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ECONOMIC RESEARCH CENTRE

MANAGING COMMUTERS' BEHAVIOUR

A NEW ROLE FOR COMPANIES

ROUND TABLE

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ECONOMIC RESEARCH CENTRE

REPORT OF THE
HUNDRED AND TWENTY FIRST ROUND TABLE
ON TRANSPORT ECONOMICS

held in Paris on 29-30th November 2001
on the following topic:

MANAGING COMMUTERS' BEHAVIOUR

A New Role for Companies

EUROPEAN CONFERENCE OF MINISTERS OF TRANSPORT

EUROPEAN CONFERENCE OF MINISTERS OF TRANSPORT (ECMT)

The European Conference of Ministers of Transport (ECMT) is an inter-governmental organisation established by a Protocol signed in Brussels on 17 October 1953. It is a forum in which Ministers responsible for transport, and more specifically the inland transport sector, can co-operate on policy. Within this forum, Ministers can openly discuss current problems and agree upon joint approaches aimed at improving the utilisation and at ensuring the rational development of European transport systems of international importance.

At present, the ECMT's role primarily consists of:

– helping to create an integrated transport system throughout the enlarged Europe that is economically and technically efficient, meets the highest possible safety and environmental standards and takes full account of the social dimension;
– helping also to build a bridge between the European Union and the rest of the continent at a political level.

The Council of the Conference comprises the Ministers of Transport of 42 full Member countries: Albania, Austria, Azerbaijan, Belarus, Belgium, Bosnia-Herzegovina, Bulgaria, Croatia, the Czech Republic, Denmark, Estonia, Finland, France, FYR Macedonia, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Moldova, Netherlands, Norway, Poland, Portugal, Romania, the Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, the United Kingdom and Federal Republic of Yugoslavia. There are six Associate member countries (Australia, Canada, Japan, Korea, New Zealand and the United States) and two Observer countries (Armenia and Morocco).

A Committee of Deputies, composed of senior civil servants representing Ministers, prepares proposals for consideration by the Council of Ministers. The Committee is assisted by working groups, each of which has a specific mandate.

The issues currently being studied – on which policy decisions by Ministers will be required – include the development and implementation of a pan-European transport policy; the integration of Central and Eastern European Countries into the European transport market; specific issues relating to transport by rail, road and waterway; combined transport; transport and the environment; sustainable urban travel; the social costs of transport; trends in international transport and infrastructure needs; transport for people with mobility handicaps; road safety; traffic management; road traffic information and new communications technologies.

Statistical analyses of trends in traffic and investment are published regularly by the ECMT and provide a clear indication of the situation, on a trimestrial or annual basis, in the transport sector in different European countries.

As part of its research activities, the ECMT holds regular Symposia, Seminars and Round Tables on transport economics issues. Their conclusions serve as a basis for formulating proposals for policy decisions to be submitted to Ministers.

The ECMT's Documentation Service has extensive information available concerning the transport sector. This information is accessible on the ECMT Internet site.

For administrative purposes the ECMT's Secretariat is attached to the Organisation for Economic Co-operation and Development (OECD).

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Un nouveau rôle pour l'entreprise

Further information about the ECMT *is available on Internet at the following address:*
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Successful approaches to environment and economy
- Company management of staff's travel choices -
Experience gained from the Austrian pilot project "Sanfte Mobilitäts-Partnerschaft"
(soft mobility partnership)

A joint initiative by the Federal Ministry for Agriculture and Forestry, Environment and Water Management and the Austrian Chamber of Commerce for the promotion of environmentally-friendly travel choices at company level and transport rationalisation

FOREWORD

This summary is based on the results and practical experience obtained from the pilot project, "*Sanfte Mobilitäts-Partnerschaft*" - Company management of staff's travel choices - implemented in a total of five model establishments and jointly sponsored by the Federal Ministry for Agriculture and Forestry, Environment and Water Management (BMLFUW) and the Austrian Chamber of Commerce (WKÖ).

The summary was drafted by Dipl.-Ing. Robert Thaler (BMLFUW), Dr. Max Herry, Dipl.-Ing. Markus Schuster (both from Büro Herry), Univ. Prof. Dipl.-Ing. Dr. Hermann Knoflacher and Univ. Doz. Dipl.-Ing. Dr. Michael Schopf (both from Technische Universität Wien, Institut für Verkehrsplanung und Verkehrstechnik).

SUMMARY

Vienna, April 2001

1. STARTING POINT AND POLICY MOTIVATION

Growing transport problems require innovative approaches to the issues of protecting the environment and the climate at company level too. In Austria, employees continue to commute by car, while the share of public transport has declined (Figure 1). In 1995, the share of the car in all modes used for travel to work actually amounted to an average of 64 per cent (Figure 2), with the share in central and peripheral districts of Austria being around 70 per cent(!). In Vienna, the share of car journeys was 43 per cent, and in large towns (other than Vienna) 58 per cent.

The share of public transport in the modes used for travel to work amounted to an average of 18 per cent in 1995 (Figure 2). In central districts only one in seven, and in peripheral districts only one in ten(!) such journeys were made with public transport. The consequences of this are:

- Customers cannot find a parking space;
- Costly company land is used for parking cars;
- Employees arrive at work late and in a state of stress;
- Delivery times cannot always be kept to;
- Annual travel costs continue to increase.

Figure 1: **Daily commuters by transport mode: car/motorcycle/moped, 1971-91**

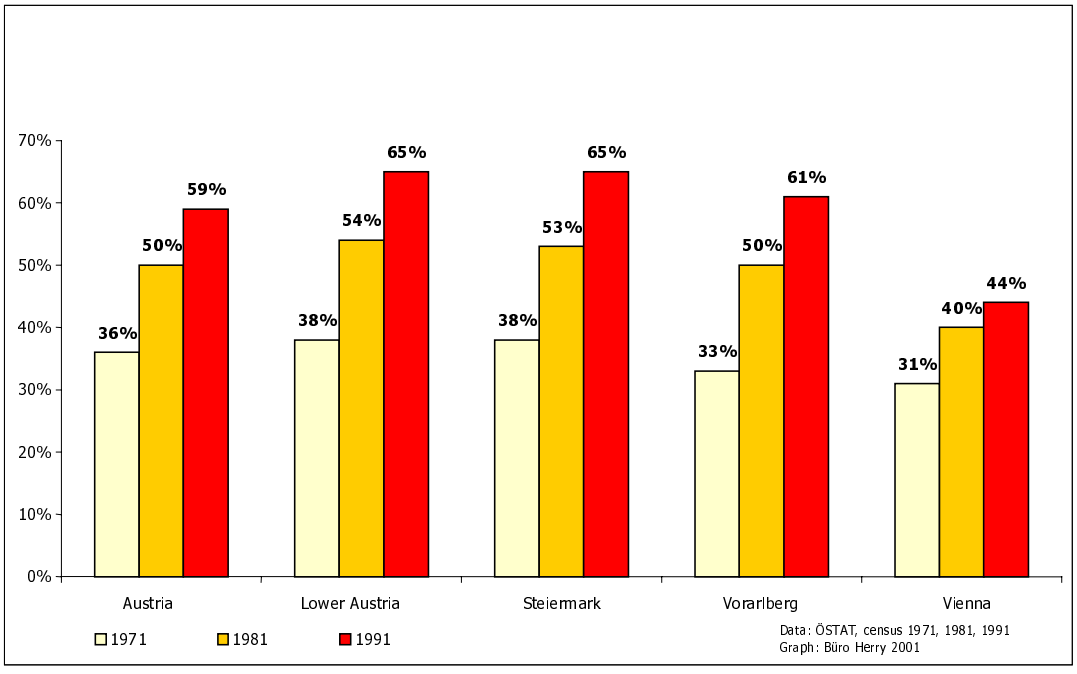
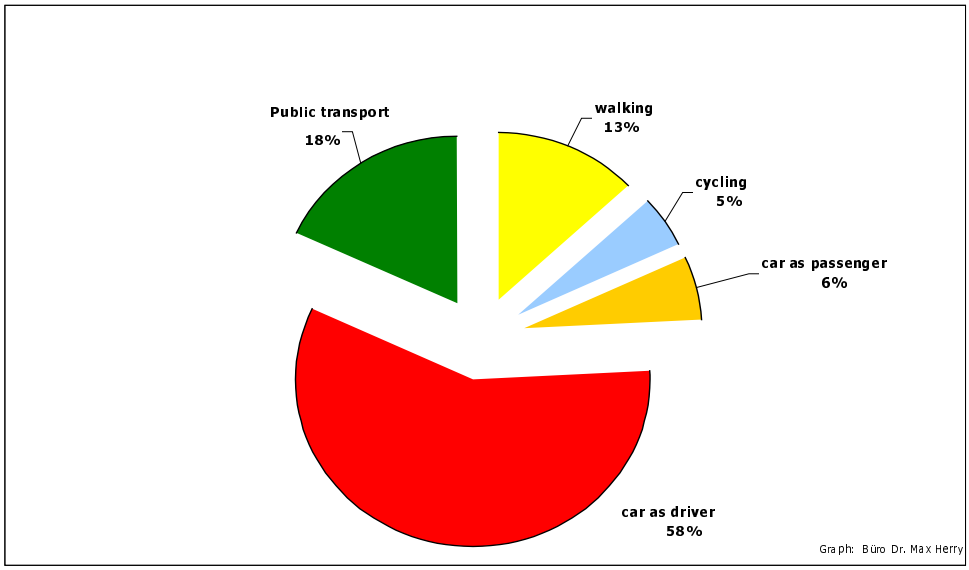


Figure 2. **Chosen transport mode for travel to work in Austria 1995 (working days)**[1]



On the basis of these findings, it can be established through detailed analysis that, despite lavish investment in transport organisation, current transport developments are frequently in conflict with modern management goals. If appropriate measures are not taken, these problems will not simply remain unresolved, they will get worse. A great many surveys, such as the Austrian national environment plan (NUP), show that a further steep rise in private car transport can be expected over the next 10 to 20 years, assuming that the framework conditions remain the same.

The projected one-sided development in transport runs counter to the objectives of sustainable development. Damage to the environment and risks to health would increase further if the current trend were to continue and the positive results of environmental policy - the reduction of exhaust fumes, for example - could be cancelled out.

Co-ordinated implementation of measures to promote sustainable transport is therefore required if the goals of environmental policy - such as that of reducing greenhouse gases in accordance with the Kyoto Protocol[2] - are to be achieved. Not only do the authorities need to act, but also businesses and, in particular, the individual transport user. It is precisely in travel to work and transport at company level that the essential starting points for the promotion of environmentally-friendly transport are to be found. The company management of staff's travel choices offers interesting ways of solving this problem.

In view of the positive experiences in many countries, such as the USA, the Netherlands and Italy, the Austrian National Environment Plan (NUP) also recommends this instrument to organisations and companies. The objectives here are environmentally-friendly transport and the rationalisation of transport, in other words, less damage to the environment and, not least, cost benefits for companies and their employees.

2. PILOT PROJECT "*SANFTE MOBILITÄTS-PARTNERSCHAFT*" – COMPANY MANAGEMENT OF STAFF'S TRAVEL CHOICES

2.1. Pilot project "*Sanfte Mobilitäts-Partnerschaft*" involving authorities and business

Based on a common initiative by the Federal Ministry for Agriculture and Forestry, Environment and Water Management (BMLFUW) and the Austrian Chamber of Commerce (WKÖ), the pilot project was started in 1997. Through a selection procedure, the following five companies or other establishments were chosen from among many others as models: BMLFUW, the Federal Office for the Environment (UBA GmbH), the AVL List GmbH (research company), Tulln State Hospital and the Medienhaus Vorarlberg (newspaper publisher).

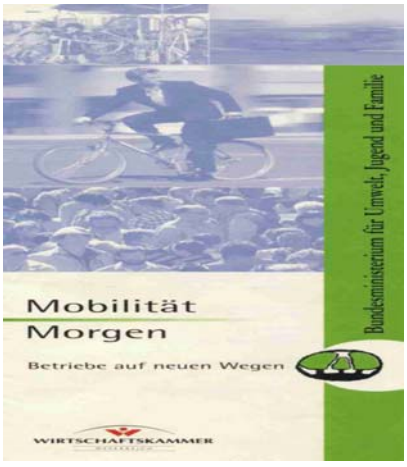


Plate 1: *Pilot project "Sanfte Mobilitäts-partnerschaft"*

The partnership between business and the authorities was to give an impetus to the "promotion of environmentally-friendly staff travel choices at company level *("soft" mobility)* and the rationalisation of transport". In the course of the two-year pilot project, the Federal Ministry for Agriculture and Forestry, Environment and Water Management (BMLFUW), together with the Federal Office for the Environment (UBA GmbH), the AVL List GmbH (Graz), Tulln State Hospital and the Medienhaus Vorarlberg used company management of staff's travel choices. The Federal Ministry supported the selected model establishments with expertise and funding.

The results of the project in the model establishments have been encouraging and show that company management of staff's travel choices leads to a clear reduction in CO_2 emissions and in

damage to the environment and, at the same time, contributes to the rationalisation of transport and its associated cost benefits.

This report gives a summary of the essential results and methodology of the pilot project.

2.2. Company management of staff's travel choices: spheres of action and working methods

"Company management of staff's travel choices" involves the formulation and implementation of company-specific approaches to transport with the object of achieving environmentally-friendly, sustainable staff transport and rationalisation of transport. If these goals are to be achieved, such management should take account not only of:

- rush-hour traffic;
- transport behaviour of employees going to work; but also
- work trips;
- business traffic;
- transport behaviour of clients; as well as
- logistics (e.g. dispatching goods, supplying, etc.); and
- fleet management.

In practice, company management of staff's travel choices, tailored to each company's situation, must be worked out and implemented case by case in close co-operation with management and staff representatives.

The core elements here are:

Motivation Involvement of employees;	"INFORMING"
Review and analysis of current situation; Estimation of potential for transfer;	"ANALYSING"
Setting of targets; Working out of sets of measures;	"PLANNING"
Implementation of measures; Evaluation;	"IMPLEMENTING"
Long-term implementation; Associated public relations work.	"TAKING CHARGE"

2.2.1 "INFORMING" - Involvement of employees

An essential part of formulating an approach to company management of staff's travel choices is the setting up of transport working groups. In these groups, in which management, staff representatives and employees take an active part, targets, measures and the associated procedures are worked out jointly. Division into smaller groups to address specific problems or means of transport, such as the "public transport" group, the "private car" group, the "bicycle" group, etc., prove to be of particular value here.

2.2.2 "ANALYSING" - Review and analysis of current situation

If approaches to the company management of staff's travel choices are to be formulated and implemented, it is necessary to carry out a review of the current situation, in which data are collected and analysed at three levels, employee level (survey), company organisation level and transport level. Above all the evaluation of staff transport choices as well as the distribution of routes – an essential part of estimating the potential – represent the major parts of the analytic phase.

2.2.3 "PLANNING" – Identifying targets and measures

The identification of targets and strategic priorities are important elements in the successful management of staff's travel choices. To meet the higher goal of sustainable development, it is possible to identify concrete **ecological goals** (e.g. reduction in CO_2 emissions, climate protection, reduction in air pollution and noise), **economic goals** (e.g. transport rationalisation) and **social goals** (e.g. road safety and public health), as well as **transport goals** (e.g. change in choice of transport). After the survey and analysis phase, the goals are worked out and concrete sets of measures are devised jointly with the employees and decisionmakers in the transport groups. In drawing up these measures, account should be taken of the following points, *inter alia*:

- Those currently travelling by foot, bicycle or public transport should continue to do so while those currently using cars should be prompted to change to alternative forms of transport;

- Account should be taken of the fundamental causes and motives of behaviour:
  - "Create alternatives and offer alternatives";
  - "Transform negative into positive behaviour and encourage positive behaviour."

2.2.4 "IMPLEMENTING" – Implementation of measures and evaluation

After planning comes the implementation phase. The most effective sets of measures, those that clearly contribute to a reduction in the modal share of private cars and therefore to the alleviation of damage to the environment and to the rationalisation of transport, are chiefly:

- all financial incentives, such as free annual travel passes for public transport users, subsidised travel for public transport users, etc.;
- increased attractiveness of associated environmentally-friendly modes of transport (better infrastructure for pedestrians and cyclists, direct links to public transport and regular services, subsidised travel for public transport users, etc.);
- logistic measures such as fleet management, optimisation of work trips, etc.;
- and, above all, measures that affect the supply of parking places, such as parking-space management, keeping the existing number of parking places stable despite an increase in staff numbers.

Greater provision of information and all measures that raise awareness are not to be overlooked, since they raise employees' consciousness of the problems significantly.

To be able to assess the effectiveness of the measures implemented, both quantitatively and qualitatively, regular surveys should be carried out on the basis of indicators that are easily taken into account (e.g. choice of transport mode, car-km covered, etc.). In the course of an assessment, employees should be asked to fill in forms and those who "form opinions" should be questioned in person.

2.2.5 "TAKING CHARGE" – Long-term implementation

Company management of staff's travel choices is not an individual measure applied to a specific place at a particular time, but a dynamic process involving motivation, learning and experience, whose overall success depends on the long-term implementation of measures in the company. An important prerequisite of this is the assignment of competence and responsibility (e.g. transport representatives) in the company. The areas of competence of a transport representative might, for example, include:

- Co-ordinating meetings of management and staff representatives;
- Keeping information on provision of services - such as public transport - up to date;
- Providing employees with current information on transport/traffic;
- Organising "transport days" to provide regular information and raise awareness;
- Maintaining and building up contacts and co-operation between transport undertakings, district corporations, etc.;
- Taking active responsibility for transport working groups and employee motivation;
- Carrying out assessments on travel behaviour and transport problems;
- Optimising vehicle fleet and procurement in accordance with ecological criteria;
- Optimising work trips and movement within company premises;
- Monitoring success and producing assessment reports.

It is of decisive importance that company management of staff's travel choices be incorporated in the company's model and established as a basic issue for management and staff representatives. The transport representative thus acquires a kind of directing/co-ordinating function.

3. MODEL COMPANY: VORARLBERGER MEDIENHAUS

This chapter gives a detailed description of the methods and results of the model company, Vorarlberger Medienhaus, which is representative of the model establishments as a whole.

Plate 2: *Model company: Vorarlberger Medienhaus*

3.1. Starting point

For a long time, particular attention has been devoted to the subject of transport in the Vorarlberger Medienhaus (publishing house).

On the one hand, readers were encouraged to use public transport, on the other hand, the limited parking space at the former site in Bregenz prompted the employees to adopt this behaviour themselves. As a result of the move from Bregenz to a new site in Schwarzach (1996), the framework conditions have fundamentally changed. The new publishing house with its interesting architectural design is – from the transport planner's point of view – badly sited in the "open countryside" at the district boundary between Schwarzach and Dornbirn. As a result of the company's move from Bregenz to Schwarzach, only around 7 per cent of the employees are resident in the town where the company is located, and the others have to travel an average of 14 km to get to work. At the beginning of the project, a total of 250 people were employed at the publishing house. This number increased by about 300 per year until the end of 1999. The generous supply of parking places at the new site, the long walk from the station to the company premises, the inadequacy of public transport provision as far as the employees were concerned, the lack of facilities in the immediate vicinity of the company premises, irregular working hours and a great many individual, personal factors led to the car being chosen as the predominant mode of transport. As a result, five people took the initiative of forming a transport group, with a view to devising ways of optimising the transport behaviour of the staff and making it environmentally friendly. These endeavours led to the company's application to take part in the pilot project.

3.2. Survey and analysis

The November 1997 survey of employees gave a comprehensive picture of their transport behaviour. There was a thorough review of the framework conditions, such as the supply of interrelated environmentally-friendly transport facilities, a structural survey in the publishing house catchment area, etc. The survey itself required each member of staff to fill in a questionnaire on his/her transport choices, with complementary questions intended to illustrate the employee's domestic circumstances and attitude towards transport. The generous supply of parking places near the publishing house and a great many other factors meant that before the beginning of the project the proportion of car drivers amounted to 75 per cent. Twelve per cent chose to use public transport to travel to work and 7 per cent chose to cycle to work (Figure 3). About a fifth (21 per cent) of the car drivers had to travel less than 5 km (Figure 4). More than half the employees (60 per cent) who drove to work lived no more than 10 km from the workplace.

Figure 3. **Transport choices for travel to work in the Vorarlberger Medienhaus before the start of the pilot project**

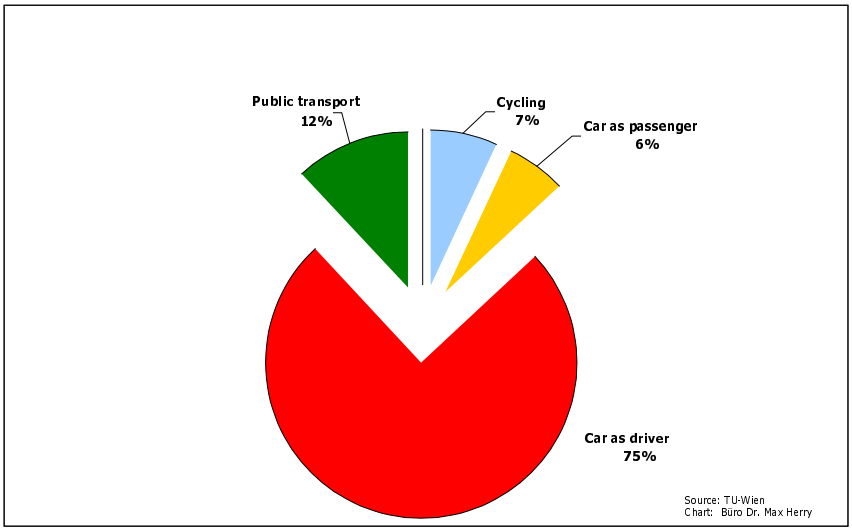
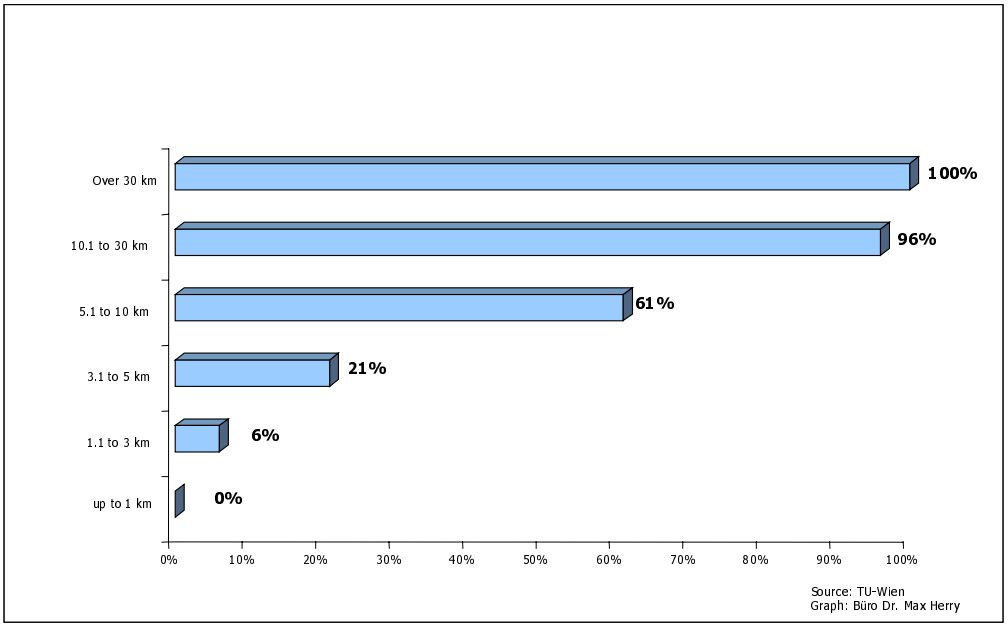
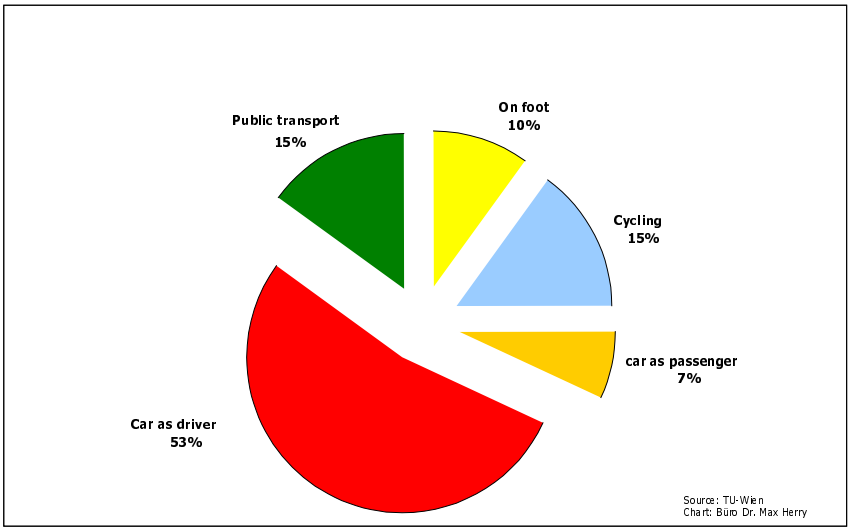


Figure 4. **Distribution per distance travelled - car drivers - Vorarlberger Medienhaus**



However, the share of the car accounted for 53 per cent of all travel by members of staff's households, public transport for 15 per cent, bicycle for 15 per cent, walking for 10 per cent and travel by car as passenger for 7 per cent (Figure 5).

Figure 5. **Choice of transport for all travel by members of staff's households before the start of the pilot project - *Vorarlberger Medienhaus***



3.3. Establishing targets and measures

The results of the transport survey support the statements made by Prof. Knoflacher at the first staff meeting, to the effect that halting the trend as the initial goal and reducing the proportion of staff choosing to drive to work from 70 to 60 per cent could be regarded as realistic goals for the time being and should be achieved in the course of the project through the implementation of certain measures.

3.4. Implementation of measures

A great many measures were implemented in the publishing house in the duration of the project. Some of them are cited below.

3.4.1 Measures implemented in the pedestrian and cyclist area

Improving the infrastructure

Following the company's talks with the Schwarzach district authorities, the resurfacing of footpaths leading to the station was incorporated into the building programme. At the instigation of the publishing house, sponsors were found - in addition to the publishing house itself - to install lights for these footpaths. Moreover, the light is provided solely by solar-lighting masts (*Sonnenpfad*). At a subsequent stage, the paths will also be bordered with plants (Plate 3).

At the company site, a cycle stand has been installed (also suitable for motor cycles) in addition to the existing one. This second cycle stand sends out the right signal, increases capacity and also gives better protection from bad weather. Moreover, facilities for cyclists have also been improved, and now changing rooms, showers, the company's own raincoats, tools (fitters are also willing to help with minor cycle repairs) and pump facilities are available (Plate 5). Furthermore, special rates have been negotiated by the works council for the purchase of cycles in several specialised shops (discounts of around 20-30 per cent).

Avoiding detours

By opening up entrances to the building at points giving easy access to bus stops, public transport users, as well as pedestrians and cyclists, have been able to reduce the length of roundabout walks. Train users are now able to open the otherwise closed rear entrance to the publishing house with a magnetic card and enter the building directly from the station without going around it.

3.4.2 Measures implemented in the area of public transport

Improvement of infrastructure and bus/train supply

In addition to the qualitative improvement in the access paths to the bus stops, the terminus of line 3 of the Dornbirn city bus service has been moved to just in front of the publishing house (Plate 4).

