ridership: +56%
				Fare elasticity of transit demand	−0.28 (10% reduction in the fare will increase bus ridership by 2.8%)
Hillsman et al. (2001)	Seattle metropolitan area, Washington	Washington state Commute Trip Reduction (CTR) program (information on specific incentives offered by participating employers not stated. Examples of interventions include compressed workweek, vanpooling, and telework.)	1998–1999	AM peak delay per vehicle regionwide	Reduced by 5.2% (from 1.50 to 1.43 minutes per vehicle)
Shoup (1997)	Los Angeles metropolitan area	Parking cash-out	1992–1995	Emissions per employee per year	Reduced emissions of CO_2 by 367 kg, of NO_x by 683 gm, of CO by 7.2 kg, and of PM_{10} by 500 g
				Commute mode share at participating worksites	SOV: −17% (from 76% to 63%) Carpool: +64% (from 14% to 23%) Transit: +50% (from 6% to 9%) Bike/walk: +39% (from 2.8% to 3.9%)