Many employees use the bus to get to the centre and back in just twelve minutes. Eight annual travel passes are available from the telephone switchboard and employees can use them for free bus travel.

Subsidised travel for public transport users

When the practice of issuing free public transport passes was cited in the Vorarlberger Medienhaus survey as an important argument for giving up the car, the publishing house promoted the use of annual travel cards, valid for interconnected modes of transport, as an incentive for employees to use public transport. If an employee made more than half of his/her journeys to work by bus and/or train, the publishing house agreed to pay the cost of the annual travel pass for the intermodal public transport system between the employee's home and the publishing house. For distances in excess of 16 kilometres, the cost of an annual pass for the regional transport network, which gives better value than the single route pass, is reimbursed. Anybody living in Bregenz gains an additional benefit: the travel pass is also valid for Bregenz city buses as a whole. If an employee takes a bicycle with him/her on the train, the firm also pays for this extra pass. This offer is open once an employee has been working for the company for four months. When an employee leaves the company, the months for which the card is still valid are charged to the employee.

Plate 3: *The unsurfaced path leading from the Vorarlberger Medienhaus to the station was unattractive in bad weather and was therefore surfaced with asphalt. The staff's frequently expressed wish for lighting was met in an innovative and environmentally friendly way (solar-lighting masts).*

Plate 4: *Line 3 of the Dornbirn city bus service now terminates directly in front of the publishing house and offers easy access to public transport.*

Plate 5: *The second cycle stand in the Vorarlberger Medienhaus sends out the right signal, increases capacity and also gives better protection against bad weather.*

3.4.3 Measures implemented in the area of car transport

Group transport arrangements

Further measures aimed at private car users mainly concern incentives to promote ride sharing. Reserved parking places for the cars used for ride sharing are thus made available near the entrance to the building. Despite a rise in the number of employees, the supply of parking places has not been increased (a reduction in real terms).

Parking spaces

In the meantime, there will be no rationing of parking spaces; however, the car park will not be enlarged, despite the increase in the number of employees. Any limitation on parking space has been ruled out by the company for the time being. To begin with, an attempt will be made to persuade employees to change their mode of travel by raising their awareness and applying "soft" pressure. Rationing parking space will therefore be seen as a measure to be resorted to in the future.

3.4.4 Measures implemented in the area of work trips

Optimising vehicle fleet

In fleet procurement, decisive importance must be ascribed to ecological criteria, such as fuel consumption, low CO_2, nitrogen oxide, hydrocarbon, particle and noise emissions, in addition to specific company requirements and safety considerations.

The vehicles “Smart” and “Golf” (Smart bears the legend *sanft mobil* to advertise soft mobility - Plate 6) have been purchased for the reporting staff: for work trips in future, employees’ own cars will only be used and travel expenses will only be paid if it is clear that neither of the two company vehicles was available. A claim for the vehicles can be made through the switchboard in the reporting staff secretariat. The staff member need only give advanced notification by telephone of the date and the length of time for which it is required. By using both of the service vehicles and thus reducing the amount paid out in travel expenses for work trips by employees in their own cars, the company makes savings of around ATS 330 000 *(Euros 23 982)* per year.

3.4.5 Measures implemented in the area of information

Information system in entrance area

An information system and display column at the exit promote awareness of the project and provide general information, timetables, charges, in-house directions, plans showing public transport stops, etc. (Plate 7). In addition, a "transport breakfast" has been introduced, which has served as a means of improving communication and providing information, raising awareness and dealing with complaints (Plate 15). Every first Friday in the month between 7.30 and 8.30 a.m., a breakfast buffet is arranged in the cafeteria for all employees who come by car in ride-sharing groups, by train and/or bus, by bicycle or on foot. This provides a good opportunity for employees to express desires or criticisms regarding transport conditions.

Plate 6: *Work trips can be made with the two service vehicles. Employees' own vehicles are hardly needed for this purpose any more.*

Plate 7: *The display column in the entrance hall, attracting attention and providing information.*

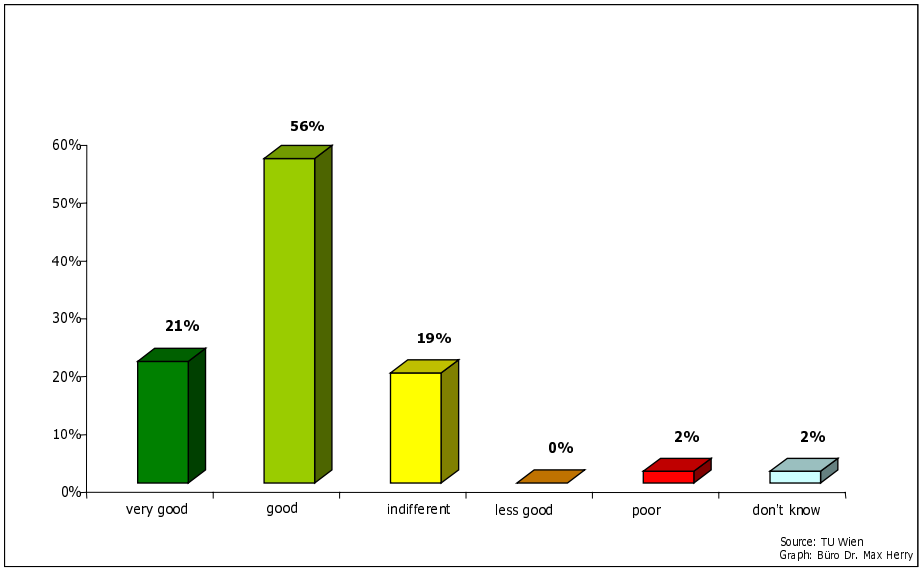
Results and analysis of effects

It has been possible to ascertain and document the success of the measures from the survey carried out after their implementation.

3.4.6 Positive assessment of the pilot project

At any rate, the post-implementation survey carried out in autumn 1999 showed that 76 per cent of the employees were of the opinion that the *Sanfte Mobilitäts-Partnerschaft* project had encouraged awareness of the issue of environmentally-friendly transport. The results of the survey thus showed a 16 per cent(!) improvement on those of the pre-implementation survey (average marks 1997: 2.46; 1999: 2.08) (Figure 6).

Figure 6. **Model company Vorarlberger Medienhaus: evaluation of project from employees' point of view**



"Use of the car in travel to work could clearly be reduced"

The proportion of employees driving to work fell from 75 per cent to 60 per cent (Table 1).

Table 1. **Model company Vorarlberger Medienhaus: Comparison of transport choices for travel to work (before and after)**

	Before	**After**
Public transport	12%	20%
Car as driver	75%	60%
Car as passenger	6%	12%
Cycle	7%	8%
Walking	0%	0%

"Use of the car outside work could also be reduced"

For all trips by employees, a fall from 71 per cent to 62 per cent may still be observed and even car journeys by employees' households in general fell from 53 per cent to 49 per cent (see Table 2). The reduction in car use for travel to work was therefore *not* cancelled out as a result of the greater number of cars available at home. This means that the positive changes in travel to work have also induced positive changes in transport behaviour on the part of households in general. Distinct changes in behaviour or attitude can thus be ascertained and mainly manifest themselves in a greater willingness to use public transport.

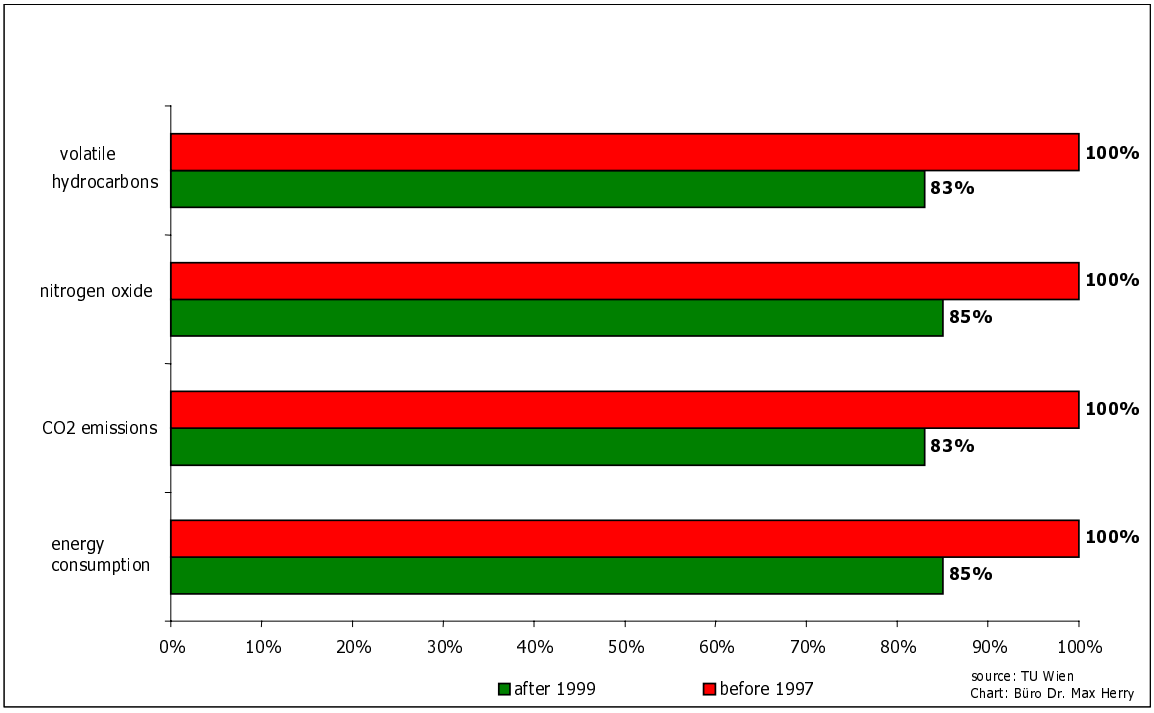
Table 2. **Model company Vorarlberger Medienhaus: Comparison of transport choices for all trips by households (before and after)**

	Before	**After**
Public transport	15%	18%
Car as driver	53%	49%
Car as passenger	7%	7%
Cycle	15%	15%
Walking	10%	10%

"A 17 per cent reduction in CO_2 from travel to work"

As far as the publishing house is concerned, the benefits to the environment are most clearly marked in the case of travel to work, where an average reduction in CO_2 of 17 per cent was observed (Figure 7).

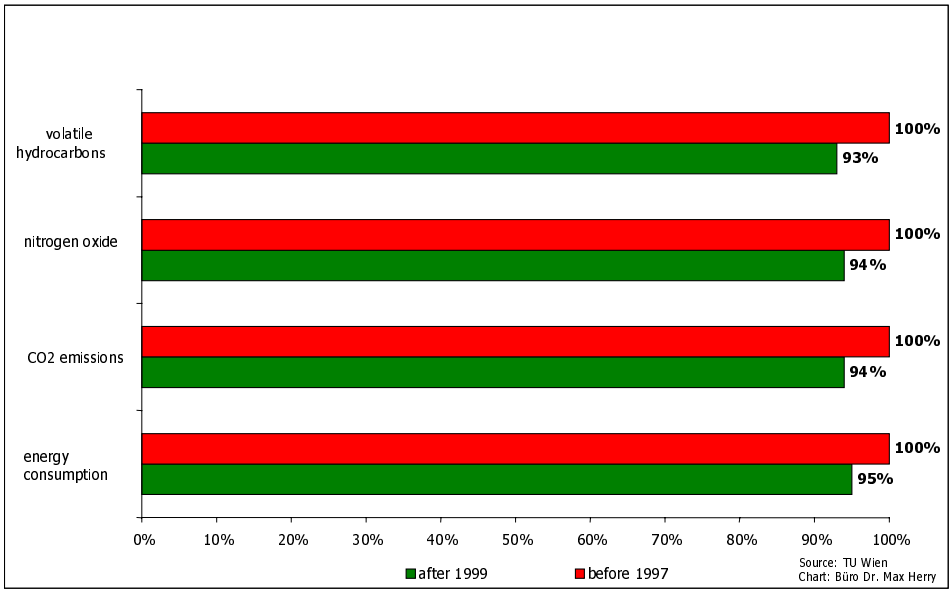
Figure 7. **Model company Vorarlberger Medienhaus: Comparison of effects on the environment of employee's travel to work before and after project (average)**



"A reduction in CO_2 can be observed if all trips by members of households are taken into account"

Because the Vorarlberger Medienhaus survey extended to the behaviour of the employee's household as a whole, it was possible to ascertain the benefits for the environment from all trips made by household members. As a result of the pilot project, it has been possible to achieve a reduction in CO_2 emissions of 6 per cent(!) even for the household as a whole (Figure 8).

Figure 8. **Model company Vorarlberger Medienhaus: Comparison of effects on the environment of all travel by "average" employee's household before and after project**



"Cost savings for employees and company"

The key factor was the promotion of greater awareness of the benefits to employees, management and the environment. Employees who have given up travelling to the publishing house in their own cars have been able to make additional savings, since travel to work no longer costs anything once they have switched to public transport. The (average) annual saving per employee amounts to around ATS 3 800[3] *(Euro 276).*

Cost savings by the company have resulted from the use of the two new service cars by the reporting staff and consequently from savings in the amounts paid out in travel expenses for work trips made in the employees' own cars, which amount to around ATS 330 000 *(Euro 23 982)* per year.

Example:

Travel expenses previously paid for work trips in employees' own cars:	+/- 500 000 ATS *(Euro 36 336)*/year
Depreciation costs for the two cars:	+/- 70 000 ATS *(Euro 5 087)*/year[4]
Further travel expenses:	+/- 100 000 ATS *(Euro 7 267)*/year
Saving for the publishing house:	*+/- 330 000 ATS (Euro 23 982)/year*

Long-term implementation

In the publishing house, all measures have already been implemented and instituted for the long term. In future, particular attention will be paid to the following activities:

- *Following up implementation of measures*:
  - Keeping up action on intermodal public transport passes;
  - Maintaining "transport breakfasts";
  - Keeping the city bus(-stop);
  - "Beating the drum for soft mobility" - keeping up discussion ;

- Providing new employees with information packages with personalised timetables;
- Maintaining and promoting ride-sharing in cars;
- Ensuring ongoing company support in the future.

– *Establishing new initiatives:*
  - Giving greater leeway to "soft mobility" group and activities in the company;
  - Introducing management of parking space;
  - Carrying out public relations work in favour of persons who change to associated environmentally-friendly modes of transport with a view to reinforcing their positive image.

4. OVERALL RESULTS FOR ALL FIVE MODEL ESTABLISHMENTS

4.1. Main results

Many measures were implemented in the model establishments during the project and they yielded the following findings:

- It was possible to influence choice of transport mode for journeys to and from work in favour of environmentally-friendly travel;
- It was sometimes possible to achieve very substantial reductions in the share of the car in the modes chosen for travel to work as a whole and thus halt the trend to further growth in car traffic (share of car reduced by up to 15 per cent);
- It was possible to increase the share of public transport, cycling and walking in the modes chosen for travel to work;
- The positive changes in the ways in which employees travel to work also led to positive changes in the transport behaviour of members of their households (as in the case of the Vorarlberger Medienhaus);
- CO_2 emissions from travel to work were reduced by between 3 per cent and 30 per cent;
- Transport was rationalised;
- The model establishments improved their image (reports in newspapers, Federal Ministry's own home page, presentations at various functions, conferences, OECD recognition: "best practice", etc.);
- Management of staff's travel choices will not only benefit the environment, it could also produce financial benefits for the company [the Medienhaus Vorarlberg is now saving around ATS 330 000 *(Euro 23 982)*/year];
- Employees gain financial benefits [by not using his/her car, the "average" employee at the Medienhaus Vorarlberg saves around ATS 3 800[5] *(Euro 276)* per year];
- Positive assessment by staff (the pilot project and hence the commitment shown in each model establishment was judged to be "very good" or "good" by more than half the staff in the establishments as a whole);
- Increased awareness on the part of employees, including management and staff representatives, of traffic and environmental problems and possible ways of solving them.

4.2. Measures implemented

The following list gives an overview of some of the measures implemented in the different model establishments.

Pedestrians and cyclists

- Making footpaths more attractive (Plate 8 and Plate 11);
- Covered cycle stands (Plate 9);
- Procurement of service cycles and two-wheel vehicles, including electric cycles and electric scooters (Plate 10);
- Bicycle servicing weeks;
- Provision of "cyclists' breakfast" (Plate 12);
- Company-sponsored insurance against bicycle theft, etc.

Plate 8: ***Vorarlberger Medienhaus: The directions from the station to the publishing house should help guests who come by train to find their way.***

Plate 9: ***In front of the BMLFUW (in Stubenbastei) a covered cycle stand has been erected and will be put to good use .***

Plate 10: ***Test days for electrical cycles in the Ministry of the environment and the Federal Office for the Environment enhance the image of the cyclist.***

Plate 11: ***Vorarlberger Medienhaus: The new resurfaced path leading from the company to the station greatly improves accessibility.***

Plate 12: ***AVL List GmbH: 220 employees took part in the "cyclists' breakfast".***

Plate 13: ***Vorarlberger Medienhaus: Minor repairs can now be made at the company – Tools and pump facilities are available.***

Public transport

- Free annual travel passes for public transport users;
- Subsidised travel for public transport users;
- "Trial months" for those who switch to public transport;
- Direct access to public transport from the company (Plate 4);
- Information packages for all employees (Plate 15);
- Personalised timetables for employees (Plate 16), etc.

Plate 14: ***Vorarlberger Medienhaus: Reserved parking places near the company entrance are made available to cars of ride-sharing groups.***

Plate 15: ***AVL List GmbH: Information packages for all employees.***

Plate 16: ***Employees at the Ministry of the Environment and the Federal Office for the Environment have been able to obtain information on transport provision on the Viennese lines and the •••••***

Motorised individual transport

- Management of parking space;
- No increase in parking space despite the increase in the size of the establishment;
- Preferential parking treatment for ride-sharing groups (Plate 14);
- Car-sharing and ride sharing;
- Financial incentives (public transport costs assumed by the establishment), etc.

Vehicle fleet procurement / company logistics / work trips

- Procurement of low-consumption, low-emission vehicles;
- Co-ordination of errands;
- Standardization of delivery dates of individual suppliers;
- Optimisation of supply logistics and warehousing;
- Replacement of private cars through service vehicle logistics and reduction of journeys to a minimum; Special train offers, improved booking facilities for work trips by train;
- New ruling by collective agreement in the Federal Office for the Environment: from now on travel time for work trips will be repaid "*financially or in free time in a ratio of 1:0.5*";
- Initiation of a discussion process on giving an ecological dimension to the decree on transport charges and the possibilities of reducing fiscal barriers.

- Organisation of “transport days” (Plate 17 to Plate 19);
- Travel information enclosed with pay slip;
- Travel information by Intranet and Internet;
- Appointment of transport representative to company.

In addition, a great many measures designed to raise awareness have been implemented in all the model establishments.

Plate 17: ***LKH Tulln: Employees’ and visitors’ attention is drawn to the "Transport Day" right at the entrance to the building.***

Plate 18: ***LKH Tulln: even the youngest have been included in "Transport Day" activities.***

Plate 19: ***AVL List GmbH: The employees were able to learn the results of the projects from displays.***

4.3. Results in detail

CAR SHARE DOWN, PUBLIC TRANSPORT AND CYCLE SHARE UP

As a result of the measures implemented, it has sometimes been possible to achieve distinct reductions in the share of the car among the modes chosen for travel to work and thus halt the trend to further growth in car traffic.

- It was thus possible to reduce the proportion of those driving to work by between 2 per cent (AVL List) and as much as 15 per cent(!) (Medienhaus Vorarlberg) (Figure 9).
- Management of staff’s travel choices was even successful in the Ministry of the Environment, where it was possible to increase the 82 per cent share of public transport before the start of the project - already very high - by another 6 percentage points to 88 per cent(!) (Figure 12).
- As to the share of cycling, it was possible to achieve the greatest reductions in the UBA GmbH (+8 percentage points), in the LKH Tulln (+7 percentage points) and in the Federal Ministry for Agriculture and Forestry, Environment and Water Management (+6 percentage points) (Figure 10).

Figure 9. **Choice of transport for travel to work – before and after project – VN Medienhaus**

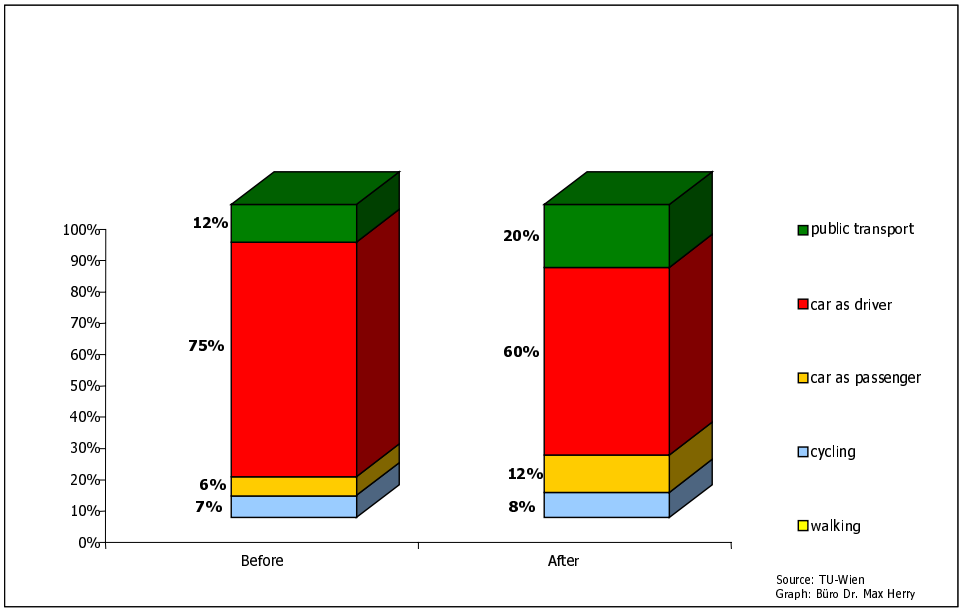


Figure 10. **Choice of transport for travel to work – before and after project – LKH Tulln**

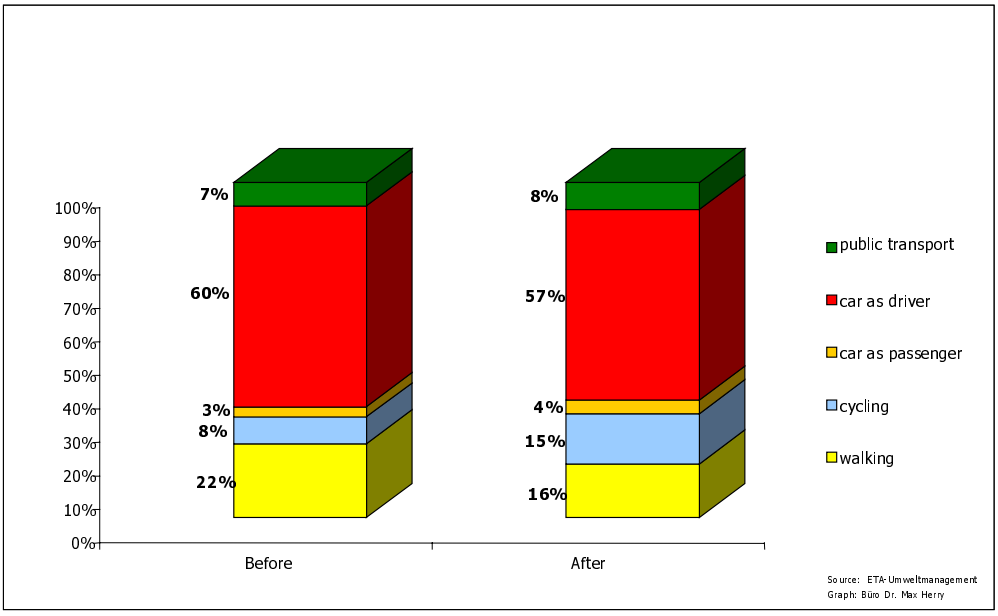


Figure 11. **Choice of transport for travel to work – before and after project – AVL List GmbH**

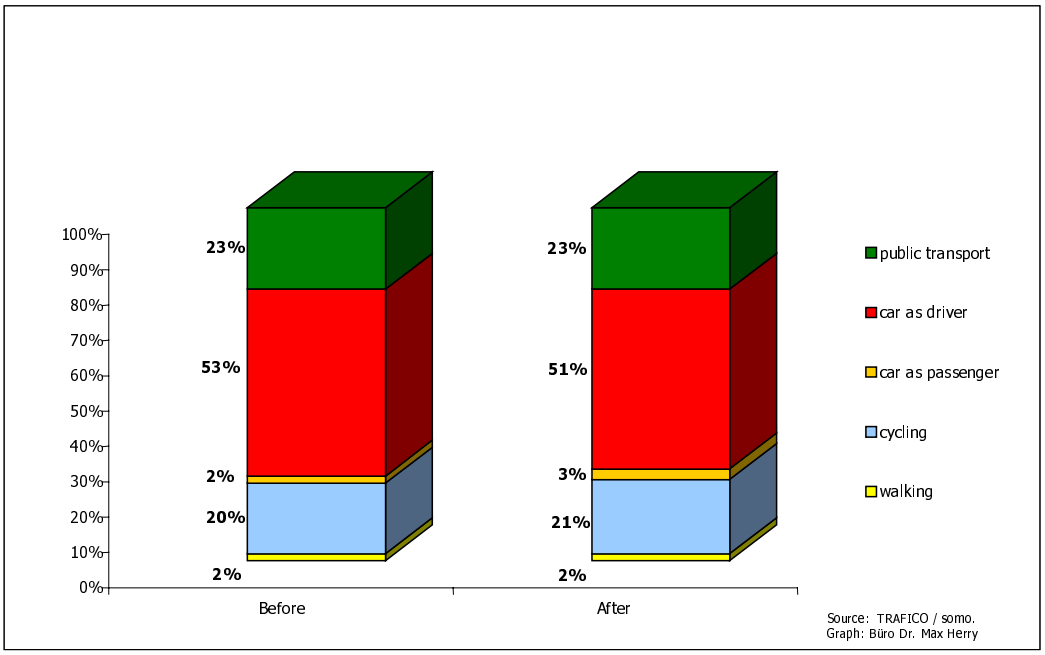


Figure 12. **Choice of transport for travel to work – before and after project – BMUJF (Stubenbastei)**

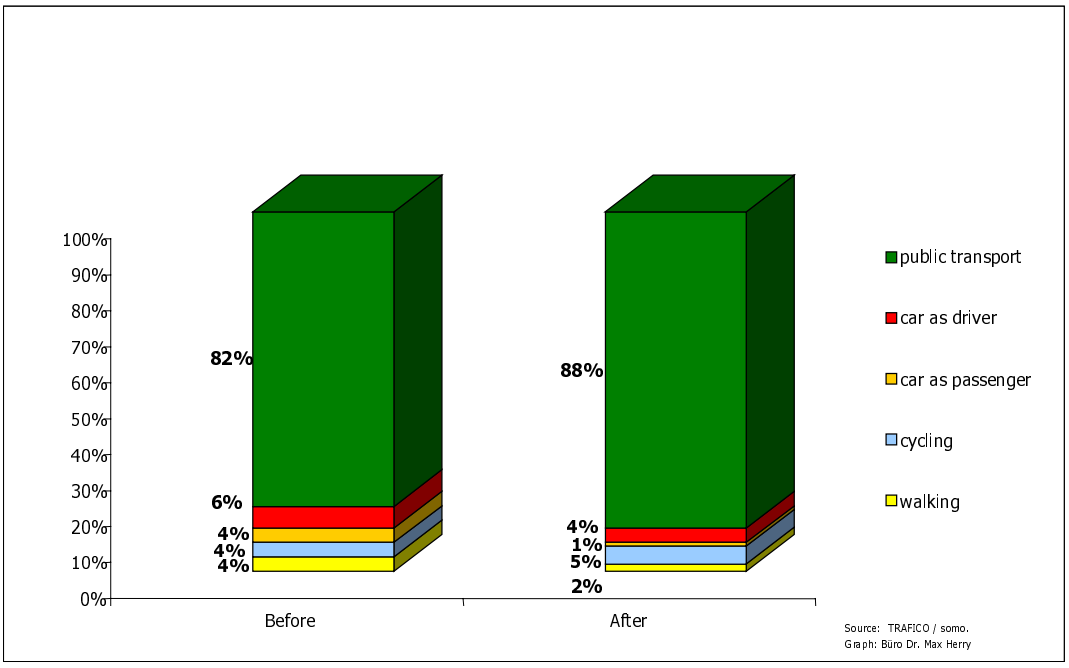
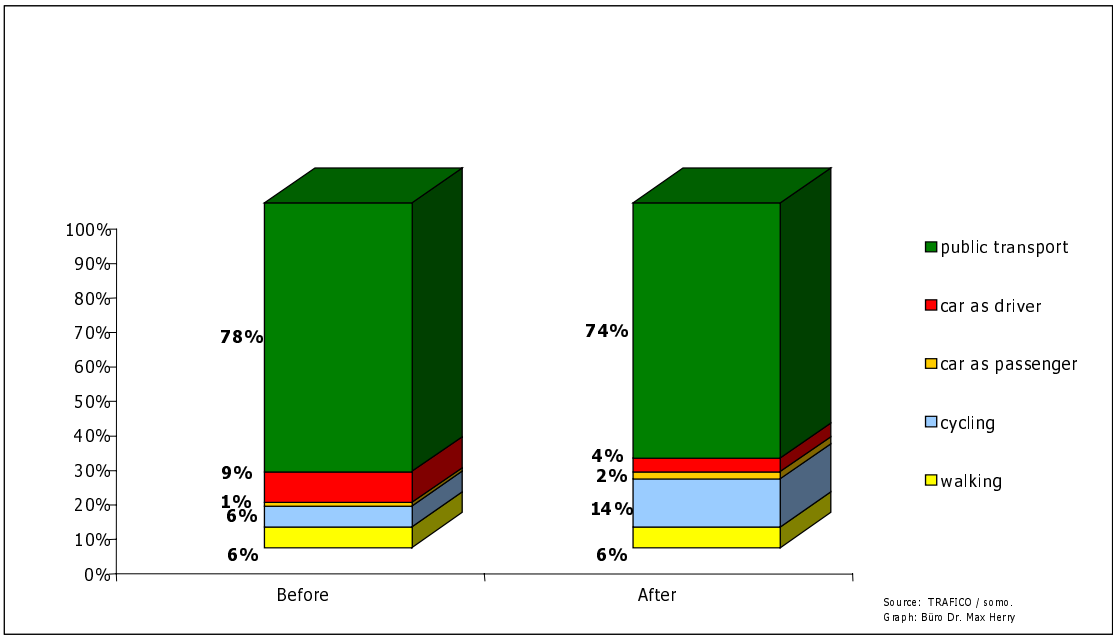


Figure 13. **Choice of transport for travel to work – before and after project – UBA GmbH**

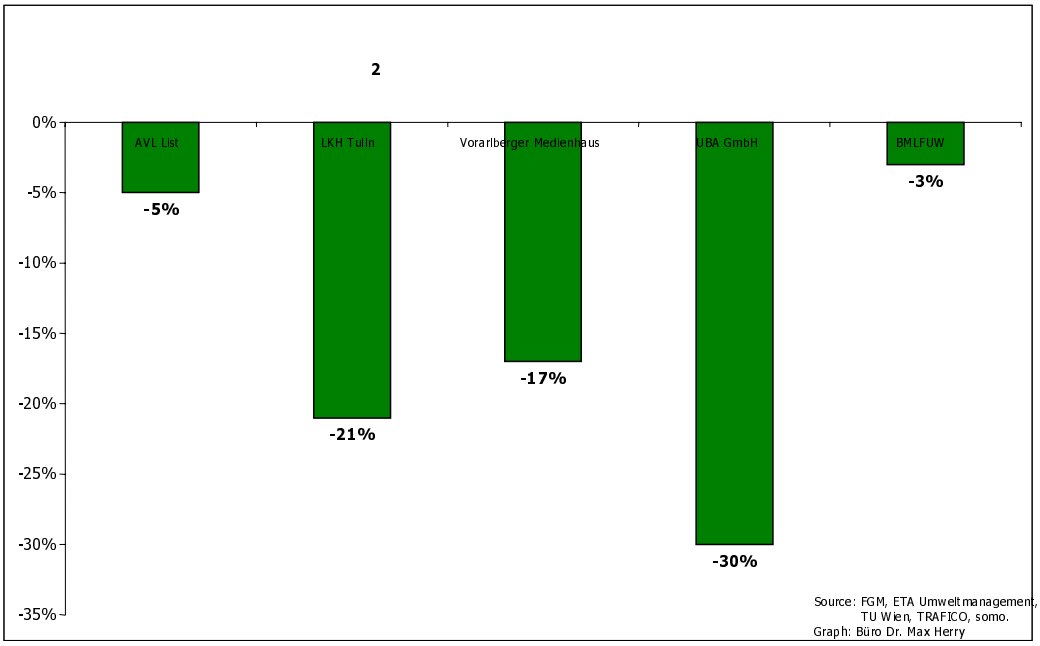


CLEAR REDUCTION IN CO_2

The changes in transport choices have brought about CO_2 reductions as follows:

- At the **AVL List** it was possible to achieve a reduction of around 31 tonnes of CO_2 per year (about 5 per cent). With the implementation of the parking space management system, a reduction of around 200 tonnes of CO_2 per year is expected;
- With the implementation of measures on work trips and supply logistics, it was possible to achieve a 21 per cent reduction, i.e. around 118 tonnes in CO_2 emissions at **LKH Tulln** (taking account of work trips and visiting traffic);
- At the **Vorarlberger Medienhaus** the environmental benefits were most marked in the field of travel to work, where an average reduction of 17 per cent in CO_2 emissions was noted;
- With the changes in transport choices, it was possible to reduce the CO_2 output per employee by 3 per cent at the **BMLFUW** and by 30 per cent at the **UBA GmbH** over the period 1997-99. It is worth noting here that, in view of the initial situation of the BMLFUW, where the public share was 82 per cent at the start of the pilot project, there was very little potential for reducing CO_2 emissions. It was nevertheless possible to increase the public transport share and thus reduce CO_2 emissions further.

Figure 14. **CO_2 reduction in the model establishments**



POSITIVE ASSESSMENT OF THE PILOT PROJECT

The fact that the activities put in place by the individual companies were also appreciated by their respective employees and that the measures met with a high degree of acceptance shows what the employees think of the pilot project. Thus, in the companies as a whole, more than half the staff rated the project as "very good" or "good".

IMPROVED IMAGE

The improvement in the image of all the companies cited as a result of the pilot project can be rated as a very positive outcome. In the course of the OECD's *environmentally sustainable transport* project, the two model establishments LKH Tulln and the Vorarlberger Medienhaus were singled out as representing "best practice" (Plate 21 to Plate 23).

Plate 20: The company's image is improved by management of staff's travel choices as a result of its being featured in different publications and referred to by organisations

Plate 21: OECD project – environmentally sustainable transport – LKH Tulln (Best practice)

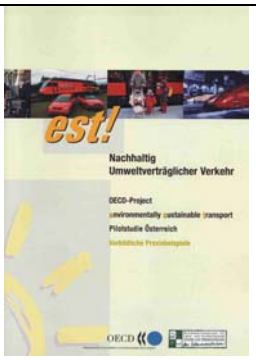


Plate 22: OECD project – environmentally sustainable transport

Plate 23: OECD project – environmentally sustainable transport – VN Medienhaus (Best practice)

COST SAVINGS FOR THE COMPANIES

Apart from improving their image, companies were also able to make cost savings by implementing environmentally-friendly transport measures (see section 3.4.6).

PUBLIC RELATIONS WORK WITHIN THE ESTABLISHMENT

On the one hand, the public relations work associated with the pilot project involved providing employees of model establishments with information in house, with a view to making them aware of progress in the work and, at the same time, encouraging them to participate (Plate 24).

Plate 24: Information leaflet AVL List GmbH

Plate 25: Fact sheet BMLFUW

On the other hand, the effects of the example set by the five model establishments and their experience of management of transport choice has been documented in various media: fact sheets (Plate 25), homepages, conference literature, handbook (Plate 26), etc.

5. CONCLUSIONS AND OUTLOOK

So that the findings of the model establishments might benefit other enterprises and encourage the implementation of travel choice management, a handbook (Plate 26) has been drafted on the subject of company management of staff's travel choices, showing the results achieved and measures adopted by the model establishments, together with tips and advice on devising and implementing approaches to managing staff's travel choices.

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Plate 26: Handbook for companies

5.1. Benefits to establishments

To sum up, it would appear that the chief benefits to the establishments that implement management of staff's travel choices are as follows:

1. Costs can be reduced (e.g. through rationalisation of transport) (*for company and employee*);
2. The company image can be improved;
3. The atmosphere in a company can be improved;
4. Conflict with neighbours can be prevented;
5. The enterprise can be made more accessible and the effect on location factors may be positive;
6. Environmental and health conditions can be improved and emissions of harmful substances, noise and land use reduced;

7. Modal choice can be altered;
8. Road safety can be improved.

Thus, from the experiences gained from the pilot project, the following conclusions can be drawn:

1) The company management of staff's travel choices provides a very useful instrument for achieving environmental goals, such as a reduction in CO_2 emissions and economic goals, such as the rationalisation of transport, in the field of company transport.

2) The two-year pilot project has shown that it is possible to achieve a high degree of support for the measures and distinct changes in transport behaviour on the part of employees and company.

3) The co-operation and support of management and staff representatives, active involvement of employees and co-operation with local authorities and transport undertakings are essential preconditions for success.

4) In view of the positive outcome of the pilot project *Sanfte Mobilitäts-Partnerschaft*, the company management of staff's travel choices can be recommended for more widespread use in Austria.

5.2. Follow-up

In view of the great success of the pilot project, the Federal Ministry for Agriculture and Forestry, Environment and Water Management (BMLFUW) and the Austrian Chamber of Commerce (WKÖ) have agreed to extend the *Sanfte Mobilitäts-Partnerschaft* further and have launched a focused initiative with the aim of promoting the company management of staff's travel choices more widely:

- Main support for the company management of staff's travel choices consists in support for the environment at company level: following a change in the law on environmental support, it is now possible to obtain support for initiatives and measures to reduce damage to the environment, notably CO_2 emissions, due to company transport and mobility.

- Services packages sent to companies and an information campaign launched with the object of encouraging as many companies as possible manage their staff's travel choices and take advantage of the new support schemes available. The handbook with the practical experience gained from the pilot project has accordingly been made available to all companies with more than 50 employees. An information and services package, containing advice and network plans, is being put together and is to be made available to the companies.

This action should be accompanied by an invitation to the public administrations (Federal, *Land* and District) to include management of travel choice in their sphere of responsibility. The pilot project has shown that just a few legal framework conditions (e.g. fiscal matters) are currently proving to be a hindrance to the individual measures (e.g. job tickets) employed in the company management of staff's travel choices, and this situation should be rectified in the medium term. Broader support for the implementation of company management of staff's travel choices is an essential component of Austria's strategy for meeting the targets for climate protection (Kyoto undertaking). This initiative should also prompt others involved in transport to adopt the instruments of travel choice management (e.g. at municipal level, in leisure and tourist travel, in the school sector). The BMLFUW has accordingly established successful travel choice management initiatives in large organisations and jointly implemented the pilot project *Sanfte Mobilität – Autofreier Tourismus* (soft mobility - tourism

without cars) with the Ministry for the Economy and Transport, the Federal *Land* of Salzburg and the model districts of Bad Hofgastein and Werfenweng, and with the support of the EU, in co-operation with other Alpine regions, transport undertakings, travel companies and vehicle manufacturers. This should mean that ways to achieve environmentally sustainable transport are identified and tried out, that ecological and economic benefits are associated and that significant efforts and contributions will support the implementation of policy on the environment and transport, as well as tourism and technology.

6. OTHER EXAMPLES IN AUSTRIA

The following list is a summary of other companies and institutions that have introduced management of staff transport choice into their establishments:

- Magistratsabteilung 22 *(Vienna);*
- Magistrat Klagenfurt *(Klagenfurt, Kärnten);*
- Magistrat Linz *(Linz, Upper Austria);*
- Suchard Schokolade GmbH *(Bludenz, Vorarlberg);*
- Ölz GmbH & Co Marktgemeinde *(Rankweil, Vorarlberg);*
- Wolford AG *(Bregenz, Vorarlberg);*
- Firma Giesinger & Kopf *(Vorarlberg)*

NOTES

1. Source: Herry, Sammer (1999), Transport Survey of Austrian Households 1995. Commissioned by BMVIT, Vienna.

2. By signing the Kyoto climate change protocol in 1997, Austria undertook to reduce levels of greenhouse gases (in particular, carbon dioxide) by 13 per cent by the period 2008 to 2012 (base year 1990).

3. For 220 working days and ATS 4.90 (€ 0.36)/km.

4. Procurement cost of the two cars: ATS 350 000 (€ 25 435). The depreciation period is five years for each car.

5. For 220 working days and ATS 4.90 (€ 0.36)/km.

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SOURCE OF PLATES:**

Plate 1:	BMLFUW
Plates 3, 4, 5, 6, 7, 8, 13, 14:	Vorarlberger Medienhaus
Plates 12, 15:	FGM-AMOR
Plates 2, 9, 10, 11, 16, 17, 18, 19, 20:	Büro HERRY

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*) The pilot project was implemented over the period 1997-99 and involved the Environment Divisions (in Stubenbastei) and the Youth and Family Divisions (in Franz-Josefs-Kai) of the former Federal Ministry for Environment, Youth and Family.

**) The right to print photographs is valid for a single use in the given work and may not be transferred to a third party.

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PARKING CASH OUT

(Chapters 1 and 22-28 from the manuscript of)
The High Cost of Free Parking

SUMMARY

Los Angeles, Revised March 2002

EXECUTIVE SUMMARY

Employer-paid parking is the most common tax-exempt fringe benefit offered to workers in the US and 95 per cent of American automobile commuters park free at work. All this free parking at work helps to explain why 91 per cent of commuters drive to work and why 91 per cent of commuters' cars have only one occupant.

Many solo drivers who park free at work would drive to work even if they had to pay for parking; employer-paid parking replaces a payment these commuters would otherwise make and it does not change their travel choices. But some solo drivers who park free at work would carpool, ride public transit, walk or bike to work if they had to pay for parking; these commuters drive to work alone because they can park free. Case studies and statistical models suggest that employer-paid parking increases the number of cars driven to work by 33 per cent when compared with driver-paid parking.

Some enlightened employers offer commuters the option to take the cash equivalent of any parking subsidy offered. Offering commuters the choice between a parking subsidy or its cash equivalent shows that even free parking has an opportunity cost—the foregone cash. The option to "cash out" employer-paid parking raises the effective price of commuter parking *without* charging commuters for parking. Commuters can continue to park free at work, but the option to take cash instead of free parking rewards commuters who do not drive to work. Parking cash out therefore increases the share of commuters who carpool, ride public transit, walk or bike to work.

Parking cash out does not mean that commuters cannot drive to work whenever they choose, because some firms offer the cash-out option on a daily basis. For example, consider the case of a firm (described in Chapter 23) that estimates its cost to provide commuter parking is $3 per space per day. The firm offers all employees free parking, but also offers them a credit of $3 on any day they arrive at work without a car. Therefore, 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 at work, the daily cash option encourages everyone to consider choosing the alternatives to solo driving whenever possible.

This daily cash-out arrangement is simple, fair and flexible for both the firm and its employees. Another important advantage is that all employees are automatically enrolled in the program even if they usually drive to work solo. Every employee can earn a $3 bonus on any day simply by showing up at work without a car. This arrangement is uncommonly generous to commuters who do not drive to work, but it merely levels the playing field among modes and it does not favor the alternatives to solo driving. Offering the same subsidy to drivers and nondrivers is unusually generous to nondrivers only because most firms offer nothing to nondrivers.

California law requires many employers to offer parking cash out if they subsidize commuter parking in spaces they rent from a third party and the evidence suggests that parking cash out produces significant benefits. Case studies in Southern California found that the commuters' solo driver share fell from 76 per cent before employers offered parking cash out, to 63 per cent afterward. For every

100 commuters, parking cash out induced 13 solo drivers to shift to another mode. Of the 13 former solo drivers, 9 joined carpools, 3 began to ride public transit and one began to walk or bike to work. Three times more commuters switched to carpools than to public transit, which shows that parking cash out can reduce solo driving to work even where public transit is not available. By encouraging carpools, parking cash out takes advantage of many empty seats in cars already on the road to work.

These substantial reductions in solo driving reduced vehicle travel by 652 vehicle-miles traveled (1,043 vehicle-kilometers traveled) to work per employee per year. This reduction in vehicle travel saved 26 gallons (99 liters) of gasoline per employee per year. Finally, the reduction in fuel consumption for commuting reduced CO_2 emissions by 367 kilograms per employee per year. Commuting to work accounts for 16 per cent of total oil consumption in the US, so parking cash out has significant potential to reduce total oil consumption in the US and total oil imports into the US.

Employers paid a net increase of only $2 per employee per month to offer parking cash out because what they paid for parking declined almost as much as what they paid to commuters increased. Federal and state income tax revenues rose by $65 per employee per year because many commuters voluntarily traded their tax-exempt parking subsidies for taxable cash. Employers praised parking cash out for its simplicity and fairness and said that it helps to recruit and retain employees. In summary, parking cash out provides benefits for commuters, employers, taxpayers and the environment. All these benefits result from subsidizing people—not parking.

Parking cash out eliminates any unintended bias inherent in employer-paid parking. Women and minorities are less likely than other commuters to drive to work solo and more likely to ride transit. For example, 78 per cent of white commuters drive to work solo and only 2 per cent ride public transit. Among black commuters, only 58 per cent drive to work solo and 16 per cent ride public transit. Because parking cash out gives an equal benefit to commuters regardless of their mode choices, it eliminates inadvertent discrimination based on gender, ethnicity or any other demographic variable and avoiding bias in transportation policy is simple transportation justice. Because commuting to work accounts for almost one third of all automobile travel in the US and because employer-paid parking is a tax-exempt fringe benefit, parking cash out promotes equity in both transportation and taxation.

Because employer-paid parking is a tax-exempt fringe benefit, the federal government subsidizes solo driving to work. To solve this problem I will propose two simple amendments to the tax code: (1) require parking cash out as an alternative to employer-paid parking and (2) allow the inclusion of employer-paid parking in cafeteria plans for tax-exempt fringe benefits.

First, parking cash out can be required by putting a condition on the definition of employer-paid parking that qualifies for a tax exemption. The non-italic text quoted below is the Internal Revenue Code's existing definition of employer-paid parking that qualifies for a tax exemption; the italic text is the proposed amendment.

> 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 proposed amendment is adopted, employers will choose 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 fringe benefit. Commuters will be able to convert the tax-exempt parking subsidy into a tax-exempt transit subsidy or to pay income taxes on the parking

subsidy's cash value and use the after-tax cash for any purpose they choose. But if an employer offers commuters an unfair deal—free parking without the option to choose its fair market value—the subsidy does not merit tax exemption. This minor amendment to the tax code will give commuters more choices and it will reduce the economic and environmental costs of employer-paid parking. Commuters who cash out their parking subsidies will reduce traffic congestion, energy consumption and air pollution. The amendment will also significantly increase income tax revenues from commuters who voluntarily choose taxable cash in lieu of tax-exempt parking subsidies.

Second, cafeteria fringe-benefit plans permit employees to select among one or more non-taxable benefits or taxable cash, so each employee can design his or her individual fringe-benefit plan. Nevertheless, a quirk in the Internal Revenue Code excludes employer-paid parking from these plans. The text quoted below is the Internal Revenue Code's existing definition of cafeteria benefit plans that qualify for a tax exemption; the proposed amendment is to delete the italic text.

> 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.
> 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 . . . 132).

Because "other than section 132" here refers to the tax exemption for employer-paid parking, the tax code prevents employers from allowing commuters to give up free parking in exchange for health insurance or any other tax-exempt benefit offered in a cafeteria plan. Therefore, deleting the words "other than section 132" from Section 125(f) will allow employers to offer commuters the option to take other tax-exempt fringe benefits in lieu of free parking at work. Why not let employers offer commuters the option to choose health insurance in lieu of free parking at work? This offer will increase the after-tax opportunity cost of the free parking and it will thus reduce solo driving to work. It will also increase the number of employees with health insurance and it will improve employers' fringe benefit packages at no cost to the employers.

In conclusion, the tax exemption for employer-paid parking should 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 cash in lieu of the parking itself. If an employer wants to offer free parking without the option to cash it out, the parking subsidy should not be a tax-exempt fringe benefit. Second, employer-paid parking should qualify for inclusion in cafeteria benefit plans. Employers should be able to offer commuters the option to trade away free parking in exchange for other tax-exempt fringe benefits. These two tax reforms will give commuters more choices and will significantly reduce the economic and environmental costs of employer-paid parking. Commuters who trade away their parking subsidies will reduce traffic congestion, air pollution, energy consumption and the risk of global warming. Commuters who voluntarily choose taxable cash in lieu of tax-exempt parking subsidies will also increase income tax revenues. Requiring employers to offer commuters the option to cash out their tax-exempt parking subsidies and allowing employers to offer commuters the option to choose other tax-exempt fringe benefits in lieu of free parking will reduce traffic congestion, conserve gasoline, improve air quality, reduce the risk of climate change, increase tax revenues without increasing tax rates and increase employee benefits without increasing employers' costs.

Two minor tax reforms can provide all these economic and environmental benefits simply by allowing commuters to choose how they wish to spend their own income.

1. INTRODUCTION: THE 21ST CENTURY PARKING PROBLEM

You don't know what you've got till it's gone.
They paved paradise and put up a parking lot.
JONI MITCHELL

American children first learn about free parking when they play Monopoly. Players move around the board and buy property, build hotels or go to jail after throwing the dice—but occasionally they land on "Free Parking." When children grow up and get real cars, the odds of landing on free parking increase dramatically because drivers park free for 99 per cent of all automobile trips in the US.[1]

If drivers don't pay for parking, who does? After drivers park their cars to shop in a store, eat in a restaurant or see a movie, they pay for their "free" parking indirectly because its cost is bundled into the prices of merchandise, meals and movies. Parking is therefore free to drivers only because its cost is hidden in higher prices for everything else and even nondrivers who walk, ride transit or bicycle have to pay for "free" parking.

The cost of parking is bundled into the prices for everything else because most cities require every new building to provide ample off-street parking. Although this parking is usually free to drivers, its cost increases the cost of real estate development, which is then passed on to consumers through higher prices for almost everything we buy. Shoppers pay for parking through higher prices for goods and services. Residents pay for parking through higher prices for housing. Employers pay for parking through higher rents for office space. Only in our role as motorists do we not pay for parking.

To provide context for this report and to suggest its global importance, we can consider what would happen if other nations ever acquire as many cars as the US owned at the end of the 20th century. Figure 1-1 shows the US vehicle-ownership rates (motor vehicles per 1,000 persons) from 1900 to 1996. The US owned no motor vehicles in 1900 and 778 motor vehicles per 1,000 persons in 1996. The vehicle-ownership rates in 1996 for 15 other nations are also placed in the graph according to the year in which the US had the same rate. For example, in 1996 Australia had the same vehicle-ownership rate as the US in 1972, Denmark the same as the US in 1958 and China the same as the US in 1911.[2]

The world outside the US, taken together, owned only 84 vehicles per 1,000 persons in 1996—the same as the US rate in 1919—but these other countries are catching up (see Figure 1-2). Since 1950 the vehicle population has grown more than twice as fast outside the US as in it[3]. The US owned half of all the world's vehicles in 1965, but only a third by 1996. Nevertheless, America's motor vehicles are still exceptionally thirsty: all by themselves, American motor vehicles consumed one-eighth of the world's total oil production in 1996[4].

Figure 1-1

GROWTH OF VEHICLE OWNERSHIP IN THE US FROM 1900 TO 1996 AND VEHICLE OWNERSHIP RATES IN 15 COUNTRIES IN 1996

(Motor vehicles per 1,000 persons)

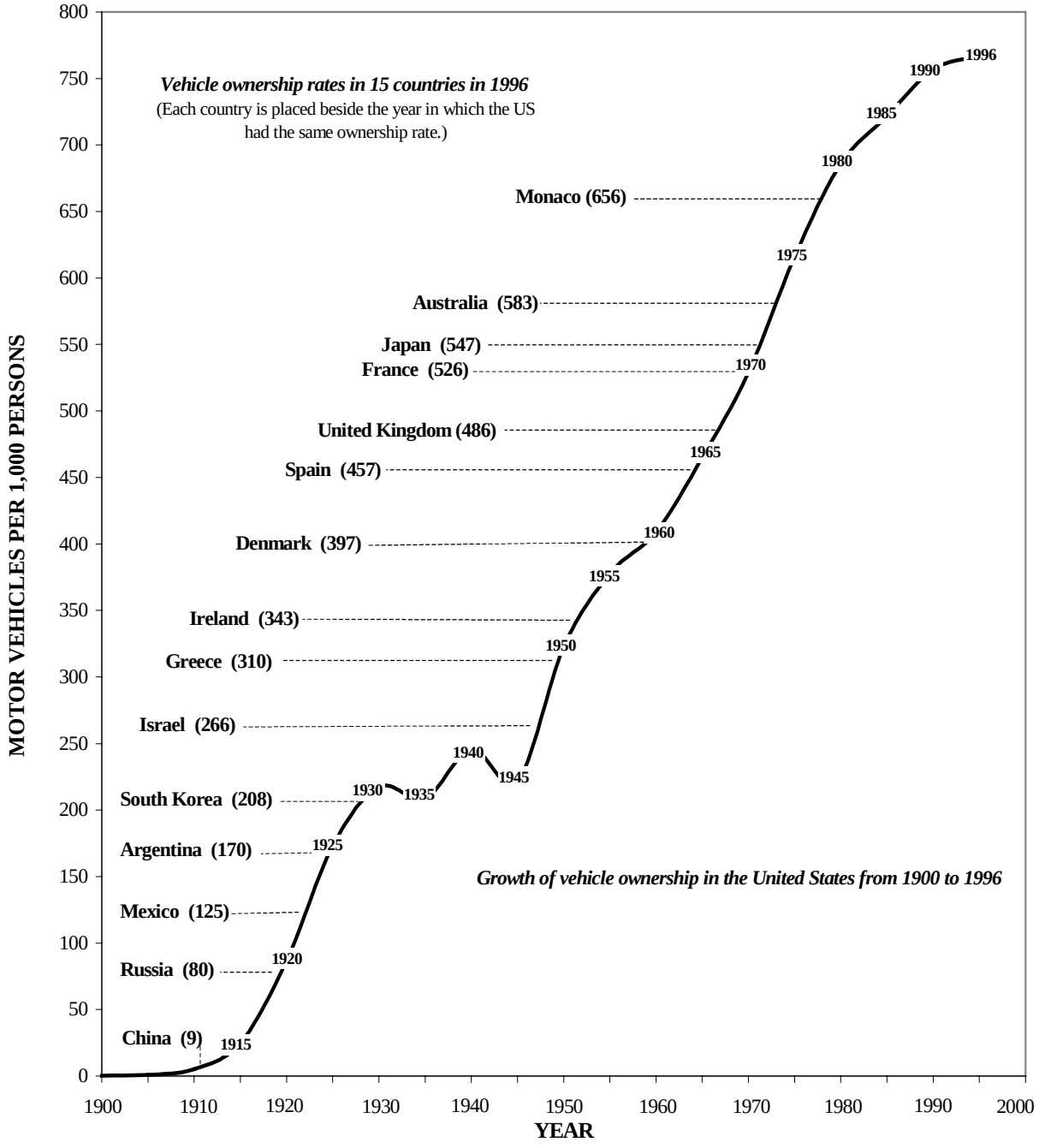
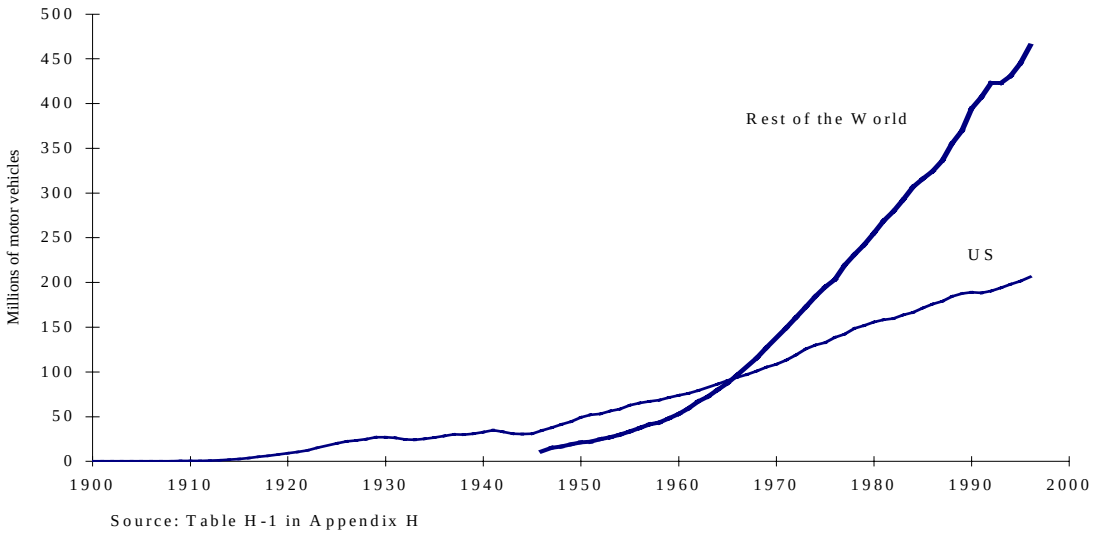


Figure 1-2. **Number of motor vehicles on Earth**



Source: Table H-1 in Appendix H

If the whole world had the same vehicle-ownership rate as the US in 1996, there would have been 4.5 billion vehicles on earth[5]. A parking lot big enough to hold 4.5 billion cars would occupy an area about the size of England or Greece[6]. But there are at least four parking spaces per car in the US; at this rate, 4.5 billion cars would require 18 billion parking spaces, which amount to a parking lot about the size of France or Spain[7]. More cars would also require more land for roads, gas stations, used car dealers, automobile graveyards and tyre dumps.[8]

If present trends continue, the world could easily have 4.5 billion cars before the end of the 21st century. For example, suppose the world's vehicle population grows by only 2 per cent a year during the 21st century, the total number of vehicles will increase from 671 million in 1996 to 4.9 billion in 2096. A projection is not necessarily a good forecast, however, because technology and policy can change. For example, manure from horse-drawn carriages littered city streets a century ago. Projected growth in transportation demand made a public health disaster seem inevitable, but then the horseless carriage arrived and solved that problem. The horseless carriages now create a parking problem, but new solutions will arrive—and this report explores one promising solution: parking cash out. After all, we don't want to see France or Spain paved for a parking lot.

22. 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

Employer-paid parking is the most common tax-exempt fringe benefit offered to workers in the US and 95 per cent of American automobile commuters park free at work. All this free parking at work helps explain why 91 per cent of all commuters drive to work and why 91 per cent of their cars have only one occupant.[9]

Employer-paid parking is a matching grant for driving to work. Employers pay the cost of parking at work only if commuters are willing to pay the cost of driving to work. Commuters who do not drive to work do not get an equivalent subsidy. This matching-grant feature of employer-paid parking encourages solo driving to work. Employer-paid parking thus increases traffic congestion, fuel consumption and air pollution.

Many solo drivers who park free at work would drive to work even if they had to pay for parking. Employer-paid parking therefore replaces a payment these commuters would otherwise be willing to make and it does not change their travel choices. But some solo drivers who park free at work would carpool, ride public transit, walk or bike to work if they had to pay for parking. Employer-paid parking does change these commuters' travel choices: they drive to work solo only because they can park free.

This chapter examines how free parking at work increases solo driving to work. Seven case studies and a statistical model suggest that employer-paid parking increases the number of cars driven to work by around 33 per cent when compared with driver-paid parking.

22.1. Ubiquitous free parking

Employer-paid parking is the norm in the US. The 1995 Nationwide Personal Transportation Survey found that 95 per cent of commuters who drive to work park free.[10] Table 22-1 shows the geographic and demographic distribution of the free parkers. Most commuters park free regardless of their age, gender, income, education or residence.

Table 22-1

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?"

The share of free parkers declines slightly as income increases: 97 per cent of drivers with an income below $20,000 a year park free, but only 90 per cent 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. 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 free-parking share also declines as education increases: 99 per cent of drivers with less than a high school education park free, but only 87 per cent of drivers with a graduate education park free. This does not mean that more education reduces the likelihood of being offered free parking at work. Instead, education is correlated with income and higher income commuters are more willing to drive to work even if they have to pay for parking.

Other surveys of commuters consistently show that most drivers park free at work. For example, a survey of 4,000 commuters in 17 large metropolitan areas found that 89 per cent of drivers park free at work.[11] Surveys also found that 93 per cent of drivers in Southern California and 82 per cent of drivers in Washington, DC park free at work.[12] Finally, a survey of trans-Hudson commuters found that 54 per cent of drivers bound for the Manhattan CBD during the morning peak travel period park free at work.[13]

The cost of providing all this free parking is enormous. In 1994, American employers provided 85 million free parking spaces for automobile commuters.[14] KPMG Peat Marwick (1990) estimated that the total annual capital and operating cost of the employer-provided "free" parking spaces amounted to $52.1 billion in 1989 (about 1 per cent of the gross national product).[15] 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.[16]

Free parking at work is not a purely American phenomenon. For example, surveys have found that 58 per cent of automobile commuters to central London park free, 59 per cent of automobile commuters to central Seoul park free and 80 per cent of automobile commuters to central Cape Town park free at work.[17]

22.2. The effects of employer-paid parking: seven case studies

Several well-documented case studies show that employer-paid parking increases solo driving. The seven studies shown in Table 22-2 compared either (1) the commuting behavior of the same employees before and after employer-paid parking was eliminated; or (2) the commuting behavior of similar employees with and without employer-paid parking. While case studies conducted in different locations and at different times cannot be generalized to all commuters, the results suggest that free parking at work increases the number of cars driven to work by about one-third.

Table 22-2

Employer-paid parking increases solo driving: seven case studies

Location, date, and type of case study	Solo driver mode share			Cars driven to work per 100 employees				
	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, DC, 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 elasticity of demand is calculated with respect to the price of parking.

More solo driving

The table's first panel shows how employer-paid parking increases the solo-driver mode share in each case study and the last row shows the average of all the case studies. In these seven studies, employer-paid parking increases the solo-driver share by between 7 and 44 percentage points. On average, 42 per cent of commuters drive to work solo if they pay to park, while 67 per cent drive to work solo if they park free. Therefore, free parking increases the solo-driver share by 25 percentage points (67% – 42%).

More cars driven to work

The second panel of the table shows how employer-paid parking increases the number of cars driven to work per 100 employees.[18] In the seven case studies, free parking increases the number of cars driven to work by between 7 and 28 cars per 100 employees. On average, commuters who pay for parking drive 53 cars to work per 100 employees, while free parkers drive 72 cars per 100 employees. Therefore, per 100 employees, employer-paid parking replaces commuters' payments for parking for 53 cars (the number driven to work when commuters pay for their parking) and stimulates commuters to drive 19 more cars to work (a 36 per cent increase).[19] These 19 extra vehicle trips generated by employer-paid parking represent 26 per cent of all the vehicle trips to work (19 ÷ 72). In these studies, one in four cars parked at work are driven to work only because the employer pays for parking.

Price elasticity of demand for parking

The last column of Table 22-2 shows the price elasticity of demand for parking at work.[20] In the seven case studies the price elasticity ranges from –0.08 to –0.23 and averages –0.15.[21] An elasticity of –0.15 suggests that reducing the price of parking by 10 per cent increases the number of vehicle trips to work by 1.5 per cent. Because employer-paid parking reduces the price of parking by 100 per cent, it produces large increases in solo driving and vehicle use.

22.3. The 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 are estimated with information on the price of travel by each mode (drive alone, carpool, transit, bicycle, walk, etc.) and they 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 that 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. Large changes in the market price of parking have little effect on commuter mode choice, however, because most drivers park free at their employer's expense. Therefore, most models underestimate how parking prices would affect mode choices if commuters actually paid these prices. Beyond the problem that most drivers don't pay for parking even where there is a market price for it, modelers usually don't have good information on the market price of parking. Denvil Coombe *et al.* (1997) explain the unsatisfactory ad hoc methods that modelers use to deal with this problem:

> *Within the conventional four-stage transport models used for conurbation studies, 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, there charges are often little more than calibration constants designed to improve the modal split to central urban locations: their magnitude can then be rationalized in terms of aggregate information about parking costs.[22]

When parking prices are measured properly and incorporated in the model properly, however, the models show that parking prices strongly influence commuters' mode choices. Bernard Feeney (1989) reviewed the effects of parking prices in 19 mode-choice models and he found that parking prices were more important than public transport fares or car fuel prices in determining travel choices for the journey to work. He noted that most models did not specify parking cost as a separate variable, but that if travel cost was found to be a significant determinant of mode choice, the travel cost variable usually included parking charges. He 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.[23]

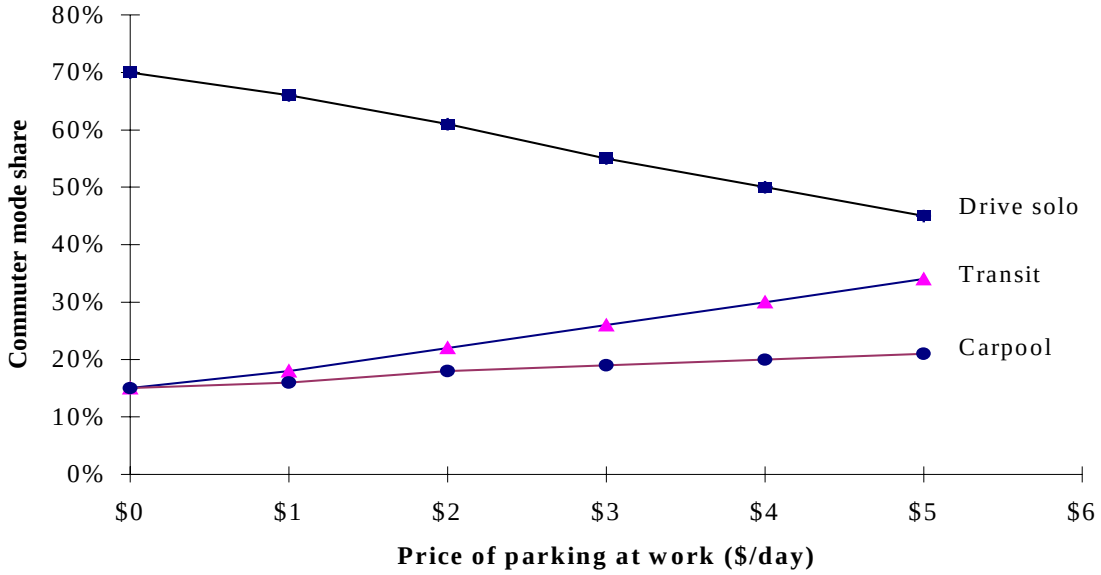
William Young, Russell Thompson and Michael Taylor (1991) reviewed models of parking as a component of the urban transport system and concluded that "*there are no commonly used models that address the question of parking policy satisfactorily.*"[24] Young (2000) also reviewed models of parking a second time and he found that all the land-use, transport and traffic models are particularly weak in their ability to assess travelers' responses to parking policies.

In contrast to almost every other transportation model previously estimated, Richard Willson (1991) estimated a mode-choice model using accurate data on the parking prices that individual commuters pay. These data were available from a transportation survey of 5,060 employees and 118 employers in downtown Los Angeles.[25] The survey included questions about the parking policy of each commuter's employer. Therefore, the data show the parking price faced by each commuter (including the parking price that 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 driver, carpool or public transit.[26] He included employer-paid parking as an independent variable along with the other more customary variables such as income, occupation and travel time and travel cost to work by each mode.

Figure 22-1 summarizes how parking prices affect the mode choices of commuters to downtown Los Angeles, as estimated from Willson's model.[27] If commuters park free at work, 70 per cent of them drive to work solo, 15 per cent ride public transit and 15 per cent carpool to work. If commuters pay $5 a day for parking, however, only 45 per cent of them drive to work solo, 21 per cent carpool and 34 per cent ride public transit to work. Therefore, when compared with free parking, charging $5 a day for parking reduces the solo-driver share by 36 per cent, increases the carpool share by 40 per cent and more than doubles the transit share.[28]

Figure 22-1

PARKING PRICES AFFECT MODE CHOICES
For commuters to downtown Los Angeles



Source: Estimated from Willson (1991).

The mode shares in Figure 22-1 were estimated by setting the values of all the other variables at their median values. We can also use Willson's model to estimate the effects of parking on the 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.[29] Table 22-3 shows the results.

Table 22-3

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 traveled (per employee per day)	18.1	24.1	+6.0	+33%	-0.14
7. Vehicle miles traveled (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.

More solo driving

The first row shows that 48 per cent of the commuters who pay for parking at work drive to work solo, while 69 per cent of the commuters who park free drive to work solo. The model thus suggests that free parking increases the solo-driver share by 21 percentage points. The parking price elasticity

of demand for solo driving to work is –0.18, which suggests that a 10 per cent increase in the price of parking at work reduces solo driving to work by 1.8 per cent.

Does employer-paid parking really increase the solo-driver share by 21 percentage points? If some employers offer free parking because many of their employees drive to work solo, solo driving may cause the employer-paid parking rather than the other way around. If so, employer-paid parking is an endogenous factor and we cannot estimate the effects of the free parking itself by comparing the behavior of commuters with and without free parking.

To examine causality, we can look at the differences in solo-driver share found in the seven case studies that compared the travel behavior of (1) the same commuters before and after employer-paid parking was eliminated or (2) matched samples of similar commuters with and without employer-paid parking. Table 22-2 shows three case studies (2, 4 and 5) where employers previously offered free parking and then began to charge for it. In these three studies, the solo-driver share decreased by an average of 28 percentage points after commuters began to pay for parking. This reduction in the solo-driver share after employers began to charge for parking strongly suggests that employer-paid parking increases solo driving rather than the other way around.[30]

Row 2 shows that the carpool share was 24 per cent for commuters who pay to park, but only 17 per cent for commuters who park free. The cross elasticity of demand between the price of parking and carpool share is +0.17, which suggests that a 10 per cent increase in the price of parking at work increases the carpool share for commuting to work by 1.7 per cent.

Row 3 shows that the transit share was 28 per cent for commuters who pay to park, but only 14 per cent for commuters who park free. Employer-paid parking 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 per cent increase in the price of parking at work increases commuter transit ridership by 3.3 per cent.

More cars driven to work

The shift to solo driving increases the number of cars driven to and parked at work. Row 4 shows that commuters who pay for parking drive 56 cars to work per 100 employees, while free parkers drive 75 cars per 100 employees.[31] Employer-paid parking therefore generates 19 more vehicle trips to work per 100 employees and it increases the number of vehicle trips by 34 per cent (19 ÷ 56). These 19 extra vehicle trips generated by employer-paid parking represent 25 per cent of all vehicle trips to work (19 ÷ 75). The parking price elasticity of demand for driving to work is –0.15 (the same elasticity that was found in the seven case studies in Table 22-2).[32]

This added driving to work increases 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 therefore spent $563 per employee per year for parking (0.56 x 12 x $83.82). If employers paid for parking, commuters parked 0.75 cars per employee and employers spent $750 per employee per year for parking (0.75 x 12 x $83.82).[33] Employer-paid parking therefore stimulates a 34 per cent increase in total spending for parking because 34 per cent more commuters drive to work if employers pay for parking (row 5).

More vehicle-miles traveled

We can also examine how employer-paid parking affects total vehicle-miles traveled (VMT) or vehicle-kilometers traveled (VKT) to work.[34] Row 6 shows that commuters drive 18.1 VMT per employee per day with driver-paid parking and 24.1 VMT per employee per day with employer-paid parking. Employer-paid parking thus stimulates commuters to drive an additional 6 VMT (9.6 VKT) per employee per day because many commuters respond to free parking at work by driving solo to work. This extra driving represents a 33 per cent increase in vehicle travel to work (6 ÷ 18.1). The extra VMT generated by the free parking also represent 25 per cent of all the VMT driven to work when commuters park free (2 ÷ 24.1). That is, one in four VMT for commuting are driven only because the employer pays for parking. The cross elasticity of demand between the price of parking and VMT for commuting is –0.14, which suggests that a 10 per cent increase in the price of parking at work reduces VMT for commuting by 1.4 per cent.

This extra 6 VMT per day for commuting mounts up over the year. Row 7 shows that employer-paid parking stimulates commuters to drive an additional 1,311 VMT (2,098 VKT) per employee each year (about the distance from Los Angeles to Dallas). This added vehicle travel increases traffic congestion and air pollution. Los Angeles already has the worst traffic congestion and air pollution in the nation, so employer-paid parking makes a bad situation even worse.[35]

More spent on transportation

The average cost of driving a car was 29 cents per mile in the year the transportation survey was conducted.[36] By inducing more commuters to drive to work, employer-paid parking thus encourages commuters to spend $380 more per employee per year ($0.29 x 1,311) for driving to work if they can park free (row 8).

If an employer pays for parking, commuters save $563 per year that they would have spent for parking, but they also spend $380 more per year for driving (see rows 5 and 8). The net effect is that commuters save only $183 a year for the combined cost of parking and driving if the employer pays for parking ($563 less for parking – $380 more for driving = $183 saving). Therefore, although the employer spends $750 per year to subsidize parking, commuters saved only $183 per year for parking and driving. The disproportion between what employers spend and what commuters save occurs because employer-paid parking increases both parking and driving. The increased parking at work inflates what employers pay and the increased driving to work diminishes what commuters save. The net effect of employer-paid parking is that the employer spends $4.10 on parking subsidies for every $1 the commuter saves on the combined cost of parking and driving ($750 ÷ $183 = 4.1).[37]

Because employer-paid parking increases spending on parking by $187 per employee per year (row 5) and increases spending on driving by $380 per employee per year (row 8), it increases total spending for parking and driving by $566 per employee per year (row 9). Employer-paid parking therefore replaces $563 per year in commuters' payments for parking and stimulates an additional $566 per 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.

22.4. Other evidence of the effects of employer-paid parking

Other studies have also shown that commuters respond strongly to parking prices. For example, a 1972 survey of express-bus riders from suburban Virginia to Washington, DC showed that employer-paid parking has a pivotal effect on commuting decisions. Of the bus riders who switched back to driving after trying the express bus, 18 per cent said they did so because of the bus fare, which averaged $1.25 a day for the round trip. 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 thus about equal to the bus fare that diverted commuters back to their cars.[38]

David Gillen (1977a) was able separate parking costs from running costs in a survey of commuters to the Toronto CBD 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 per cent will increase the automobile mode share by 3.1 per cent.[39]

The Center for Urban Transportation Research (1989) surveyed 4,000 persons who live within one-half mile of public transportation in 17 metropolitan areas in the US. Approximately 70 per cent 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 per cent responded either that it costs too much to park or that there is no place to park at work. This response implies that half of all choice transit commuters (and 35 per cent of all transit commuters) would drive to work if their employers offered free parking.[40]

A 2001 survey of 3,600 commuters in the San Francisco Bay Area found that 76 per cent of commuters who parked free at work drove to work solo, while only 48 per cent of those who paid to park drove solo. Results from the annual surveys in the previous nine years showed even larger differences in the solo-driver share between commuters who park free and those who pay to park.[41]

Daniel Hess (2001) 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 commuters 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 paid by commuters who did not park free was $5.40 a day. The model is similar to Richard Willson's (1991) model for Los Angeles and Hess found similar results: free parking at work greatly increases the probability of solo driving to work. Hess estimated that 62 per cent of commuters who park free will drive to work solo, while only 46 per cent of commuters who pay $6 a day for parking will drive to work solo.[42] Hess also estimated that commuters who park free will drive 69 cars to work per 100 persons, while commuters who pay $6 a day for parking will drive 48 cars per 100 persons. Therefore, a subsidy of $6 a day for parking in the Portland CBD increases the number of cars driven to work by 44 per cent.

David Hensher and Jenny King (2001) used the stated-preference approach to estimate a joint modal-and-parking-location-choice model. Using a sample of 1,789 of 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."[43] They also found that the cross-elasticity of demand between the price of parking and the probability of traveling to the CBD by transit was +0.29, which suggests that increasing the price of parking by 10 per cent will increase the transit mode share by 2.9 per cent. Increases in parking prices produced substantial changes in parking locations and mode choices, but virtually no loss in total travel to the CBD.

Parking policy affects commuters' travel choices more than most (or all) other variables do, but mode-choice models typically do not include a parking cost variable. Nevertheless, these surveys,

case studies and mode-choice models that do include the price of parking as a variable all show that employer-paid parking greatly increases solo driving to work.

22.5. Employer-paid parking discourages carpooling

Employer-paid parking greatly increases solo driving to work because the cost of parking is a large share of the total money cost of commuting by car. We can examine the economics of carpooling to show why employer-paid parking increases solo driving. Carpoolers split the money 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 22-4). The cost of parking at work is $4 and the round-trip cost of driving to work (for fuel and other variable costs) is $2. 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. In this example, as in the real world, cost sharing is an incentive to carpool and the added travel time is a disincentive.

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 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 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 $1 a day. And if the carpool already has five members, adding a sixth member saves each person 20¢ a day.

Column 5 shows how much each carpooler saves when another person joins the carpool if employers pay for parking. Each person in a two-person carpool pays $1 a day, so each person saves $1 a day compared with the $2-a-day cost for solo driving. Adding a third carpool member saves each person 33¢ a day. And if the carpool already has five members, adding a sixth member saves each person 7¢ a day.

Column 6 shows how much adding another person to the carpool saves per hour of added travel time if drivers pay for parking. Each additional person in the car adds 5 minutes (0.083 hours) to travel time, but the cash saving from cost splitting declines as carpool size increases, so the savings per hour spent in added travel time declines as carpool size increases. Each person in a two-person carpool saves $3 for five minutes of added travel time, so each person saves $36 per hour of added travel time ($3 ÷ 0.083 hours). Adding a third carpool member saves each person $1 and adds another five minutes to travel time, so each person saves $12 per hour of added travel time.[44] If the carpool already has five members, adding a sixth member saves each person only 20¢ and adds another five minutes to travel time, so each person saves $2.40 per hour of added travel time.

Finally, Column 7 shows how much adding another person to the carpool saves per hour of added travel time if employers pay for parking. Each person in a two-person carpool saves $1 for

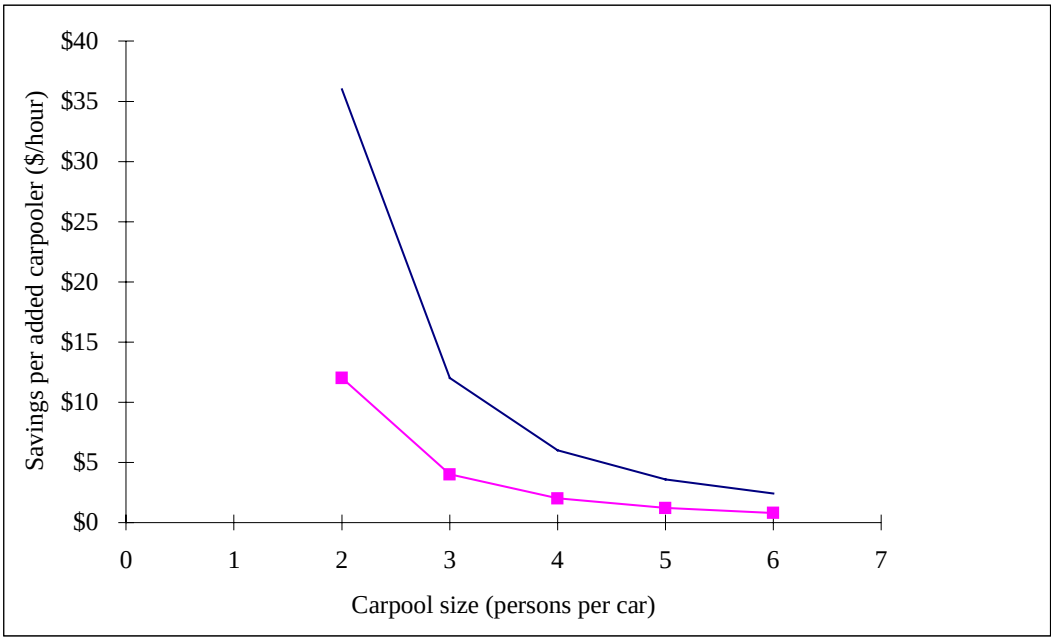
five minutes of added travel time, so each person saves $12 per hour of added travel time. Adding a third carpool member saves each person 33¢ and adds another five minutes to travel time, so each person saves $4 per hour of added travel time. If the carpool already has five members, adding a sixth member saves each person only 7¢ and adds another 5 minutes to travel time, so each person saves 80¢ per hour of added travel time.

TABLE 22-4

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	
	Running cost = $2	

Number in car	Commuting cost per person		Money saved by adding another person in the car: Per person per day		Per person per hour	
	Pay parking	Free parking	Pay parking	Free parking	Pay parking	Free 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



Columns 6 and 7 show that employer-paid parking greatly reduces the incentive to carpool by eliminating the saving for splitting the cost of parking. Employer-paid paring 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.

The graph in Table 22-4 shows how free parking affects commuters' travel choices. 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 person in the carpool if drivers pay for parking (from Column 6). Solo drivers can save $36 per hour spent in additional travel time by joining a two-person carpool. Therefore, only commuters who value time savings at more than $36 per hour will drive solo. Commuters who value time savings 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.

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 money and time costs, of course. Nevertheless, they surely weigh these costs when making travel choices and employer-paid parking encourages solo driving. The example's assumptions were conservative because parking at work often costs more than $4 per day (see Chapter 7) and carpooling may add less than 5 minutes to travel time for every additional person in the car.[45] Therefore, employer-paid parking may exert an even stronger incentive toward solo driving than the example suggests. Similar reasoning shows that employer-paid parking also encourages solo driving at the expense of public transit, walking and cycling to work. Therefore, the previous findings that employer-paid parking increases the number of vehicle trips to work by about one-third seem reasonable.

Employer-paid parking, by itself, does not explain the popularity of solo driving for commuting, but it hides the cost of parking, reduces the (driver's) cost of solo driving to work and increase the number of solo drivers. Mode choices do not necessarily reveal commuters' travel preferences because employer-paid parking distorts the prices that drivers pay.

To illustrate the difference between commuters' preferences and their travel choices, consider what would happen if employers offered to pay the cost of gasoline for all commuters who drive to work. This would strike many observers as an environmental outrage and a scandalous incentive for driving to work. But as Chapter 7 showed, employer-paid parking is typically worth 2.5 times the fuel cost of driving to work, so employer-paid parking is much more of an incentive to drive to work than

free fuel would be. Employer-paid parking increases solo driving to work, but this does not imply that it has increased commuters' preferences for solo driving. Commuters are simply responding to lower prices for solo driving to work. Commuters' choices accurately reveal their preferences among commute modes only when prices accurately reflect the costs of the alternative modes. If all commuters were given a fair choice among modes, more of them would choose to ride public transit, carpool, walk or bike to work. But employer-paid parking does not give commuters a fair choice among modes because it offers either free parking or nothing at all.

22.6. 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 22-2 and 22-3 report 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, they 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 cost 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.[46]

The studies reported in Tables 22-2 and 22-3 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 time or destination for some trips and they can avoid making other trips. In a survey conducted by Britain's Royal Automobile Club, drivers reported that 30 per cent of their car mileage was "not very important" or "not at all important."[47] 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.

22.7. 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, these commuters will ride public transit, walk or bike to work. Employer-paid parking draws these commuters into cars for their journey to work. Employer-paid parking increases the number of cars driven to work by about one-third because many commuters who can park free at work respond by solo driving to work. Employer-paid parking is an invitation to drive to work alone.

Employer-paid parking distorts transportation prices and this price distortion increases traffic congestion, fuel consumption and air pollution. Nevertheless, the price distortion is difficult to remove because most commuters (who are also voters) feel that 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.

23. CASHING OUT EMPLOYER-PAID 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 will be difficult because free parking at work is a popular and politically entrenched fringe benefit. For example, a survey of commuters in seventeen American cities found that more than half of bus riders opposed the idea of charging employees for parking at work.[48] If even bus riders oppose charging employees for parking, trying to take free parking from drivers will be like trying to take a delicious bone from a vicious dog. To paraphrase Justice Holmes, free parking that 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.

Beyond the economic value of employer-paid parking to commuters, its symbolic value is another formidable barrier to reform because parking spaces often denote rank in an organization. For example, in academia you are not what you drive but where you park. With 175 different kinds of parking permits, UCLA's parking hierarchy makes the Titanic look like a one-class ship. At Berkeley, only Nobel Laureates are eligible for the campus's highest status symbol—a named parking space. For example, after Charles Townes won the 1964 Nobel Prize for physics, Berkeley attached his name to a parking space to signal the award. Townes commented, "It saves me a whole lot of time. The cost is not the big thing—it's the convenience."[49] 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 parking space, he replied, "Well, the parking space goes on and on. It's considered slightly more important than the prize itself."[50] Cal Tech also reserves named parking spaces for 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 told his colleague. He continued to walk to work on most days and kept his 1978 Oldsmobile for days he needed to drive.[51] And in Hollywood, 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."[52]

A Nobel Laureate's parking space at Berkeley

PARKING FEUDALISM

Universities often lead society in advocating social and economic equality, but they resemble a feudal society in their parking policies. UCLA's 175 different types of parking permit are carefully graded according to the status of each administrator, faculty member, staff member or student. Major donors to UCLA receive campus parking permits according to the size of their donations. Parking privileges are cumulative so 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 all permits of a lower rank. 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 most convenient parking spaces on campus for the coveted "X" permit that allows holders to park in the spaces reserved only for X permits and in all the spaces reserved for all the other permits. The X permit is UCLA's equivalent to the feudal *droit de seigneur*.[53]

Parking at work has come to be viewed as a basic employee benefit and almost an American birthright. Both the economic and symbolic values of employer-paid parking make it quixotic to urge charging for the parking spaces that commuters now get free. Nevertheless, this chapter explains how we can reform employer-paid parking without charging commuters for parking: Require employers to offer commuters the option to take the cash equivalent of any parking subsidy offered.

23.1. California's parking cash-out law

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

California enacted a parking cash-out requirement in 1992.[54] 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.*[55]

California's parking cash-out requirement applies only to firms with 50 or more employees and only to parking spaces that the firms rent rather than own.[56] 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.[57]

The cash-out requirement can be interpreted as a test that a commuter transportation policy must pass. A transportation policy will pass this test if it subsidizes the alternatives to parking (such as transit, walking or cycling) as much as it subsidizes parking. A policy will fail this test only it if subsidizes parking more than the alternatives. Many existing commuter transportation policies comply with the cash-out law. For example, the following policies comply with the cash-out law because they subsidize the alternatives to parking as much as they subsidize parking:

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

The law requires firms to offer parking cash out if they subsidize parking, but it does not require commuters to rideshare. The law simply requires firms to offer commuters the option to choose the cash equivalent of any parking subsidy offered and the commuters choose how they want to get to work. A firm's policy violates the law *only* if it subsidizes parking at work more than it subsidizes ridesharing to work.

RIDESHARING

In Californian transportation jargon, ridesharing refers to any alternative to solo driving. Even walking and cycling are called ridesharing. Solo driving is the norm and any alternative transportation (deviant transportation?) is called ridesharing.

23.2. The 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 among more transportation options, (2) rewards the alternatives to solo driving, (3) reduces vehicle trips, (4) treats all commuters equally, (5) costs firms very little, (6) strengthens the city center, (7) converts economic waste into tax revenue and (8) sidesteps the strong opposition to charging commuters for parking at work.

Gives commuters a new choice

Parking cash out adds a new choice for many commuters who now face a take-it-or-leave-it choice between free parking and nothing. Firms can continue to subsidize parking so long as they broaden the offer to give commuters 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 would not make this choice. Commuters who were already ridesharing are also clearly better off because they receive cash in lieu of the parking subsidies that they already declined. And commuters who continue driving to work are no worse off, although the foregone cash means that drivers are in effect paying for their "free" parking.

Rewards the alternatives to solo driving

Transportation economists often recommend congestion tolls and emissions fees to charge drivers for the external costs of driving. In contrast, parking cash out does not charge anyone for anything;

instead, it rewards commuters for choosing the alternatives to driving to work solo. Parking cash out is a buy-back, not a take-away. Allowing commuters to cash out their parking subsidies is an easy step in the right direction because it rewards commuters for doing the right thing, rather than punish them for doing the wrong thing. Parking cash out also rewards the most environmentally benign forms of commuting—walking and cycling—as alternatives to driving.

Reduces vehicle trips

Offering commuters the choice between free parking or its cash value shows that even free parking has a cost—the cash not taken. The foregone cash is a new price for taking the free parking, a price that increases the cost of solo driving. When the opportunity cost of a free parking space becomes explicit, some commuters cash out the parking subsidy and begin to and ride public transit, carpool, walk or bike to work. Most commuters who use their cars for business or personal reasons while at work will still drive solo, but a 1996 survey of commuters in Southern California found that 40 per cent of all automobile commuters do not use their cars for either business or personal reasons while at work.[58] Many commuters are thus in a good position to cash out their free parking.

Chapter 25 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 per cent—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, 9 joined carpools, 3 began to ride transit and one began to walk or bike to work. These mode shifts prompted by parking cash out reduced vehicle travel to work by 652 VMT (1,043 VKT) per employee per year.

Treats all commuters equally

Employer-paid parking subsidizes only commuters who own cars and drive to work. Nationwide, 95 per cent of white households own a car, while only 76 per cent of black households own a car.[59] Free parking therefore benefits these groups differently. Parking cash out allows a firm to offer free parking and yet avoid any unintended bias implicit in subsidizing only commuters who drive to work.

Parking cash out gives greater after-tax benefits to lower-income commuters because cash is taxable income and because lower-income commuters are in lower tax brackets. Lower-income workers therefore gain more after-tax cash in lieu of employer-paid parking and the in-lieu cash is also 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 the option to choose cash instead of free parking allows them to benefit from commuting subsidies to the same extent that other commuters can.

These three points—that 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 to low-income commuters who need to drive to work because of personal circumstances. Offering commuters free parking with the option to cash it out is much fairer than offering them the customary choice of free parking or nothing at all.

Costs employers very little

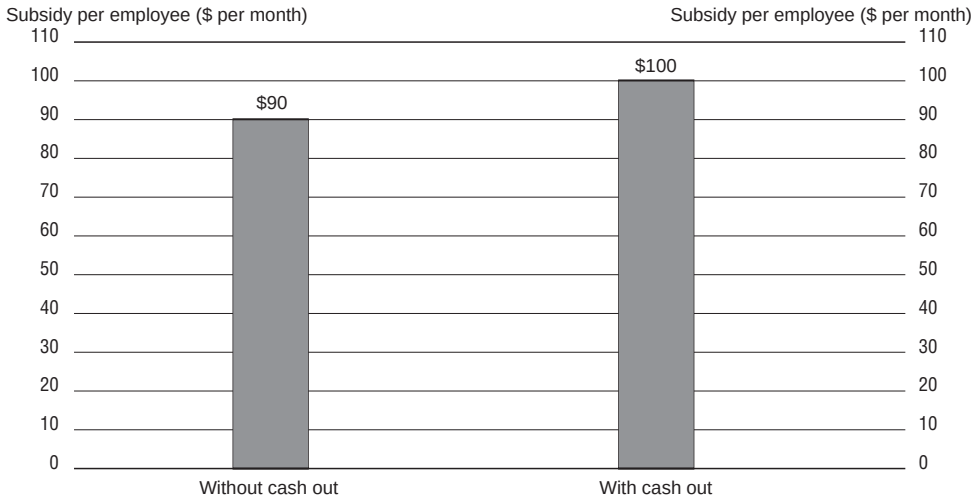
California's cash-out requirement applies only to parking spaces that firms rent rather than own and only to employers who offer their employees a parking subsidy. If a commuter gives up a parking space for cash, the money previously spent to rent a parking space becomes the commuter's cash allowance and the firm breaks even. Nevertheless, firms incur a small cost for commuters who are now offered a parking subsidy but do not drive to work. If these commuters become eligible to receive the cash value of parking subsidies they have not taken, the firm does not save anything on parking with which to finance the new cash payments. Nevertheless, very few firms will have to pay much to commuters who are now offered a parking subsidy but do not drive to work. The 1995 NPTS found that 91 per cent of American workers commute by car and that 95 per cent 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. Some of these commuters who already do not drive to work are not offered free parking, so the firm does not have to offer them the cash option. Some firms already offer a ridesharing subsidy (such as a free bus pass) to commuters who do not drive to work, 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 rents a parking space for each driver at a cost of $100 a month, but offers no transportation subsidy to other commuters. Suppose also that 90 commuters drive to work solo and the other 10 commuters ride transit, walk or bike to work.[60] The firm offers a parking subsidy of $100 a month to every commuter, but it pays only $90 per commuter to rent parking spaces because only 90 of the 100 commuters drive to work (see Table 23-1). Now suppose the firm begins to offer all commuters the choice of either a free parking space or $100 a month. Fifteen solo drivers switch to another mode, give up a parking space and take $100 a month; the firm also pays $100 a month to the 10 commuters who previously did not drive to work. In this example, parking cash out reduces the number of cars driven to work by 17 per cent (15 ÷ 90) and raises the firm's cost to subsidize commuting by 11 per cent ($10 ÷ $90). This additional $10 per person per month is the cost of adopting a policy that treats all commuters equally no matter how they commute to work, without reducing the subsidies offered to solo drivers. Complaining that offering parking cash out will increase a firm's cost in this case would be the same as arguing that to save money the firm should subsidize only commuters who drive to work.

TABLE 23-1

EMPLOYER'S COST OF OFFERING FREE PARKING TO 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%



In this example the firm does pay $10 more per person per month to offer parking cash out, but this added cost is a new fringe benefit for commuters who do not drive to work. The cost of parking cash out is therefore unlike an increase in most other costs (like an increase in the price of electricity, for example). Instead, the cost of parking cash out is a transfer to commuters and it provides a valuable fringe benefit that helps to recruit and retain workers. Table 23-2 illustrates the crucial distinction between transfer costs and real costs in the context of parking cash out. The firm's $10 per-person-per-month cost of parking cash out becomes added income for nondriving commuters. This added income is an added benefit of working for the firm that offers parking cash out and the firm will benefit from improved recruitment and retention of workers, although it is difficult to put a dollar value on this benefit. In contrast, suppose the price that the firm pays for electricity increases. This added cost provides no benefit to either employees or to their employer. All firms would greatly prefer to pay $10 per person per month to offer parking cash out for their employees than to pay the same money for an increase in the price of electricity. The firm receives a significant benefit from

parking cash out but receives no benefit from the higher cost of electricity. Therefore, the transfer cost of parking cash out cannot be compared with a real cost without taking into account the benefits of parking cash out to both employees and their employer.[61]

TABLE 23-2

AN EXAMPLE OF 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

Offering parking 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 now 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. First, a firm can simply eliminate parking subsidies and it will save money. Second, a firm can eliminate parking subsidies and offer all commuters a cash commuting allowance equal to the previous total parking subsidy divided by the total number of commuters; this will not add to the firm's costs. Third, a firm can reduce parking subsidies and offer all commuters the option to cash out the lower parking subsidy; this policy can also be also cost-neutral for the firm. In practice, the case studies presented in Chapter 25 found that firms saved almost enough on parking subsidies to pay the full cost of parking cash out. As a result, the firms' commuting subsidies rose by only 3 per cent (from $72 per employee per month before cash out, to $74 per employee per month afterward), so in practice parking cash out was almost cost-neutral.

Strengthens the city center

Many CBD employers offer free parking to attract workers who might otherwise be deterred by the high price of parking in the CBD. Employer-paid parking equalizes the cost of parking between the CBD and suburban work sites (by making it free in both places), but it does not make the CBD superior to suburban locations for commuters. Because CBD employers pay more to provide free parking, however, they can also offer more cash in lieu of a parking space and can thus give more cash to commuters who do not drive to work solo. This potential for a higher cash option for CBD commuters makes the CBD a better place to work than it had been with free parking alone. Allowing commuters to cash out employer-paid parking therefore increases 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 is usually focused toward the CBD, so many commuters can more easily take the cash and shift to public transit. Similarly, a high employment density in the CBD implies a high density of potential fellow carpoolers, so many commuters can take the cash and shift to carpools.

Solo-driver commuters typically account for 65 to 85 per cent of the total traffic volume to and from the CBD during peak hours and commuting accounts for 71 per cent of all VMT during the morning peak.[62] Commuters who cash out their free parking thus reduce traffic congestion on trips to the CBD, which becomes more accessible to everyone, including those who continue to drive to work solo. In the case studies of parking cash out in Chapter 25, the 22- and 16 per cent reductions in solo-driver share 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 automatically targets the strongest incentive to avoid solo driving exactly where this incentive does the most good.

Some CBD employers may fear that parking prices high enough to divert solo drivers to other modes may also divert travelers to other destinations. Parking cash out does not raise parking prices, however and therefore will not reduce travel to the CBD. Parking cash out changes mode choices without changing destination choices.

Mode choices versus destination choices

Higher parking prices in the CBD will divert travelers to other destinations. To examine this issue, Dasgupta *et al.* (1994) estimated how increasing the price of parking in the CBD would change mode choices and destination choices in five English cities (see Table 23-3). They used the same travel demand model for cities that range in population from 180,000 (Reading) to more than 500,000 (Leeds and Bristol). They estimated that doubling the price of parking in the CBD would reduce vehicle trips to the CBD by an average of 17 per cent and increase trips to the CBD by other modes by 10 per cent. But total trips to the center by all modes would fall by 5 per cent.[63] That is, higher parking prices reduce vehicle trips to the CBD by both (1) diverting travelers from solo driving to other modes and (2) reducing the number of trips to the CBD.

Table 23-3. **Changes in travel to the City center after parking prices are doubled**

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

In contrast, parking cash out reduces vehicle trips to the CBD by diverting commuters from solo driving to other modes, not by diverting them to other destinations: parking cash out changes mode choices but not destination choices. 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 it.

Agglomeration economies

Parking cash out can benefit the CBD in another way. The high density of economic, social and cultural activities in the CBD produces agglomeration economies that give the center competitive advantages in comparison with suburbs. Employer-paid parking reduces the benefits of high density, however, because employers, developers and property owners must allocate valuable space to provide free commuter parking, which removes a sizeable share of land from other uses that employ more people and earn more revenue. Employer-paid parking also increases traffic congestion on the routes to the CBD. Parking cash out allows CBD employers to offer free parking and to enjoy the benefits of higher density because fewer parking spaces are needed. Parking cash out also reduces traffic congestion on the routes to the CBD. For these reasons, parking cash out can strengthen the city center.

Converts economic waste into tax revenue

Commuters who cash out employer-paid parking must pay taxes on the additional cash income they receive. For example, suppose your free parking space costs your employer $100 a month and you are in the 30 per cent 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.

Free parking is an inefficient fringe benefit if you prefer its after-tax cash value. This inefficiency of providing in-kind parking subsidies is private waste that 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.

When a commuter voluntarily chooses taxable cash rather than a tax-exempt parking subsidy, federal and state income tax revenues increase. A commuter who chooses $70 in after-tax cash rather than a $100 parking subsidy pays $30 extra in taxes and is still better off. This $30-a-month increase in tax revenue does not result from an increase in tax rates or 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 represents reduced "deadweight loss." The deadweight loss caused by employer-paid parking is the difference between what a firm pays to provide a parking space and the value a commuter places on receiving the space (i.e. the lowest price at which the commuter will "sell" the parking space back to the firm).[64] For example, suppose that the lowest after-tax value at which you will cash out your free parking space is $60 a month. You can take $100 in taxable cash,

receive an additional $70 in after-tax income and still be $10 better off than when you parked free. Thus, the option to cash out your parking subsidy eliminates deadweight loss totaling $40: the government captures $30 as tax revenue and you keep a $10 increase in your own welfare.

The seven case studies summarized in Table 22-2 show that many commuters think their parking spaces at work are worth less than what employers pay for them. On average, driver-paid parking leads commuters to occupy 19 fewer parking spaces per 100 employees when compared with employer-paid parking. As an extreme example, consider the results found in the Mid-Wilshire Los Angeles case study; after the firm ceased offering fee parking for solo drivers, 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 in the previously free spaces. That is, 41 of the 42 commuters who drove to work solo when they parked free felt that the parking spaces were worth less than the $57.50 a month that their employer had been paying for them. Because many commuters think that parking spaces are worth less than what employers pay for them, 85 million employer-paid parking spaces must create serious economic inefficiency.

This inefficiency is not a purely American phenomenon. Verhoef, Nijkamp and Rietveld (1996) conducted a stated-preference survey of commuters at the Free University in Amsterdam and estimated the drivers' maximum willingness to pay for their parking spaces at work. 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.[65] Verhoef, Nijkamp and Rietveld estimated that if both on-street and university parking were priced the same, 82 per cent of the drivers were unwilling to pay more than $9 a month for the parking spaces that the university provided free.[66]

Cashing out an employer-paid parking subsidy proves beyond doubt that you think free parking is worth less than what your employer pays to provide it. Parking cash out thus converts economic waste into increased tax revenue and increased employee welfare. The tax revenue windfall is an additional benefit beyond any reduced air pollution, traffic congestion and energy consumption that also result. The case studies in Chapter 25 found that because many commuters chose taxable cash instead of tax-exempt parking subsidies, the federal and state governments received $65 per employee per year in additional tax revenues when commuters were offered the cash option.[67]

The research summarized in Chapter 22 shows that parking subsidies strongly influence commuters' mode choices and that many commuters switch from solo driving to another mode when asked to pay for formerly free parking spaces. Thus, 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. Nevertheless, 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-subsidized parking space, pay taxes on the cash and then use some of the after-tax income to park in a cheaper space without ceasing to drive to work solo. The commuter is better off, the employer is no worse off and federal and state income tax revenues increase.

Sidesteps the opposition to charging for parking

Employer-paid parking is both an immovable object and an irresistible force. It is immovable because, once granted, it is almost impossible to take away. It is irresistible because most commuters who can park free at work drive to work. Parking cash out makes a political end run around the strong opposition to charging for parking. Employers can continue to offer free parking at work, but the

option to take the cash value of the free parking solves most of the problems created by the free parking itself. Case studies (in Chapter 25) show that once firms offer parking cash out, the benefits become obvious to everyone.

In summary, parking cash out gives commuters a new choice, rewards the alternatives to solo driving, reduces vehicle trips, treats all commuters equally, costs employers very little, strengthens the city center, increases tax revenues without increasing tax rates and sidesteps the political opposition to charging for parking at work. It accomplishes all these goals simply by allowing commuters to choose how they wish to spend their own income.

23.3. Daily parking cash out

Cashing out employer-paid parking does not mean that commuters cannot drive to work whenever they choose, because a firm can offer the cash-out option on a daily basis. The Pfizer Corporation's parking cash-out program at its laboratories at Sandwich in Kent, England, shows that the daily option gives commuters great flexibility in travel choices. Pfizer estimates that the capital and operating cost of providing parking for its employees in Sandwich is over £1 million per year and that the average cost per space is £2 (approximately $3) per day.[68] Pfizer employees can park free at work on any day, but any commuter who arrives at work without a car receives a credit worth £2. Commuters can thus 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 at work, the daily cash option encourages everyone to consider choosing the alternatives to solo driving whenever possible.

The program is simple. Pfizer employees automatically earn a credit of £2 each day they report to work when 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.[69] Therefore, a solo driver will receive 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 will receive 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. An important advantage of this arrangement is that all employees are automatically enrolled in the program even if they usually drive to work solo. As in the US, the cash-out credit is taxable income while the parking subsidy is tax-exempt. Pfizer treats all commuters equally, but the tax system continues to favor drivers.

All staff can use the company's intranet to check their parking cash-out balances and personal commuting history and this 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 receives 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. If the passengers use their cards to exit, this automatically reimburses drivers for their costs. Pfizer even suggests to employees that using the passengers' cards to activate the parking gate will make it easier to produce the cards and put them away safely.

This daily cash-out arrangement is simple, fair and flexible for both the firm and its employees. Every commuter can earn a £2 bonus on any day simply by showing up at work without a car. This arrangement is uncommonly generous to commuters who do not drive to work, but it merely levels the playing field among modes and does not favor the alternatives to solo driving. If a firm is indifferent about how its employees travel to work, it should reward all commute modes equally, as the Pfizer policy does. Pfizer's policy does favor ridesharing when compared with most firms' commuting

policies, but that comparison reveals how little we expect of these policies. Offering the same subsidy to drivers and nondrivers is unusually generous to nondrivers only because most firms offer nothing to nondrivers.

Pfizer's program shows how a daily cash-out program can easily be adjusted to favor the alternatives to solo driving. For example, suppose a firm's cost to provide a commuter parking space is $3 a day. If both the credit for arriving at 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 discourage solo driving to work, it should reward alternative (deviant?) travel more than it rewards solo driving.

Pfizer's policy is particularly appropriate for firms that want to reduce vehicle trips as a condition for planning permission to expand their operations. Pfizer agreed to offer its cash-out program as a TDM measure when it sought planning permission to expand its headquarters in Kent. Therefore, other local governments may find it appropriate to require TDM programs similar to Pfizer's when a proposed development will increase the traffic generated at a site.

This daily parking cash-out arrangement is particularly well suited to universities. Some faculty members complain that charging for parking discourages the faculty from coming to campus and they argue that the university should offer free parking to encourage faculty to come to campus to meet with students, attend committee meetings and participate fully in the life of the university. In this situation, daily parking cash out would serve everyone's interest. Faculty who drive to campus could park free, but faculty who come to campus without a car would receive the cash value of the parking they do not use. This arrangement would encourage the faculty to come to campus even more frequently than free parking does and the cash alternative to free parking would not skew scholars' travel choices toward cars. Faculty who stay at home would receive nothing. What could be fairer or more efficient?

23.4. 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? In the short run, they will become available to everyone else. Parking cash out does not immediately reduce the number of parked cars, but it can reshuffle cars and commuters 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.[70] Solo drivers sought out other solo drivers and 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 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.[71]

Second, reducing the demand for parking will reduce the market price of parking and this lower price will attract other drivers to fill the parking spaces emptied by solo drivers who cash out. The parking spaces vacated by peak-hour commuters will become available to shoppers, business clients and tourists. Because most commute trips occur during peak hours while other trips occur more

evenly through the day, parking cash out will spread the peak and therefore reduce peak-hour congestion. Because short-term parkers pay more per hour than monthly parkers do, commercial parking garages will earn more revenue.

Finally, cashing out can redistribute parking spaces more fairly among the workforce. When the Canadian government began to charge its employees for parking in Ottawa, more women began to drive to work.[72] 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, many 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 will produce these three effects 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 thus 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 eliminate their parking requirements in response to parking cash out. California's cash-out law requires local governments to reduce the parking requirements for commercial developments that implement parking cash out.[73] After the parking supply has adjusted downward in response to cash out, the reduction in vehicle trips, traffic congestion and air pollution should be greater.

23.5. The potential for parking cash out

California's cash-out requirement applies only to parking spaces that firms rent for their employees' use. To estimate the number of these rented parking spaces, Shoup and Breinholt (1997) surveyed a random sample of 1,200 firms throughout the US. 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 ten times greater for a firm with 1,000 employees than for a firm with 100 employees. Therefore, every employee in the nation had an equal chance of having his or her firm selected for the sample. The sample thus allowed us to estimate the number of commuter parking spaces provided to the entire employed population of the US.[74]

85 million free parking spaces for commuters

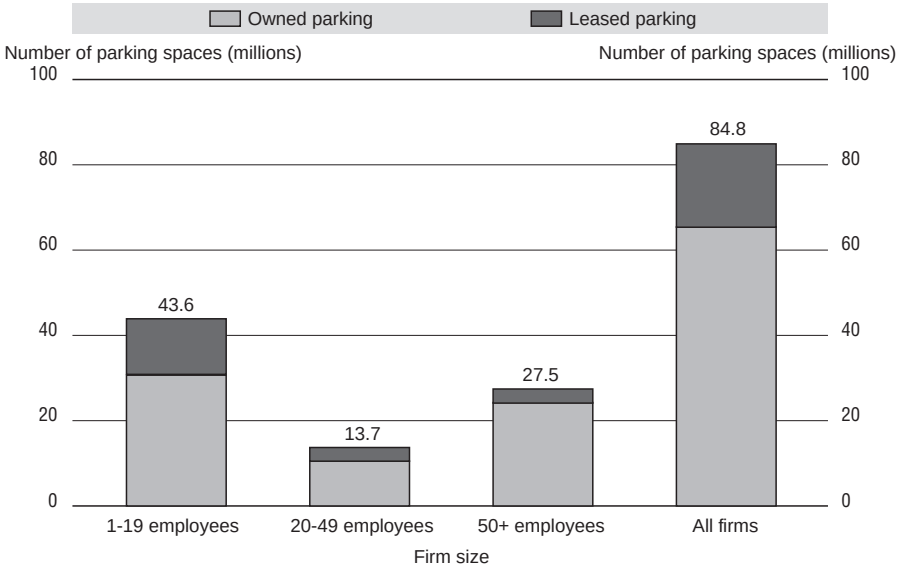
We estimated that employers provided 84.8 million free parking spaces for commuters in the US in 1994. Firms rented 19.5 million (23 per cent) of these parking spaces and owned 65.3 million (77 per cent). Firms with fewer than 50 employees rented 16.2 million parking spaces for commuters (four-fifths of all rented parking spaces), while firms with 50 or more employees rented 3.3 million spaces (see Table 23-4).

TABLE 23-4

EMPLOYER-PAID PARKING SPACES IN THE UNITED STATES

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).



An exemption for small firms?

California requires only firms with 50 or more employees to offer parking 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 inappropriate. Perhaps the legislature chose this size threshold by making a false analogy between parking cash out and most employers' travel demand management (TDM) programs. For example, the South Coast Air Quality Management District (SCAQMD) in Southern California requires employers with 250 or more employees to offer travel demand management (TDM) programs for their employees. It may be argued that small firms should be exempted from the TDM requirement because they have greater difficulty arranging carpools among their few employees. But three important differences between parking cash out and TDM programs suggest that small firms should not be exempt from a parking cash-out requirement.

First, many TDM programs involve a considerable administrative burden. Kenneth Green (1994) studied one major firm's spending to comply with the SCAQMD's TDM requirement and found that administration consumed 72 per cent of this spending. Only 28 per cent of the firm's spending

reached commuters as ridesharing subsidies. By contrast, case studies of firms that offer parking cash out have found that administration cost the firms almost nothing and that almost all of the firms' spending reached commuters as ridesharing subsidies. (see Chapter 25).

Second, requiring employers to reduce automobile commuting imposes a significant financial cost. Ernst and Young (1992) found that firms spent $105 per employee per year to comply with the SCAQMD's TDM requirement. With parking cash out, however, firms simply allow commuters to shift parking subsidies into their paychecks. The savings in reduced parking subsidies finance the additional cash income paid to commuters. Small firms should find it much easier to pay cash to employees than to spend that same cash to lease and manage parking spaces.

A third important difference between most TDM programs and parking cash out relates to economies of large scale. A small firm cannot arrange a significant number of convenient carpool matches among its few employees.[75] This economy-of-scale argument justifies exempting small firms from a TDM requirement but does not justify exempting small firms from a cash-out requirement. The effectiveness of parking cash out does not rely on ridesharing among a single firm's employees. If commuters can cash out their parking subsidies, they can rideshare with employees of other firms, so having few employees does not eliminate the benefits of parking cash out for small firms. For parking cash out, firm size does not matter.

The economies of scale for parking cash out depend on the total number of commuters offered the cash option, not the number of employees of one firm. These economies of scale occur because finding a carpool partner is much easier when everyone else is also seeking a carpool partner. Offering all commuters the option to cash out their employer-paid parking greatly increases the probability of finding a carpool partner because commuters can carpool 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 that they will take it.

In summary, there are three good reasons not to exempt small firms from the cash-out requirement. First, small firms rent approximately 16 million parking spaces for commuters, which are more than four-fifths of all the rented parking spaces. Therefore, eliminating 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. Second, cashing out employer-paid parking in rented spaces imposes almost no financial burden on a firm. Third, commuters are more likely to cash out parking subsidies and carpool if many firms offer commuters the same option.

California does not require firms with fewer than 50 employees to cash out their parking subsidies, but these firms provide almost five times more free parking in rented spaces than do the firms with 50 or more employees (see column 2 in Table 23-4). Smaller firms have no more difficulty than larger firms in cashing out parking subsidies and smaller firms rent many more parking spaces to subsidize commuter parking. Therefore, exempting firms with fewer than 50 employees from the cash-out requirement makes no sense.

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 lease agreements for parking, the South Coast Air Quality Management District (SCAQMD) surveyed the parking arrangements of firms with more than 50 employees (PCR 1996). Forty-nine of the 417 responding firms (12 per cent) rented parking spaces and reported their lease arrangements. Fifty-five per cent of these 49 firms reported that their parking

spaces are bundled into the cost of the office space they lease; 29 per cent reported that the parking is leased separately (unbundled) from their office space; and 6 per cent reported that parking is included in the lease for office space but is itemized separately (unbundled). The remaining 10 per cent of firms reported some other arrangement. Thus, between 35 and 45 per cent of the rented parking spaces are unbundled. Finally, 88 per cent of the firms with unbundled parking reported that they can reduce the number of parking spaces leased.[76] Therefore, at least 31 per cent of the rented parking spaces in Southern California are readily available for cashing out (35% x 88%).

Six million rented parking spaces to cash out

We can apply these results to make a rough estimate of the number of commuter parking spaces in the US that might be cashed out. If employers rent 19.5 million parking spaces to offer free to commuters and if the leases for 31 per cent of these rented parking spaces allow employers to reduce the number of spaces rented, American employers can easily offer commuters the option to cash out approximately six million employer-paid parking spaces.[77] The research reported in Chapter 25 suggests that offering six million commuters the option to cash out their employer-paid parking will reduce commuter travel by 3.9 billion VMT per year, save 156 million gallons of gasoline per year and reduce 2.2 million metric tons of CO_2 emissions per year.

While these six million easily-cashed-out parking spaces represent only 7 per cent of all employer-paid parking spaces, many of them are in central business districts where parking cash out produces the greatest benefits. For example, one survey in Southern California found that 71 per cent of the firms in downtown Los Angeles rent parking spaces to subsidize commuter parking.[78] For firms that could reduce the number of spaces they rent, the average parking subsidy was $79 per employee per month. One downtown firm spent $64,500 a month to subsidize commuter parking in rented spaces. Parking cash out can clearly benefit both employers and employees in central cities and the nation.

23.6. Conclusion: Free to choose

California's parking cash-out requirement does not prohibit, tax or even discourage employer-paid parking. Instead, an employer who offers to pay for parking for commuters drive to work alone mist simply offer to pay commuters the same amount if they ride public transit, carpool, walk or bike to work. Commuters can spend the cash value of their parking subsidies any way they want. Parking cash out is therefore a fair way to reduce vehicle trips, improve employee welfare, strengthen the city center and increase tax revenues—all at almost no cost to the employer. Parking cash out produces all these benefits simply by giving commuters the freedom to choose how to spend their own money.

24. PARKING CASH OUT: THE TAX ANGLE

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

The prospects for parking cash out looked bright in 1992. The US Department of Transportation published my report on Cashing Out Employer-Paid Parking and California enacted its parking cash out law.[79] Parking cash out seemed reasonable to many policy analysts and in 1993 the Clinton administration proposed a national parking cash-out requirement as one of the many initiatives in its Climate Change Action Plan.[80] I was invited to a ceremony at the White House when President Clinton and Vice-President Gore presented 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 US Internal Revenue Code penalized parking cash out, even in California. Far from moving quickly to require parking cash out, Congress took five years to amend the Internal Revenue Code simply to allow it. This chapter explains how the tax code formerly penalized parking cash out and describes how the Transportation Equity Act for the 21st Century (TEA 21) amended the tax code to allow it. One lesson to be learned from this chapter is that badly written tax laws can do great harm to the economy and the environment. Another lesson is that apparently minor reforms in the tax code can produce enormous benefits at low cost.

24.1. The asymmetric tax exemption for employer-paid parking

Employer-paid parking is the most common tax-exempt fringe benefit in the US, but it is also an anomaly. Most tax exemptions (like the one for employer-paid health insurance contributions) promote a specific public goal. But the tax exemption for employer-paid parking aggravates traffic congestion, air pollution and energy consumption because it encourages employers to offer free parking, which in turn encourages solo driving to work.

Employer-paid parking was always assumed to be tax exempt, but it did not become officially tax exempt until the Tax Reform Act of 1984 introduced the category of "working condition fringe benefits." These benefits were 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.[81] That is, if your employer gives you something that you would be able to deduct from your taxable income if you paid for it yourself, you don't have to pay taxes on the value of this benefit received from your employer.[82] Because the Internal Revenue Code does not allow commuters who pay for parking at work to deduct this cost as a work-related expense, employer-paid parking does not fit this definition of a working condition fringe benefit. To clarify that employer-paid parking was 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."[83]

This special rule made parking the only fringe benefit that was tax-exempt when the employer paid for it but not tax-deductible when the employee paid for it. This asymmetric tax exemption for employer-paid parking (but not for driver-paid parking) encouraged employers to convert taxable wages into tax-exempt parking subsidies. Employees are not necessarily better off in this bargain, however. Employer-paid parking does not necessarily increase employees' total compensation because higher fringe benefits are traded off for lower cash wages (lower wages for all employees, not just for those who drive to work).[84]

A conventional tax deduction—like the one for charitable contributions—reduces the after-tax price of the deductible item by the taxpayer's marginal income tax rate.[85] But to take advantage of the tax-exemption for commuter parking, the employer had to pay for the parking. This asymmetric tax treatment reduces the driver's cost of parking at work by 100 per cent—to zero. The tax exemption for employer-paid parking therefore increases solo driving by much more than the conventional tax deduction increases charitable giving. The only limit on the extent to which free parking can increase solo driving seems to be when everyone drives to work alone and we are approaching that limit.

The open-ended tax exemption for free parking drew increasing criticism. For example, an employer-paid parking subsidy of $400 a month was tax exempt, but any employer-paid transit subsidy worth over $15 a month was taxable income. To remedy this situation, the National Energy Policy Act of 1992 replaced the 1984 "special rule for parking" with a new tax-exempt fringe benefit, the "qualified transportation fringe." The tax exemption for employer-paid parking was capped at $155 a month, indexed for inflation (it was $180 a month in 2001). Employer-paid vanpool and transit subsidies were made tax exempt up to $60 a month (subsequently increased to $100 a month in 2002).[86] Any subsidies above these tax-exempt amounts are taxable income.[87]

The initial tax exemption of $155 a month for employer-paid parking was chosen because it was the average commercial price of parking near Capitol Hill and would thus exempt from taxation all the parking subsidies received by Members of Congress and their employees. An unexpected problem arose in the case of Senators, 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 in 1992, so the Senators would have incurred an income tax liability. The problem was solved by reserving the same 100 parking spaces exclusively for Senators, but without a name on each space. In 1994, the Senate solved another of its parking problems with the same 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."[88]

24.2. The tax expenditure for employer-paid parking

A "tax expenditure" is the reduction in tax revenue caused by a tax exemption.[89] In 1995, the value of all tax-exempt employer-paid parking subsidies was estimated at $31.5 billion a year and the marginal income tax rate for all taxpayers averaged 19 per cent.[90] At this 19 per cent marginal tax rate, the federal tax expenditure for employer-paid parking was $6 billion a year.[91] That is, the federal government would have collected $6 billion a year more in income taxes if commuters had paid income taxes on their employer-paid parking subsidies.

We can use the data in Chapter 22 to estimate the federal tax expenditure for employer-paid parking for commuters to downtown Los Angeles (see Table 22-3). Firms that offered free parking spent $750 per employee per year to provide the tax-exempt subsidy. At a 19 per cent marginal tax

rate, the tax expenditure (foregone tax revenue) for free parking was $143 per employee per year ($750 x 0.19). The resulting increase in driving to work increased the employers' and employees' combined spending by $566 per employee per year for driving to and parking at work.[92] Therefore, every $1 of federal tax expenditure for free parking in downtown Los Angeles stimulated $3.97 in additional private spending for driving and parking ($566 ÷ $143).

The tax expenditure for employer-paid parking was $143 per employee per year and free parking at work stimulated commuters to drive an 1,311 additional VMT per employee per year. Therefore, commuters drove an additional 9.2 VMT for every $1 of tax expenditure for employer-paid parking (1,311 ÷ $143).[93] The tax exemption for employer-paid parking therefore looks very cost-effective if the government wants to increase vehicle travel at peak hours.

24.3. Is employer-paid parking wage discrimination?

Employer-paid parking helps to attract employees, but it can also be interpreted as higher wages for employees who drive to work than for other employees. The economic motive for this wage discrimination is to attract workers who commute by car and who can therefore choose among many alternative employers within automobile commuting distance.[94] Those who do not drive to work must seek employment within a more limited area. The employer does not need to offer an equivalent subsidy to nondrivers who have few other employment options.[95]

This wage-discrimination rationale would lead some employers to offer free parking at work even if it were not a tax-exempt fringe benefit. Therefore, the tax exemption does not motivate all employer-paid parking. Nevertheless, the federal government subsidizes employer-paid parking through the tax code and thus subsidizes wage discrimination against commuters who ride public transit, walk or bike to work.

24.4. Parking cash out: two tax penalties

The Internal Revenue Code not only encourages employer-paid parking, but until 1998 two features of the code also penalized parking cash out: (1) the not-in-lieu-of-compensation provision and (2) the constructive-receipt doctrine. These two tax penalties explain why few employers offered parking cash out before 1998.

Not-in-lieu-of-compensation provision

Before 1998, if an employer gave commuters the option to choose cash instead of a parking subsidy, the otherwise tax-exempt parking subsidy became taxable income for the commuters who took the parking. Section 132(f)(4) of the Internal Revenue Code stated:

> BENEFIT NOT IN LIEU OF COMPENSATION—[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 if an employer gave commuters the option to choose cash in lieu of a parking subsidy, the parking subsidy itself became taxable income even for commuters who did not choose taxable cash.

Suppose that, to comply with California's cash-out requirement, an employer offered commuters who rideshare a cash subsidy equal to the parking subsidy they would receive if they drove to work solo. If the employer offered this option, the parking subsidy itself ceased to qualify as a tax-exempt transportation fringe benefit because it was no longer "provided in addition to (and not in lieu of) compensation otherwise payable to the employee."[96] If an employer complied with California's cash out requirement, the Internal Revenue Code required commuters who chose the free parking to pay income tax on the formerly tax-exempt parking subsidies. Both employees and employers were also required to pay Social Security and other payroll taxes on the parking subsidies.

The not-in-lieu-of-compensation provision makes sense for fringe benefits that promote public purposes. For example, disallowing the choice between an employer-paid pension contribution and its cash value is logical because the government wants to encourage retirement saving. But disallowing the choice between employer-paid parking and its cash value is illogical because free parking encourages solo driving, which in turn increases traffic congestion and air pollution.

Constructive-receipt doctrine

Another feature of tax law—the constructive-receipt doctrine—also penalized cash out. 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. 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."[97] The constructive-receipt doctrine implies that commuters who are offered taxable cash in lieu of a tax-exempt parking subsidy but choose the tax-exempt parking subsidy should pay income taxes on the cash not taken.

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 parking subsidy was tax-exempt according to the not-in-lieu-of compensation rule. If the firm offered the choice between a $100 parking subsidy or $75 in cash, the $100 parking subsidy lost its tax-exempt status because a parking subsidy was taxable income only if it was offered in lieu of any compensation otherwise payable to the commuter. Taxable income therefore increased by $100 a month for commuters who accepted the parking subsidy.

Now suppose that only the not-in-lieu-of-compensation rule was eliminated, so the $100 parking subsidy remained tax-exempt despite the $75 cash offer. 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 taxable 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 they therefore "constructively received") the $75 in taxable cash.

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. By encouraging employer-paid parking and discouraging parking cash out, the tax code for many years caused serious harm to commuters, cities, the economy and the environment.

24.5. Eliminating the tax penalties

The Internal Revenue Code discouraged employers from voluntarily offering to cash out parking subsidies and it deterred California from enforcing its cash-out law. This conflict between the Internal Revenue Code and California's cash-out law highlighted the irrationality of the tax code's not-in-lieu-of-compensation rule for employer-paid parking. Progress was difficult because few transportation analysts understand the byzantine tax code and few tax analysts appreciate the tax code's 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 tax penalty for offering cash in lieu of parking. This amendment was enacted in 1998 as part of the Transportation Equity Act for the 21st Century (TEA-21). Section 9010 (Election to Receive Taxable Cash Compensation in Lieu of Nontaxable Qualified Transportation Fringe Benefits) of the Act amended the Internal Revenue Code to state that employers can offer taxable compensation in lieu of a tax-exempt transportation fringe benefit.[98] 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.

This amendment replaces the not-in-lieu-of-compensation provision with an override of the constructive-receipts doctrine, so the tax code now explicitly permits what it previously prohibited. Therefore, employers can now allow commuters to choose taxable cash instead of tax-exempt parking, transit or vanpool subsidies.

This minor 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 make 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.[99]

24.6. A revenue windfall for federal and state governments

If a commuter chooses taxable cash instead of a tax-exempt parking space, tax revenues increase. To show this, suppose a firm pays $100 per space per month to provide free parking at work. A commuter in the 25 per cent marginal tax bracket who cashes out the $100 tax-exempt parking subsidy receives $100 in cash, which is reported as taxable wages on the commuter's W-2 statement. Of this $100, the commuter receives $75 after taxes, so commuters who cash out their free parking show that they prefer $75 in cash to a free parking space that costs the firm $100. Voluntary choice produces the $25 in tax revenue and this windfall comes from increased economic efficiency, not from increased tax rates. Few other tax reforms will reduce traffic congestion, improve air quality, conserve energy and increase tax revenue without increasing tax rates.

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 per cent after cash out was offered (see Chapter 25). Because commuters chose taxable cash instead of tax-exempt parking subsidies, their taxable income increased by $255 per year per employee offered the cash option.[100] Given the income tax rates that commuters paid on the taxable cash, federal income tax revenues increased by

$48 per employee per year and California income tax revenues increased by $17 per employee per year.[101]

24.7. Paying for parking with pre-tax income

TEA-21 also allows commuters to pay for parking with pre-tax income. Employers who do not subsidize parking can offer tax-exempt free parking to commuters who accept an equivalent reduction in their taxable wages. For example, suppose a commuter earns a salary of $4,100 a month and pays $100 a month for parking at work (see box). Because the not-in-lieu-of-compensation provision has been removed from the tax code, the employer can allow this commuter to choose either a salary of $4,100 a month without free parking or a salary of $4,000 a month with "free" parking. If the commuter takes the parking, the commuter's pre-tax income declines by $100 a month. The driver pays for parking by accepting a lower pre-tax income, so the payment is tax-exempt. Therefore, the commuter saves both payroll taxes and income taxes on the $100-a-month reduction in taxable wages and the employer saves payroll taxes on the same $100-a-month.

EQUAL MONTHLY WAGES WITH AND WITHOUT EMPLOYER-PAID PARKING

	Employer pays for parking (tax-exempt)	Driver pays for parking (pre-tax)
Salary	$4,000	$4,100
Parking	Free	$100

If employers adjust wages to compensate for fringe benefits, the tax consequences are the same whether the employer or the commuter pays for parking at work. The after-tax cash foregone by a commuter who parks at 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 a commuter who earns $4,100 a month without free parking and can pay $100 a month (pre-tax) to park. Both commuters can take either $4,000 in taxable wages with a parking space or $4,100 in taxable wages without a parking space. Both commuters' cost of parking is the after-tax value of $100 a month. Commuters who pay for parking at work therefore receive the same tax benefits and the same after-tax income as commuters who park free.[102]

With a 19 per cent federal tax rate and a 6.5 per cent state tax rate, commuters face a 25.5 per cent combined marginal income tax rate.[103] Social Security and Medicare add a payroll tax rate of 7.65 per cent, so a typical commuter's total marginal tax rate on earned income is about 33 per cent.[104] The employer also pays 7.65 per cent in payroll taxes. Therefore, paying $100 for commuter parking from pre-tax rather than after-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. The University itself saves $1 million a year in payroll taxes (see Table 24-1).[105] The annual tax savings per employee with a payroll deduction for parking ranges from $69 at UC Santa Barbara to $236 at UCLA and the average saving is $155 per employee per year.[106]

TABLE 24-1

PAYING FOR PARKING FROM PRE-TAX INCOME: TAX SAVINGS AT THE UNIVERSITY OF CALIFORNIA

Campus	Employees with parking	Total annual parking fees	Total annual tax savings			Annual tax savings per employee		
			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.

How do these tax savings for commuters and their employers affect government tax revenues? The government loses tax revenue when commuters who formerly paid for parking with after-tax income begin to do so with pre-tax income (as at the University of California). Nevertheless, Congress's Joint Committee on Taxation estimated that allowing parking cash out will increase federal income tax and Social Security tax revenues by $169 million between 1998 and 2007—without any increase in tax rates.[107] This estimated revenue windfall for the federal government is the difference between (1) the increase in tax revenue from commuters who choose taxable cash instead of tax-exempt parking, minus (2) the decrease in tax revenue from commuters who begin to pay for parking with pre-tax income. Because 95 per cent of automobile commuters parked free at work in 1995, many more commuters can cash out tax-exempt parking subsidies than can begin paying for parking with pre-tax income and the federal government therefore gains more tax revenue than it loses.[108]

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 to work. On the other hand, the opportunity to cash out their parking subsidies will induce other commuters to stop driving to work. Ninety-one per cent of commuters already drive to work, so few commuters can begin driving because of the reduced after-tax price of parking and many commuters can stop driving.[109] Therefore, the net effect of the price changes should reduce the number of cars driven to work.

24.8. Paying for transit and vanpools with pre-tax income

Most commuters who ride public transit pay their fares with after-tax income because fewer than 1 per cent of all employers offer transit fringe benefits.[110] TEA21 eliminated the not-in-lieu-of compensation provision for all transportation fringe benefits, however, so commuters can now pay for transit and vanpools with pre-tax income in the same way that 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 with pre-tax income. Any employer can make a similar arrangement for commuters to pay for transit and vanpools with pre-tax income. The tax exemption for transit and vanpool fringe benefits was $65 a month in 1998 and TEA-21 increased this exemption to $100 a month in 2002.

24.9. Transportation and tax equity

TEA-21 increases transportation tax equity in four ways. First, by allowing parking cash out, it increases equity among all commuters 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, each commuter receives the same benefit regardless of how they travel to work.

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

Third, by allowing commuters to pay for public transit with pre-tax income, it improves equity between those who drive to work and those who ride transit or vanpools to work. 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 tax 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.

24.10 The next step: two proposals

The tax code continues to favor solo driving to work because employer-paid parking is tax exempt and in-lieu cash is taxable. A more serious problem is that the tax code only allows employers to offer taxable cash in lieu of a tax-exempt parking subsidy. 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 reducing traffic congestion, air pollution and energy consumption were an urgent national priority, this tax preference for solo drivers would be insupportable.

To counteract the federal tax incentive for employer-paid parking, Chapter 27 proposes two amendments to the tax code: (1) require parking cash out as an alternative to tax-exempt employer-paid parking and (2) allow employers include employer-paid parking in "cafeteria plans" that offer commuters the option to choose other tax-exempt fringe benefits in lieu of free parking at work.

24.11 Conclusion: Slow advances

The tax exemption for employer-paid parking is an anomaly among tax-exempt fringe benefits because it encourages behavior that other public policies (and much government spending) are intended to discourage—solo driving to work. California addresses this problem by requiring many employers to give commuters the option to cash out any parking subsidy offered. Until 1998, however, the Internal Revenue Code penalized employers who complied with California's parking cash-out requirement.

In 1998, TEA-21 amended the Code to allow the choice between an employer-paid parking subsidy and cash income. Commuters can cash out their employer-paid parking subsidies and commuters can pay for parking from pre-tax income. Transit and vanpool commuters can also pay their commuting costs from pre-tax income. The tax code continues to favor solo driving to work, however, because it now simply allows employers to offer commuters the option to take taxable cash in lieu tax-exempt parking and still prohibits employers from including employer-paid parking in any cafeteria benefit plan. Allowing employers to offer commuters taxable cash in lieu of a tax-exempt parking subsidy is therefore only a partial reform. But as Benjamin Cardozo said, "Justice is not to be taken by storm. She is to be wooed by slow advances."

25. PARKING CASH OUT: EVALUATING THE EFFECTS

It's very simple. It's not difficult at all. CASE STUDY 2
Cash works very well for us. CASE STUDY 8

Until 1998, employer-paid parking was a tax-exempt fringe benefit only if it was "provided in addition to (and not in lieu of) any compensation otherwise payable to the employee."[111] Because this tax provision created a penalty for parking cash out, California could not enforce its parking cash-out law. Nevertheless, some employers voluntarily complied with the cash-out requirement because they were unaware of the tax conflict and we can evaluate their experience to assess the effects of parking cash out.

This chapter presents case studies of eight employers who have complied with California's cash out requirement.[112] The case studies examined how parking cash out affects the following six outcomes:

1. Commuter mode shares;
2. Vehicle trips to work;
3. Vehicle miles traveled to work;
4. Vehicle emissions from work trips;
5. Gasoline consumption for work trips;
6. Employers' spending to subsidize commuting.

By introducing parking prices as a factor influencing commuters' travel choices, parking cash out reduced vehicle travel to work by 12 per cent—equivalent to taking one of every eight commuters' cars off the road. The employers paid only $2 per employee per month to offer parking cash out because what they paid to rent parking spaces declined almost as much as the cash they paid to commuters in lieu of parking spaces. Federal and state income tax revenues rose by $65 per employee per year because many commuters voluntarily traded their tax-exempt parking subsidies for taxable cash. The employers praised parking cash out for its simplicity and fairness and said that it helps them recruit and retain workers. The benefit/cost ratio of the eight cash-out programs was at least 4-to-1.

25.1. The eight cases

The eight employers include an accounting firm, a bank, a government agency, a managed-care medical provider, a video post-production company and three law firms. They range in size from 120 to 300 employees, with a combined total of 1,694 employees. Two employers are in downtown Los Angeles, three in Century City, two in Santa Monica and one in West Hollywood.

To comply with California's cash-out law, an employer must offer commuters the option to choose a cash payment equal to any parking subsidy offered. The eight firms initially offered greater subsidies for parking than they offered to commuters who did not take a parking space, but all the

firms subsequently adopted policies that comply with the cash-out requirement. Table 25-1 shows the commute subsidy policies of the eight firms both before and after complying with the law.

TABLE 25-1

COMMUTE SUBSIDIES BEFORE AND AFTER CASH OUT
($ 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 G explains each firm's commute subsidies.

After complying with the law, all eight firms offered a cash payment at least equal to the parking subsidy, but six (all except Cases 2 and 3) voluntarily went beyond mere compliance with the law by subsidizing one or more alternatives to parking more than they subsidize parking.[113] The varied policies in the eight case studies show that 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 a variety of policies, each of which complies with California's cash-out law.

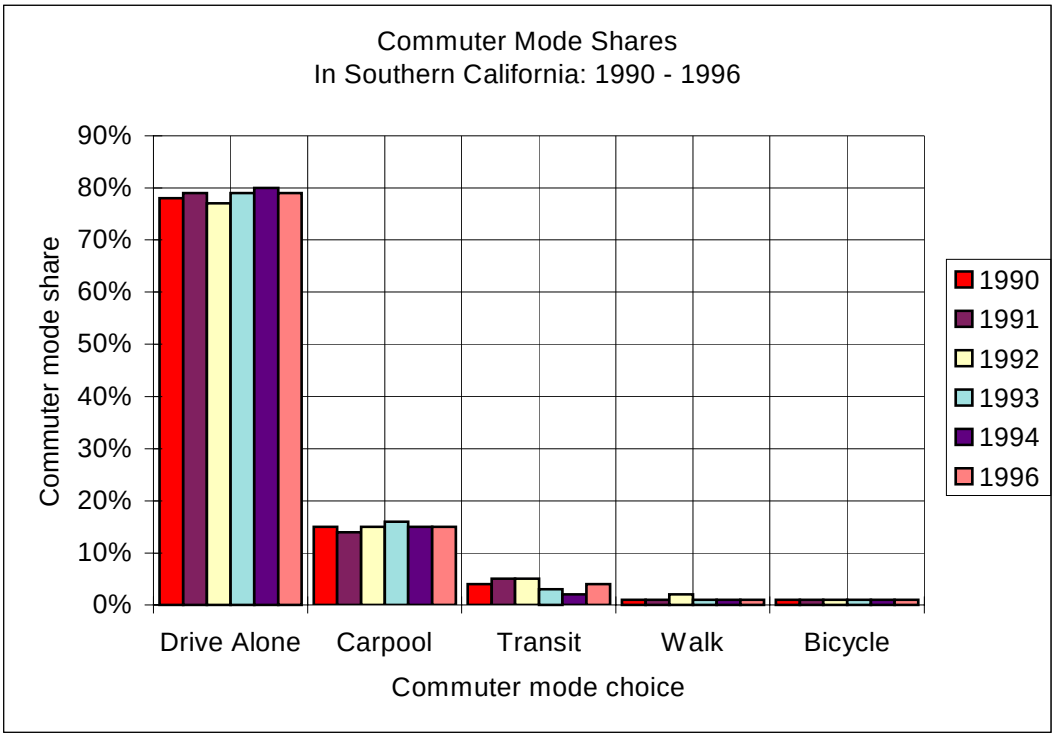
25.2. Case study methodology

The eight case-study firms were identified in consultation with Commuter Transportation Services, a regional agency that assists nearly 5,000 employers with rideshare matching. They are the only ones with cash-out programs that had operated long enough to provide data for evaluating the post-cash-out effects. Data for the case studies were obtained from the Trip Reduction Plans that all firms with more that 100 employees submitted 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 they report the results in a consistent format.[114] The plans also provide detailed information about every ridesharing incentive they offer. I also interviewed five of the eight firms' transportation coordinators to obtain their personal evaluations of parking cash out.[115]

Do factors other than parking cash out explain the reductions in solo driving found at the eight firms? Figure 25-1 shows the mode shares for all commuters in Southern California from 1990 to 1996.[116] The solo-driver share ranged between 77 and 80 per cent during these years, with no downward trend. Therefore, regional trends do not explain the reduction in solo driving at the eight firms. Other

rideshare incentives cannot explain the reduction in solo driving either, because five of the eight firms discontinued other rideshare incentives when they began to offer the cash option.

Figure 25-1



One additional firm that did not offer parking cash out was also examined to control for factors other than cash out. This firm provides a suitable comparison because its parking subsidy remained $75 a month greater than its ridesharing subsidy between 1991 and 1995. The firm's solo-driver share was 83 per cent in both 1991 and 1995. This finding suggests that parking cash out and not other factors, explains the reduction in solo driving at the eight case study firms.

25.3. Summary of travel changes after cash out

Table 25-2 summarizes the travel changes at the eight firms after compliance with the cash-out law. It shows the changes in solo-driver share, vehicle trips to work and VMT for commuting. The cases are arranged according to the reduction in solo-driver share after cash out, in descending order. The last row shows the weighted averages for all 1 694 employees of the eight firms. The solo-driver share fell from 76 per cent before employers offered cash out, to 63 per cent afterward. The number of daily vehicle trips to work fell by 11 per cent and total vehicle travel to work fell by 652 VMT per employee per year. These three outcomes are explained in detail below.

TABLE 25-2

SUMMARY OF TRAVEL CHANGES AFTER PARKING CASH OUT

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

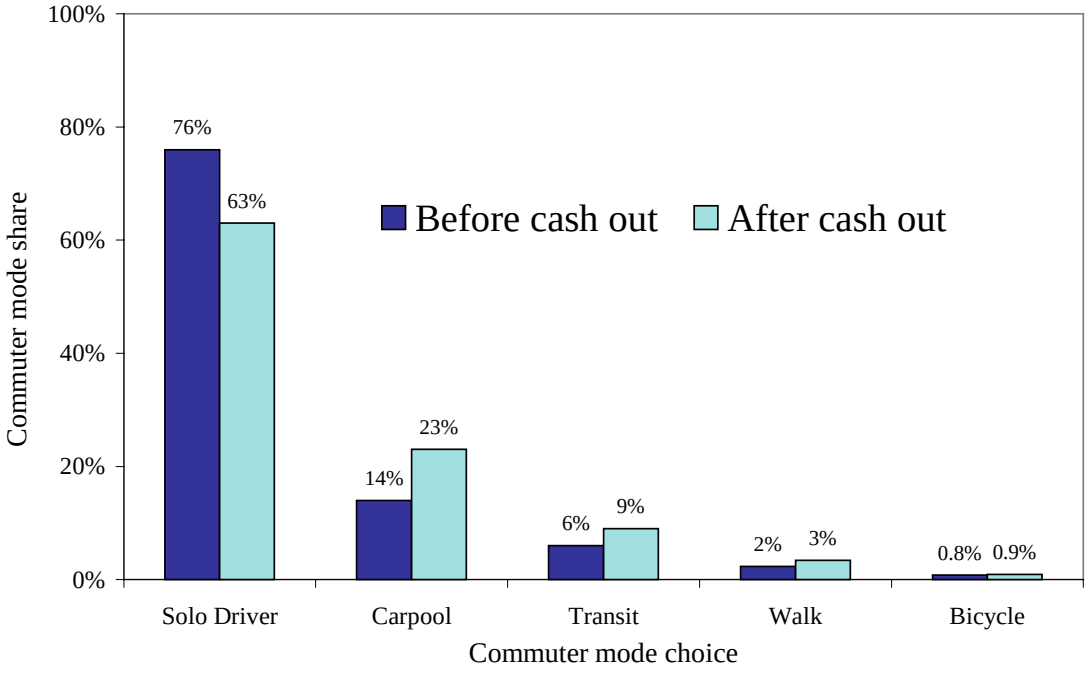
Source: Shoup 1997c. The firms are listed in descending order of the change in solo driver share in Column 4.

The solo-driver share fell by 13 percentage points

The first panel in Table 25-2 shows that the solo-driver share at the eight firms fell from 76 per cent before parking cash out to 63 per cent afterward or by 13 percentage points. 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. 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. The firm then raised the cash offer to $65 a month.

Figure 25-2 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 mode shares for commuting found in the 1990 Census.[117] After cash out, the solo-driver share fell from 76 per cent to 63 per cent. The carpool share rose from 14 per cent to 23 per cent, the transit share rose from 6 per cent to 9 per cent and the combined walk/bicycle share rose from 3 per cent to 4 per cent. 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 one trillion.

FIGURE 25-2
COMMUTER MODE SHARES BEFORE AND AFTER PARKING CASH OUT
(for the 1,694 employees of the eight case-study firms)



One way to see the effects of parking cash out is to consider a hypothetical group of 100 commuters. Per 100 commuters, parking cash out induced 13 solo drivers to shift to another mode. Of the 13 former solo drivers, 9 joined carpools, 3 began to ride transit and one began to walk or bike to work. These mode shifts reduced the number of solo drivers to work by 17 per cent, increased the number of carpoolers by 64 per cent, increased the number of transit riders by 50 per

cent and increased the number who walk or bike to work by 39 per cent.[118] This result shows that a simple, fair and almost costless reform of employer-paid parking can significantly reduce vehicle travel.

The noteworthy shift from solo driving to carpooling runs counter to the national trend. The nationwide carpool share fell from 20 per cent in 1980 to 14 per cent in 1990, while the carpool share at the eight firms rose from 14 per cent before cash out to 23 per cent 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 available. By encouraging carpools, parking cash out takes advantage of many empty seats in cars already on the road to work.

Vehicle trips to work fell by 11 per cent

The second panel in Table 25-2 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 the vehicle trip rate is 1, all commuters drive to work solo because every person at work creates a vehicle trip to work. If the vehicle trip rate is 0.5, every person trip to work creates only one-half of a vehicle trip; for example, if all commuters drive from home to work in two-person carpools, the vehicle trip rate would be 0.5. The VTR therefore 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 one-half of a vehicle trip, each person in a three-person carpool is counted as one-third of a vehicle trip and so on. No vehicle trips are attributed to transit riders, cyclists or pedestrians.[119]

The average number of vehicle round trips to work fell from 0.82 per commuter per day before cash out to 0.73 per commuter per day afterwards. Parking cash out therefore reduced 0.09 vehicle round trips per day per commuter offered the cash option, reduced the number of vehicle trips to work by 11 per cent (0.09 ÷ 0.82) and reduced the demand for parking at work by 11 per cent.

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.[120]

Vehicle travel to work fell by 652 VMT per employee per year

The third panel of Table 25-2 shows that commuters drove 652 fewer VMT (1,043 fewer VKT) per person per year after the firms complied with the cash-out law. The reduction in total vehicle travel after cash out is calculated by multiplying each firm's reduction in the number of vehicle trips to work by the commuters' average round-trip distance to work.[121] A 1991 travel survey of commuters in Southern California found that the average one-way vehicle commute distance was 15 miles (24.1 kilometers).[122] Annual surveys conducted between 1989 and 1996 found that average one-way vehicle commute distances ranged from 14.8 to 16.9 miles.[123] Fifteen miles (24.1 kilometers) is therefore used as the average one-way distance to work to calculate the VMT reduction for each avoided vehicle trip.[124]

Commuters who carpool may drive a more circuitous route to work than if they drove solo. Jon Fricker defined circuity as "the extra distance that a member of a carpool travels, compared to that

person's drive-alone distance between home and work."[125] He defined the "circuity factor" as the "ratio of ridesharing distance to drive-alone distance." If carpooling creates substantial circuity, the method used to calculate VMT to and from work overestimates the VMT reduction when commuters shift from solo driving to carpooling. Nevertheless, a test of the results found that circuity had almost no effect on the VMT estimates.[126]

The reductions in vehicle travel after cash out ranged from 5 to 24 per cent, with an average of 12 per cent fewer VMT per employee per year—equivalent to removing from the road one of every eight cars driven to work at the case-study firms. This estimate of a 12 per cent VMT reduction after cash out is conservative because it measures only short-term effects. Parking cash out is a new practice and few firms have enough experience 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 did, however, have records available for three years after cash out: the solo-driver share fell from 79 per cent in the year before cash out to 76, 69 and 67 per cent in the following three years.[127]

The transportation coordinator at Case 3 offered two likely explanations for a long-term decline in solo driving. First, new employees who have not 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 that offers cash out, more of them choose the alternatives to driving solo to work. 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?

The eight firms complied with California's cash-out requirement in several different ways (see Table 25-1). Five firms maintained their parking subsidies and increased their ridesharing subsidies (Cases 2, 3, 4, 6 and 7). Two firms reduced their parking subsidies and increased their ridesharing subsidies (Cases 5 and 8). One firm eliminated its parking subsidy for solo drivers and maintained its ridesharing subsidy (Case 1). Given these varying 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 these subsidies, differed among the three firms.[128] Despite differences in the specific cash-out terms, each firm's vehicle trips per employee fell by 9 per cent (see Table 25-2). This result shows that differences in the specific terms of cashing out did not significantly affect the resulting changes in travel choices.

25.4. Emission reductions and gasoline savings

By reducing vehicle travel, parking cash out also reduced vehicle emissions. We can calculate these reductions in vehicle emissions by multiplying the reductions in vehicle trips and VMT by the emissions created per trip-end (cold-start and hot-soak emissions) and per VMT (running emissions). For example, cash out reduced 40 trips and 585 VMT per employee per year in Case 4 (see Table 25-2). The California Air Resources Board has estimated "emissions factors" that measure the average vehicle's emissions per trip end and per VMT for each type of emission.[129] Multiplying 40 trips and 585 VMT by the emissions factors for reactive organic gases (ROG), carbon monoxide

(CO), nitrogen oxides (NO_x) and inhalable particulate matter less than ten microns in diameter (PM_{10}) gives the emissions reduced per employee per year for Case 4. Parking cash out reduced vehicle emissions by 819 grams of ROG, 683 grams of NO_x, 7.2 kilograms of CO and 500 grams of PM_{10} per employee per year for the 1,694 employees of the eight firms.

The California Air Resources Board treats 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.[130] This valuation method gives an estimated reduction of 3 kilograms of vehicle emissions per employee per year, a 12 per cent reduction in vehicle emissions for driving to work.

The shifts in travel behavior prompted by parking cash out reduced vehicle travel to work by 652 VMT per employee per year and thereby saved 26 gallons (99 liters) of gasoline per employee per year (12 per cent of the total gasoline consumption for driving to work).[131] Because commuting to work accounts for about 16 per cent of total oil consumption in the US, parking cash out has significant potential to reduce total oil consumption in the US and total oil imports into the US.[132]

By reducing gasoline consumption, parking cash out reduced CO_2 emissions for vehicle commuting to work. Combustion of each gallon of gasoline produces 19.6 pounds of tailpipe CO_2 emissions. The full-fuel-cycle CO_2 emissions (which include the emissions from extracting, transporting and refining motor fuel) are 57 per cent more than tailpipe emissions alone.[133] Parking cash out thus eliminated 800 pounds (367 kilograms) of CO_2 emissions per employee per year or 12 per cent of the CO_2 emissions caused by vehicle commuting to the eight firms.[134]

EMISSION REDUCTIONS AFTER PARKING CASH OUT
(kilograms per employee per year)

ROG	0.819 kilograms
NO_x	0.683 kilograms
CO	7.2 kilograms
PM_{10}	0.5 kilograms
CO_2	367 kilograms

25.5. Consistency with previous research

The results of the cash-out case studies are consistent with previous research on employer-paid parking. Table 25-3 compares three different types of research conducted in downtown Los Angeles. The first row shows the results predicted from the mode-choice model estimated with data on commuters to downtown Los Angeles (from Table 22-3 in Chapter 22). The model predicted that every 100 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.[135] The second row shows the average of the results from the two case studies of parking cash out in downtown Los Angeles. Every 100 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 predictable results.

TABLE 25-3

CASH-OUT RESULTS COMPARED WITH PREVIOUS RESEARCH
(cars driven to work per 100 employees)

Estimation method	Employer pays for parking: *Without* cash option	Employer pays for parking: *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 case studies of employer-paid parking in LA CBD	77	–	53

Row 1 refers to the model of commuting to the LA CBD (see Table 22-3).
Row 2 shows the average of Case Studies 5 and 8 in Table 25-2.
Row 3 shows the average of Case Studies 1 and 7 in Table 22-2.

The third row shows the results found in the two case studies of ending employer-paid parking in downtown Los Angeles. Every 100 commuters drove 77 cars to work when employers offered free parking without the cash option and only 53 cars when drivers paid for parking. Therefore, both the model (in row 1) and the case studies (in rows 2 and 3) both show that driver-paid parking reduces vehicle trips more than parking cash out does. Two reasons explain this result.

First, commuters who cash out a parking subsidy must pay income taxes on the in-lieu cash. Income taxes therefore reduce the after-tax opportunity cost of taking a free parking space when commuters are offered the option to cash out a parking subsidy. For example, if you are in the 30 per cent 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. Therefore, charging commuters $100 a month for parking reduces driving to work more than offering commuters $100 a month in lieu of free parking.

Second, commuters may be influenced by the "endowment effect," which refers to situations where possession of a good increases the value one places on it.[136] For example, once you buy a car, the lowest price at which you are willing to sell it may be much higher than the highest price you were willing to pay to buy 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. This price may be higher than what the commuter would be willing to pay for the space had the employer not provided it free. 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. Employee turnover thus leads to a continuing decline in the solo-driver share after cash out is in place.[137]

25.6. The cost of parking cash out

Beyond examining how parking cash out affects commuters' travel choices, we can examine how it affects employers' costs. In most cases, parking cash out is simply a more flexible use of money that 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 because they rode transit, carpooled, walked or biked to work. We can estimate this new cost of subsidizing previous nondrivers in the eight case studies. Table 25-4 shows the changes in the firms' total spending per employee per month 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 do not drive to work solo; it saved $70 per employee per month. 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 per employee per month, with a range from $8 to $33.

TABLE 25-4

SUMMARY OF EMPLOYERS' SUBSIDY PER EMPLOYEE
($ 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 (1997c)

Of the seven firms that spent more after cash out, two offered either a parking subsidy or its cash value: Case 2 spent $6 more per employee per month, while Case 3 spent $16 more per employee per month. The other five firms voluntarily went beyond mere compliance with the cash-out requirement by offering commuters the choice between a parking subsidy or more than its cash value; they spent from $8 (Cases 6 and 7) to $33 (Case 5) more per employee per month. These five firms' experience suggests that when employers calculate all their commuter subsidies in cash values they may decide to subsidize ridesharing more than solo driving.[138]

The eight firms, considered together, reduced their parking subsidies by almost as much as they increased their cash payments in lieu of parking subsidies. In Case 1, the firm saved $70 per employee per month by reducing the subsidies to solo drivers, who previously received larger subsidies than

nondrivers. The other seven firms' spending increased by an average of $13 per employee per month, which resulted from the increased payments to nondrivers, who previously received smaller subsidies than solo drivers. Because the overall subsidy reductions and increases almost net out, the eight firms' total spending for both parking and cash in lieu of parking rose by only 3 per cent. The average commuting subsidy per employee rose from $72 to $74 a month, so parking cash out was almost cost-neutral for these firms.[139]

This change in firms' spending refers only to payments for parking subsidies and for cash payments in lieu of parking subsidies. But when firms offer a parking subsidy without the cash option, they often try to encourage ridesharing with a collection of incentives to counter the parking subsidy itself. After the eight firms began to offer the straightforward choice between a parking subsidy or its cash value, five of them simultaneously discontinued other ridesharing incentives (such as free carwashes for carpoolers). Ridesharing increased in all five cases where firms deleted ridesharing incentives other than cash out, which shows that reduced spending on these other incentives can be an added benefit of parking cash out. I have not estimated the firms' savings associated with the discontinued ridesharing incentives, although they may be substantial. If these savings are included, the firms' total spending to subsidize commuters may have declined. These savings will be especially important at firms that offer both free parking and various rideshare incentives. If these firms offer parking cash out and eliminate all other rideshare incentives, they will probably increase ridesharing and save money.

This minor change in the eight firms' total commuting subsidies after cash out suggests how an individual firm can cash out employer-paid parking without spending significantly more on commuting subsidies: redistribute the existing total commuting subsidy equally among all commuters, independent of the commuters' travel choices. This redistribution will not significantly increase the firm's total cost or reduce the commuters' total 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. It will also comply with California's parking cash-out requirement.

Transfer costs versus real costs

We must distinguish between two very different kinds of cost when assessing the cost of parking cash out. 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 another use of the subsidies that the firm already provides to these commuters. The firm incurs no net cost.

Second, 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. The firms' cash payments are not funded by reduced spending to rent parking spaces. 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 23 explained why a firm's cost of parking cash out is 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 explain why transfer payments are not a use of 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. . . . to 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.[140]

Transfer payments do not consume any of the "economic pie," but they do change the size of the individual slices of the pie for employers and previous nondrivers. 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. And by improving employee benefits, it should also help employers to recruit and retain workers.

Because the case-study firms reduced parking subsidies and increase ridesharing subsidies, most of the redistribution that took place was from solo drivers to nondrivers. After cash out, the eight firms spent only $2 more per employee per month ($24 per year) on the sum of parking subsidies and cash payments in lieu of parking subsidies.[141] As a result, employees gained $2 per person per month in additional income, which is a transfer payment from employers to previously undercompensated nondrivers.

Negligible administrative cost

Beyond 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 cost is a real use of resources, not a transfer payment to commuters. Nevertheless, the firms' representatives all said that administration is simple and the cost is negligible:

- *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 that she spends approximately two minutes per employee per month on the cash-out program. The other firms' representatives said that the cost is imperceptible and one likened it to the cost of making changes in the number of exemptions for employees' income tax withholding.

The firms' representatives all said that administering the payroll taxes on cash subsidies in lieu of tax-exempt free parking causes no problems. Payroll taxes on cash subsidies increased by $1.63 per employee per month after cash out and they are included in the firms' subsidy cost in Table 25-4.

California's cash-out requirement applies to parking spaces that firms rent but does not apply to parking spaces that firms own. Does this increase administrative costs for employers who both rent and own parking spaces? Three of the case-study firms both own and rent parking spaces for commuters and representatives of these firms said this causes no difficulty. These firms offer the cash option to all commuters regardless of whether they park in owned or rented spaces. When a commuter who parks in an owned space takes the cash, a commuter who formerly parked in a rented space takes the owned space and the firm reduces the number of spaces it rents. This arrangement benefits both the employers and employees.

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

In summary, the administrative cost of parking cash out is negligible. As the transportation coordinators stated, parking cash out is simple, easy to administer and almost automatic.[142]

25.7. A 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 benefits both commuters and their employers. Previous nondrivers who begin to receive in-lieu cash are clearly better off. Solo drivers who trade a parking space for cash are also better off or they would not make the trade. Parking cash out also benefits employers because it helps to recruit and retain workers. The firms' representatives commented:

- *It's a good hiring incentive for us*. (Case 4);
- *[Parking cash out] is an excellent recruiting point because people count it as income.* (Case 5);
- *Employees are grateful and thankful and motivated. So, that's a plus for the company.* (Case 6);
- *[Parking 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 that justify California's cash-out requirement. The legislation states two objectives: to reduce traffic congestion and to reduce air pollution. In the eight case studies, parking cash out reduced 652 VMT (1,043 VKT) per employee per year and reduced vehicle emissions by 819 grams of ROG, 683 grams of NO_x, 7.2 kilograms of CO and 500 grams of PM_{10} per employee per year. What are these reductions in VMT and vehicle emissions worth to society?

First, we can value the VMT reductions by referring to the literature on the economic costs of traffic congestion. Michael Cameron (1991) estimated that congestion costs for Los Angeles range from 10¢ to 37¢ per VMT. He also estimated that a peak-period congestion toll of 15¢ per VMT would raise average speeds to 35-40 miles per hour on Los Angeles freeways; without a toll, the congestion-related external costs of vehicle use are presumably higher than 15¢ per VMT. Second, after an extensive literature review, Kenneth Small (1992) recommended a peak-period charge of 15¢ a mile (in 1990 dollars) on congested freeways in Los Angeles. Third, Patrick DeCorla-Souza and Anthony Kane (1992) estimated that the cost of new highway capacity to serve peak users in Los Angeles is 20¢ per peak-hour VMT. If the benefits of reducing vehicle travel are valued at only 10¢ per VMT reduced (the low end of the estimates for Los Angeles), the benefit of reducing VMT by 652 miles per employee per year is worth $65.20 per employee per year (see Table 25-5).[143]

TABLE 25-5

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
NOx	0.683 kilograms	$18.70 per kilogram	$12.77
CO	7.2 kilograms	$0.385 per kilogram	$2.77
PM10	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. This calculation excludes any benefits to commuters or their employers; including these benefits would increase the benefit/cost ratio.

Second, we can value the reduction in vehicle emissions by referring 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 per kilogram of emissions reduced by a proposed control measure is less than this value, the measure is considered cost effective. Presumably, the SCAQMD does not require emission controls that cost more than the value of the emissions reduced. Therefore, we can interpret the maximum allowed control cost as the value to society of reducing emissions. Alternatively, we can interpret an emissions reduction from parking cash out as worth the maximum allowed control cost because cash out can replace another emissions-reduction measure with this cost. 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}.[144] Using these values, Table 25-5 shows that the emissions reductions are worth $33.96 per employee per year.[145]

Adding the benefits of reduced VMT and reduced vehicle emissions gives total benefits of $99.16 per employee per year. In comparison, the firms' costs were $24.53 per employee per year. By this measure, the benefit/cost ratio for parking cash out is 4-to-1 ($99.16 ÷ $24.53). Congestion relief accounts for two-thirds of the total benefits and pollution reduction for one-third.

Beyond providing the public benefits of reduced congestion and cleaner air, parking cash out provides private benefits to commuters and their employers. First, solo drivers who cash out a parking subsidy and begin to rideshare are better off or they would not make this choice. Second, commuters who were already ridesharing without receiving the in-lieu cash are better off because they begin to receive cash in lieu of the parking subsidies they had previously declined. The cost of $24.53 (the denominator of the benefit/cost ratio) is the employers' cost of paying these previous nondrivers. This cost is a transfer from employers to commuters who were already ridesharing and if we count it as a cost to employers we should also count it as a benefit to commuters. When this transfer payment to commuters is included as a benefit in the numerator of the calculation, the benefit/cost ratio increases to ($99.16 + $24.53) ÷ ($24.53) or 5-to-1.[146]

25.8. The 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.[147] Nevertheless, many groups received significant benefits from cash out—nondrivers, low-wage workers, women, minorities and the state and federal governments—beyond the public benefits of reduced congestion and cleaner air. The benefits to these groups are described below.

Nondrivers

Without parking cash out, the employer saves money when a commuter decides to forego a parking space at work. With parking cash out, the commuter who foregoes the parking space saves the money. One firm's representative explained the equity aspect 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 it out rewards only commuters who drive to work. Cash out thus 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 solo, while lower-income commuters are more likely to carpool, ride public transit or walk to work (see Table 25-6). Parking cash out therefore gives greater benefits to lower-income commuters for two reasons: they are less likely to drive to work and 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 the younger, less educated and less skilled workers.

TABLE 25-6

THE 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 parking 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 a uniform benefit to all commuters, but each firm did so after complying with the cash-out law. Perhaps this occurred because parking cash out exposes any inequality associated with offering different parking subsidies to different commuters. Offering the same commuting subsidy to everyone naturally appears fairer than offering free parking only to some employees.

Women

Parking cash out can eliminate 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 showed that 78 per cent of men and only 62 per cent of women drove to work solo. 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 solo, while women are more likely to carpool or ride transit (see Table 25-6). Parking cash out lets employers subsidize commuting without creating any gender bias.

Minorities

Parking cash out also eliminates any ethnic bias associated with employer-paid parking. The 1995 NPTS found that minorities are less likely than other commuters to drive to work solo and more likely to ride transit (see Table 25-6).[148] For example, only 58 per cent of black commuters drive to work solo and 16 per cent ride public transit. Among white commuters, 78 per cent drive to work solo and only 2 per cent ride public transit. Because parking cash out provides an equal benefit to commuters regardless of their mode choices, it eliminates any inadvertent 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. Employer-paid parking is a tax-exempt fringe benefit and commuting to work accounts for almost one-third of all automobile travel in the US, so parking cash out promotes both tax equity and transportation justice. Parking cash out will also insulate employers from any allegations of discriminatory behavior.

Government

Employer-paid parking subsidies are tax-exempt, while cash offered in lieu of a parking subsidy is taxable. Commuters who cash out their employer-paid parking subsidy therefore pay more in federal and state income taxes. Because many commuters chose taxable cash at the eight firms, taxable income increased by $255 per employee per year.

The Joint Tax Committee of Congress uses a marginal income tax rate of 19 per cent to estimate the revenue effects of changes in taxable wages; at this tax rate, federal tax revenues increased by $48 per employee per year after cash out.[149] The California Franchise Tax Board uses a marginal income tax rate of 6.5 per cent to evaluate the revenue effects of changes in taxable wages; at this tax rate, California tax revenues increased by $17 per employee per year.[150]

Employers and employees both pay Social Security payroll taxes on the cashed-out parking subsidies, which are 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.

25.9. Employers praise parking cash out

Beyond reducing traffic congestion and air pollution and benefiting nondrivers, parking cash out also benefited employers. As mentioned earlier, the cash option increases employee benefits and 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 fifty or sixty more employee cars, with no place to park.* (Case 8);
- *Cash works very well for us.* (Case 8).

Although California's cash-out requirement may appear, on first impression, to be an unfunded mandate for employers, the employers' comments show that it is not. The cash payments to commuters are mainly a more flexible use of resources formerly devoted to subsidizing parking. 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 do not offer other ridesharing incentives. One firm's experience clearly illustrates the advantage of parking cash out when compared with other ridesharing incentives. After becoming exempt from the SCAQMD's trip-reduction regulations because its employment declined, one firm (not included in the eight case studies) immediately withdrew all its ridesharing 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.*[151]

This firm's experience implies that parking cash out will have significant long-term effects. The cash-out case studies were conducted during 1991-1995 and, to learn about the long-term effects, 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. In 1996 the SCAQMD began to exempt all firms with fewer than 250 employees from its trip-reduction regulations, so the case-study firms no longer conduct annual transportation surveys or submit reports to the SCAQMD. Nevertheless, the firms continue to offer parking cash out:

- *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 worksite. 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).

This last comment suggests that in some cases parking cash out is not simply a sensible fringe benefit, but that it also allows some employers to remain downtown where the scarcity of parking would otherwise force them to relocate to a suburban location. Therefore, parking cash out can help cities to retain employment in central locations that are well served by public transit.

Parking is a traditional part of most employers' benefit package and parking cash out is logically related to employer-paid parking. Many other ridesharing benefits are not a traditional part of the employers' benefit package and they appear superfluous except to satisfy clean-air regulations. 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."[152] In contrast, parking cash out is a logical extension of the traditional parking subsidies and it easily fits in as a normal operating procedure for any business. Therefore, once established, parking cash out is likely to become a permanent feature of the employer's benefit package.

The firms' representatives also said that parking cash out costs very little but is very popular with employees:

– *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);

– *Its 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 LA. 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 non taxable.* (Case 8).

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

25.10 The legislative analyst's report

Most employers have never heard of California's parking cash-out requirement because the state government has done little to publicize it or enforce it. This may seem surprising, because most of us assume that once the legislature enacts a law, the executive branch will enforce it or at least tell people about it. The non-enforcement of the parking cash-out 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.*[153]

After examining the state's implementation of the parking cash-out law, the LAO concluded that the state had done nothing to enforce the law and had done little to make employers aware of it:

> *Almost ten years after this program was established, the Air Resources Board (which administers the program) has conducted little outreach to make employers aware of the program.*[154]

The LAO found that few employers complied with the law because most of them were unaware of it, but the LAO estimated that compliance would produce substantial benefits. Although the law applies only to firms that employ more than 50 persons and offer free parking in rented parking spaces, the LAO estimated that the law covers about 290,000 employer-paid parking spaces. Compliance with the law would reduce between 113 and 226 million VMT per year in California and would reduce vehicle emissions for commuting by two tons per day. The LAO also estimated that each parking space that commuters cashed out would generate an additional $258 per year in federal tax revenues and $50 in state tax revenues. The LAO concluded that the Air Resources Board should conduct greater outreach to all firms with 50 or more employees to make sure that they are aware of the law's requirements.

A bureaucratic impediment to parking cash out is that it makes a small positive contribution in several important areas: air quality, transportation efficiency, energy conservation, employee welfare and state tax revenues. 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 (environment, transportation, energy, employee benefits, tax revenues), no one will look out for the state's total welfare. This seems to be what has happened in California.

California's experience suggests that 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 adopt a parking cash-out requirement. For this reason, Chapter 28 proposes an alternative way to encourage employers to offer parking cash out: amend the federal Internal Revenue Code. This solution will eliminate the need for every state to enact individual parking cash-out laws and to enforce these laws.

25.11 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 present much valuable information about the likely effects of offering commuters the option to cash out their employer-paid parking subsidies.

The eight case studies show that parking cash out reduces vehicle travel, vehicle emissions and gasoline consumption. For the 1,694 employees of the eight case-study firms, parking cash out reduced, per employee:

1. 0.09 vehicle commutes per day.
2. 652 VMT (1,043 VKT) per year.
3. 683 grams of NO_x emissions per year.
4. 819 grams of ROG emissions per year.
5. 500 grams of PM_{10} emissions per year.
6. 7.2 kilograms of CO emissions per year.
7. 367 kilograms of CO_2 emissions per year.
8. 26 gallons (99 liters) of gasoline consumed per year.

For every 100 commuters, parking cash out induced 13 solo drivers to shift to another commute mode. Of the 13 former solo drivers, 9 joined carpools, 3 began to ride transit and one began to walk or bike to work. These mode shifts reduced vehicle travel to work by 12 per cent—equivalent to removing from the road one of every eight cars used for commuting. The employers' payments to rent parking spaces for commuters declined almost as much as their payments to commuters in lieu of parking spaces increased, so the employers' total subsidies for commuting increased by only $2 per employee per month after parking cash out. Federal and state income tax revenues increased by $65 per employee per year because many commuters voluntarily traded their tax-exempt parking subsidies for taxable cash income. Employers praised parking cash out for its simplicity and fairness and said that it helps to recruit and retain workers. The benefit/cost ratio of parking cash out is at least 4-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.

26. PARKING CASH OUT COMPARED WITH CONVENTIONAL TDM

Senior decisionmakers 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 effectiveness, simplicity and fairness. To show these advantages, we can compare parking cash out with conventional Transportation Demand Management (TDM) programs that many firms offer to their employees in an attempt to reduce solo driving to work.

When my co-authors and I evaluated one well-regarded TDM program in Los Angeles, we found significant problems with the conventional approach.[155] The firm paid $100 per space per month 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 also received $15 a month. Transit riders received $15 a month. This appears to promote ridesharing because the price of parking decreased as vehicle occupancy increased but, when compared with a policy of no commuting subsidies, the program actually increased the number of vehicles driven to work.

26.1. Perverse incentives in TDM

How could a TDM program increase driving to work? Table 26-1 shows the perverse incentives inherent in this TDM program (and in many similar programs). Each solo driver received a parking subsidy of $50 a month (columns 4 and 5). Two-person carpools received a parking subsidy of $75 a month, so each person received $37.50 a month because two employees split the subsidy. Three-person carpools received a parking subsidy of $100 a month, so each person received $33.33 a month. A 10-person vanpool received a parking subsidy of $100 a month and each vanpooler received 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 that the commuting subsidy increased as vehicle occupancy decreased. Commuters who walked or biked to work received nothing. This incentive structure would be appropriate if the goal were to encourage solo driving, but not if the goal is to encourage ridesharing.

Table 26-1

Distribution of subsidies in a TDM Program

Travel mode	Market parking price	Employee 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)
Drive alone	$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).

We then compared the mode split of this firm's commuters with the mode split of a similar firm that did not subsidize either parking or ridesharing. Both firms had the same solo-driver share but the firm with the TDM program had more carpoolers and fewer transit riders. 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 therefore increased rather than decreased the number of vehicles driven to work.

Parking subsidies in the TDM program explain why it increased driving to work. Forty-eight per cent of commuters drove to work solo and received 65 per cent of the total transportation subsidy (columns 6 and 7). Eighteen per cent of commuters rode public transit to work, but received only 7 per cent of the total transportation subsidy. Each solo driver received 135 per cent of the average subsidy, while each transit rider received only 39 per cent of the average subsidy (column 8). Because the TDM program gave higher subsidies to lower-occupancy vehicles, we should not be surprised that it increased the number of vehicles driven to work.

When my co-authors and I presented the results of our study to executives at the firm that offered the TDM program, we pointed out that commuters in higher-occupancy vehicles received smaller subsidies. The firm's executives told us that we misunderstood the program because the higher-occupancy vehicles obviously received higher subsidies. We replied that, 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 discussion it emerged that the firm's tax lawyer had devised the TDM program to be "tax efficient." He did not want to abandon parking subsidies because they are tax-exempt compensation. The lawyer was not self-serving, however, because he rode the train to work and received only $15 a month.

Because most firms offer commuters only free parking, this firm's TDM program is far more generous to nondrivers than most firms are. Solo drivers do receive the greatest subsidy, but their share of the total subsidy is smaller than in many other TDM programs. For example, the Greater Hartford Ridesharing Corporation surveyed commuter transportation subsidies provided by 11 major downtown firms who together employed 50 per cent of the downtown workforce in Hartford, Connecticut. Although only 36 per cent of commuters drove to work solo, they received 86 per cent

of the total subsidies; 26 per cent of commuters rode the bus to work and they received only 4 per cent of the total subsidies. The average annual subsidy was $716 per solo driver and only $50 per bus rider.[156] The distribution of travel subsidies in the Los Angeles TDM program is therefore more sensible than at most firms, but the results are nevertheless bound to be disappointing when TDM programs mainly subsidize parking.

26.2. Three problems with conventional TDM programs

Most TDM programs create three unintended (but not unpredictable) problems: (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 three problems combine to undermine the effectiveness of TDM problems and to produce counterproductive results like the outcome discussed above.

No subsidy for walking or bicycling to work

Most conventional TDM programs offer no subsidy for commuters who walk or bike to work, although walking and bicycling are the two most environmentally benign travel modes. If the goal a TDM program is to reduce vehicle travel to work, walking and bicycling should receive the highest subsidies.

Few economies of scale

Because most TDM programs restrict commuters to carpool partners within their own firm, they fail to take advantage of the economies of scale in carpooling. The firm that offered the carpool program described in Table 26-1 had 1 200 employees, but even that large source of potential carpool partners is tiny when compared with the 175,000 office workers who commute to downtown Los Angeles. And most firms employ far fewer than 1 200 employees.

Carpooling exhibits economies of scale: if more people are searching for a carpool partner, it is easier to find one. You need a large population of potential carpoolers to find a suitable match in terms of origin, destination, work schedule, personality and other factors. 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 by offering all commuters in a region the option to cash out their parking subsidies.

Incentives for dishonesty

It is common knowledge that conventional TDM programs can invite dishonesty. If a solo driver persuades a cyclist or transit rider to sign up as a member of his or her "carpool," the solo driver gets a free or discounted parking space. Everyone familiar with rideshare programs knows about this "phantom carpool" problem. After I made a presentation at the US Department of Transportation headquarters in Washington several years ago, a staff member gave me a ride home and I asked him how much he paid to park. He blushed and admitted that he got his parking space free by forming a phantom carpool with two transit riders. "Everyone does it," he said.

26.3. Parking cash out solves these problems

Parking cash out solves these three problems associated with conventional TDM programs. First, if everyone can cash out their parking subsidies, everyone (including those who walk or bike to work) gets the same subsidy regardless of how they travel. The subsidy per person does not decline with higher-occupancy vehicles, as it does in the TDM program shown in Table 26-1. Second, parking cash out gives commuters the option to take their parking subsidy in cash and use the money to carpool with any employee of any other company in the region. Parking cash out therefore increases the pool of potential carpool partners, which leads to more carpooling than occurs when commuters receive a subsidy only for carpooling with fellow employees of the same firm. Third, parking cash out does not create an incentive to game the system at the expense of others because commuters get either a parking subsidy or cash, with no need to dissemble in either case. Ensuring that a TDM program works as intended is therefore far less complicated with parking cash out than with other ridesharing incentives.

Beyond solving many of the problems associated with most TDM programs, parking cash out simplifies life for commuters and employers. For example, 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 at one of the nation's great research centers—the Lawrence Berkeley Laboratory (see next page "Parking Woes Baffle UC Scientists"). As Marshal makes clear, even the brightest employers create many unfortunate but not unforeseeable problems when they resist using market prices to allocate parking spaces.[157]

San Francisco Chronicle **November 26, 1992**

PARKING WOES BAFFLE UC SCIENTISTS

By Jonathan Marshall
Chronicle Economics Editor

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 that 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."

26.4. Partial cash out

Despite the advantages of parking cash out, some firms may not want to offer it to commuters because they (1) do not want to spend more to subsidize commuting or (2) do not want to reduce parking subsidies. Because commuters who already do not drive to work have no parking space to cash out, any new cash subsidy paid to these commuters would increase these firms' spending to subsidize commuting. In this case, a firm may want to offer a partial cash-out program without reducing parking subsidies.

A study in the Minneapolis-Saint Paul metropolitan area found that several employers introduced parking cash out by offering commuters the option to take a cash subsidy in lieu of the free parking, but the cash subsidy is less than the value of the free parking. For example, in 1998 the University of Saint Thomas in Minneapolis paid $150 per space per month to rent parking spaces and offered them to all staff at a price of $12.50 per month; the parking subsidy was thus $137.50 per space per month and the University did not offer any other commuting subsidies. In 1999 the University continued the parking subsidy but began to offer $100 per month to all commuters who do not 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 less than offering commuters the full cash equivalent of the parking subsidy.

Van Hattum, Zimmer and Carlson (2000) explain why the University decided 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.*[158]

Table 26-2 shows the results of this partial cash-out policy. When the University subsidized only parking, 207 of the 238 employees (87 per cent) bought a parking permit for $12.50 per month (and received a parking subsidy of $137.50 per month), while 31 employees did not buy a permit (and received nothing). The University spent $28,463 per month to subsidize parking or $119.59 per month per employee (column 1).

After the University began to offer the partial cash out, 190 employees (80 per cent) continued to buy a parking permit and 48 chose to take $100 per month in lieu of a $137.50 per month parking subsidy (column 2). The University pays $100 per month to the 31 commuters who were already ridesharing and it saves $37.50 per month for the 17 commuters who gave up a parking permit for $100 in cash. The 31 previous nondrivers cost the University $3,100 per month and the 17 new nondrivers save the University $637 per month, so the University's spending increased by $2,462 per month or 9 per cent.

After the partial cash out, the number of cars driven to campus fell by 8 per cent and transit ridership increased by 55 per cent. The University spends $30,925 per month to subsidize commuting or $129.94 per employee per month and each non-driver receives $37.50 per month less than solo drivers receive. While these mode shifts with partial cash out are impressive, it is worth noting that 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 per month (column 3).

TABLE 26-2
PARTIAL VERSUS FULL PARKING CASH OUT

	Parking subsidy	Parking cash out		
		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. Total parking subsidy	$28,463	$26,125		(2)x(3)
5. Non-drivers	31	48		
6. Subsidy per non-driver	0	$100	$137.50	
7. Total non-driver subsidy	0	$4,800		(5)x(6)
8. Total commuting subsidy	$28,463	$30,925	$32,725	(4)+(7)
9. Commuting subsidy per employee	$119.59	$129.94	$137.50	(8)/(1)

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

The University would spend an additional $37.50 per month for each of the 48 employees who now do not take a permit and it would not save any more on parking. Compared with the partial cash-out program, a full cash-out program would increase spending to subsidize commuting by only 6 per cent, but it would also reduce solo driving even further and it would treat all employees equally, regardless of how they travel to work.

26.5. 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. Nevertheless, many so-called TDM programs offer free parking to solo drivers, smaller subsidies to commuters who ride transit or carpool and usually nothing to commuters who walk or bike to work. Therefore, one simple 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.

27. THE POLITICS OF PARKING CASH OUT

Policy is negotiated, not formulated.
DAVID JONES

California enacted its parking cash-out law in 1992, shortly after the Department of Transportation published my report on Cashing Out Employer-Paid Parking.[159] Other transportation pricing reforms—such as congestion tolls and vehicle-emission fees—have been thoroughly studied and widely recommended but not adopted. Why was parking cash out politically successful when other reforms have not been enacted? This chapter describes why and how California enacted its parking cash-out requirement. It also explains the political reasoning that may lead other states or the federal government to adopt a similar requirement.

27.1. Why California enacted the parking cash out law

Four aspects of parking cash out contributed to its political appeal: (1) it is an incremental change; (2) it is potentially Pareto-optimal; (3) it is efficient; and (4) it is fair.[160]

An incremental change

Problem solving often entails finding the next feasible step toward an ultimate goal. Parking cash out is a politically feasible next step toward efficient pricing of transportation and it 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 cash instead of the parking subsidy. Commuters can also continue to park free at work, but they gain a new option: additional cash income if they don't drive to work alone.

Legislative hearings on the proposed cash-out requirement led to an important feature of the law that was ultimately enacted. Critics pointed out that since cities require developers to provide off-street parking spaces, the state should not require employers to pay commuters not to use these required parking 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 applies only to employers who rent parking spaces from a third party, so the employer breaks even when a commuter foregoes a rented parking space and takes the cash.

Most win, few lose

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

Economists call a change that makes some people better off and no one worse off "Pareto optimal," and Pareto optimality is 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 that 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 told the Assembly Members that free parking for workers is a nonnegotiable right. I was relieved when he concluded, "But I like what the professor just said." He liked the idea that workers continue to get free parking if they drive to work, but they can also cash it out and spend the additional income however they want. Offering the option to cash out free parking means that a commuter who takes the free parking in effect pays for it by foregoing the cash, but this situation did not bother him because it provides commuters a new benefit without taking away an old one. Just as greater flexibility and expanded choice sound good in labor negotiations, "parking cash out" sounds much better than "charging for parking."

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 25 found that the benefit/cost ratio of parking cash out was at least 4-to-1 and probably much higher.

A standard practice in benefit-cost analysis is to neglect transfers that redistribute income. But for a political analysis, distribution is usually more important than efficiency. Although the redistribution associated with parking cash out is minor—consisting mainly only of the cash payments to commuters who are now offered a parking subsidy but do not take it—this minor redistribution nevertheless contributed significantly to parking cash-out's political success.

When I testified at a California Senate hearing on parking cash out, what aroused the legislators' greatest interest in the proposal was its equity implications rather than transportation or economic efficiency. As described in Chapter 25, employer-paid parking favors solo drivers but does not explicitly favor either men or women. Nevertheless, in the one case study where data were available on the commuters' gender, 78 per cent of men and only 62 per cent of women drove to work solo before the employer began to offer parking cash out. Therefore, employer-paid parking subsidized men more than women and inadvertently discriminated against women. 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 regardless of gender, ethnicity, income, age or any other factor that may be related to travel choices. This is a powerful political argument in favor of parking cash out.

Calculating the explicit cash value on employer-paid parking exposes the distribution of commuting subsidies. For example, some of the case-study firms in Chapter 25 offered higher parking subsidies to higher-paid staff before cash out. Although California's cash-out law does not require firms to offer a uniform transportation benefit to all commuters, all eight firms did so after cash out highlighted the size and distribution of the firms' parking subsidies.

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

27.2. How California enacted the parking cash out law

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

Research showed that employer-paid parking increases solo driving

Case studies consistently showed that employer-paid parking increases solo driving to work. The studies summarized in Table 22-2 show that, on average, employer-paid parking stimulates a 36 per cent increase in driving to work. The accumulating evidence convinced more and more people that employer-paid parking increases traffic congestion, fuel consumption and air pollution and that something should be done to remedy this obviously undesirable situation.

A precedent showed that a cash-out requirement is legal

The City of 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. If a city can require employers to offer a transit subsidy to everyone if they offer a parking subsidy to anyone, a state should be able to require employers to offer cash in lieu of a parking subsidy.

University researchers cooperated with state government

Although research results and legal precedents helped to build the case for parking cash out, it was cooperation between the University of California and the state government that put parking cash out on California's legislative agenda. The Public Policy Program of UCLA Extension sponsors an annual conference that addresses the linked issues of transportation, land use and air quality. These conferences at Lake Arrowhead attract university researchers, elected officials, agency administrators, union leaders, business representatives and environmental activists who meet to discuss policy problems and to propose potential solutions. I presented a preliminary version of the parking cash-out proposal at one of these conferences in 1988 and benefited from hearing the questions and concerns of the politicians and employers who attended. I then revised the proposal to address these concerns and was able to present the accumulating research in its favor. As evidence of the critical importance these conferences, the cash-out bill that was eventually enacted in 1992 (Assembly Bill 2109) was

introduced by Assemblyman Richard Katz, Chairman of the Assembly Transportation Committee, whose chief aide, John Stevens, participated in the 1988 Lake Arrowhead conference that debated the original cash-out proposal.

Negotiations removed the objections

The first draft of the cash-out legislation did not include an exemption for employers who own their own parking spaces. Employers pointed out that because cities require developers to provide parking spaces, 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 and a provision was added that requires local governments to reduce parking requirements when a developer implements cash out. These amendments ensured that California's parking cash-out requirement is not an unfunded mandate for employers. Parking cash out is instead a self-funded mandate because employers save on the reduced cost of rented parking spaces about what they pay to commuters who don't drive to work.

With these amendments to the original cash-out proposal, the Senate passed the bill with a large bipartisan majority. The Assembly passed it, but on a strict partisan vote (the lone Republican who voted for the bill is 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). When I later asked several Republican members of the Assembly why they opposed the bill, they explained that because the vote came late in the year neither they nor their aides had adequate time to study the bill. After I explained the bill to them, several said they liked it and would have supported it if they had understood it better.

When the law reached Republican Governor Pete Wilson, his aides in the Office of Policy Research were initially concerned that the bill intruded 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 conference at Lake Arrowhead where the cash-out proposal had been presented) supported the bill. The lobbyists who had initially testified against earlier drafts of the bill also reported that the bill had been sufficiently amended to address their objections. Governor Wilson signed the legislation in Fall 1992.

27.3. A failed attempt to repeal the cash out law

Although California enacted its parking cash-out law in 1992, the Internal Revenue Code penalized parking cash out until 1998 (see Chapter 24). This tax penalty 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 that the law was not working. Some employers also expressed concerns that showed a serious misunderstanding of what the law actually required. For example, the California Chamber of Commerce wrote:

> *The program does not consider the different circumstances under which small businesses operate. In particular, small business 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*.[161]

Concern that the law will harm small businesses in rural areas seems far fetched, because the cash-out requirement applies only to employers who (a) have 50 or more employees, (b) rent parking spaces and can reduce what they pay for these parking spaces if a commuter chooses cash and (c) are

located in an area that violates the state's air pollution standards. The Chamber of Commerce thus did not respond when it was asked to identify a single small business in a rural area that would be subject to the cash-out requirement.

The Council for Environmental and Economic Balance (CEEB) expressed concerns that are similarly farfetched. For example, CEEB wrote:

> *Where collective bargaining agreements exist which require the employer to provide free parking for employees, the collective bargaining agreement conflicts with a mandatory cashout program.*[162]

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.

An attempt was made to repeal the state's parking cash out law in 1996. A Senator from Orange County introduced a bill (SB 731) that had 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 also suggested that parking cash out is un-American and that repealing the cash-out requirement would therefore be a patriotic gesture. The Legislature eventually divided the issues of parking cash out and flag burning into separate bills and the flag burning law was enacted by a unanimous vote. The Legislature did not, however, repeal the cash-out requirement.[163]

27.4. Conclusion: Parking cash out is a political success

California enacted its parking cash-out law in 1992 to deal with the traffic congestion and air pollution caused by employer-paid parking. Four aspects of parking cash out appealed to legislators: (1) it is an incremental change; (2) it is potentially Pareto optimal; (3) it is efficient and (4) it is fair. Four additional factors contributed to the successful political outcome: (1) research showed that employer-paid parking increases solo driving; (2) a municipal precedent showed that the cash-out requirement is legal; (3) university researchers and state officials cooperated to develop the proposal; and (4) the drafters negotiated with employers to resolve potential opposition to the law.

Until 1998, however, the Internal Revenue Code discouraged parking cash out. Offering commuters the option to choose cash instead of a parking subsidy triggered tax increases for both employers and employees and an attempt was made to repeal the cash-out requirement. The repeal attempt failed for two reasons. First, a wide coalition of environmental activists (especially the Sierra Club) came together to oppose the cash-out repeal. Second, Congress amended the Internal Revenue Code in 1998 to eliminate the tax penalty for cashing out employer-paid parking. This change in the tax code removed the only real objection to parking cash out.

28. WHY REQUIRE EMPLOYERS TO OFFER PARKING CASH OUT?

> *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.* THOMAS SCHELLING

If the benefits of parking cash out far exceed the costs, why must California require firms to offer parking cash-out programs? Why don't firms offer it voluntarily? This chapter explains the rationale for requiring firms to offer parking cash out. It also proposes two minor changes in the Internal Revenue Code that would encourage parking cash out nationwide.

28.1. The rationale for a parking cash out requirement

Each individual firm's own free parking is a tax-exempt fringe benefit that attracts workers, but all firms' free parking collectively increases traffic congestion, air pollution and energy consumption. The individually rational behavior of many firms thus leads to a collectively irrational outcome and society must somehow deal with this divergence between individual and collective interests. Problems stemming from the divergence between individual and collective interests have been variously described as the free-rider problem, public-goods problem, prisoners' dilemma or 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.*[164]

Employers who offer free parking may not know that they are increasing traffic congestion and air pollution or that parking cash out helps solve these problems. And even if employers do know that parking cash out reduces traffic congestion and air pollution, these public benefits accrue to everyone in a region, not exclusively to each individual employer who offers parking cash out. We cannot expect individual employers to voluntarily consider regional benefits when deciding how to structure compensation for their employees. Employers will not consider themselves better off if they offer programs that benefit the region and they may consider themselves worse off because they have to pay for the programs. We can therefore interpret a parking cash-out requirement as a social contract that reduces traffic congestion and improves the region's environment, including the business environment for all firms: all firms are better off if they cooperate than if they each go their separate way. These regional benefits are the economic rationale for California's cash-out law. The law does not prohibit, tax or even discourage employer-paid parking, but it does require employers who subsidize parking for a commuter who drives to work to offer the same subsidy if the commuter carpools, rides public transit, walks or bikes to work.

California's cash-out law requires employers who subsidize commuter parking to offer commuters the fair market value of the parking subsidy in cash. Other states could enact similar laws, but a simpler 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.

28.2. Require parking cash out as a condition for tax exemption

The tax code continues to favor solo driving to work because employer-paid parking is tax exempt and in-lieu cash is taxable. A more serious problem is that the tax code simply allows employers to offer taxable cash in lieu of a tax-exempt parking subsidy. TEA-21 thus achieved only a partial reform of the tax code, which still favors solo drivers over other commuters. If reducing traffic congestion, air pollution and energy consumption were an urgent national priority, this tax preference for solo drivers would be insupportable.

The tax exemption for employer-paid parking typically saves employers and employees about 42 per cent of the cost of parking at work when all the avoided federal and state income and payroll taxes are considered.[165] 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 thus simply carrying out a policy embedded in the Internal Revenue Code. The tax code is flawed, not the employers' or their employees' behavior. Every state should not have to enact a parking cash-out requirement to counteract a damaging incentive in the federal tax code.

A minor 22-word amendment to the tax code can solve this problem: require parking cash out as an alternative to employer-paid parking. Parking cash out can be required by putting a condition on the Internal Revenue Code's definition of employer-paid parking that qualifies for a tax exemption. The non-italic text quoted below is the existing definition of employer-paid parking that qualifies for a tax exemption; the italic text is the proposed amendment.

> 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 fringe benefit. Commuters will be able to convert the tax-exempt free parking into a tax-exempt transit subsidy or to take the parking subsidy's cash value, pay taxes on the additional cash income and use the remaining after-tax cash for any purpose they choose. But if an employer offers commuters an unfair deal—free parking without the option to choose its fair market value—the free parking does not merit a public subsidy and should not receive a tax exemption. This minor amendment to the tax code 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 additional cash income will not only help themselves but will also reduce traffic congestion, energy consumption and air pollution for everyone else. The amendment will also significantly increase income tax revenues when commuters voluntarily choose taxable cash in lieu of tax-exempt free parking.

What is 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.[166] In general, the fair market value 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 box).[167]

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.

Internal Revenue Service Notice 94-3, p. 330

Despite this clear definition of employer-paid parking's fair market value, it has been difficult to collect the income taxes due on free parking at work, 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.'*[168]

It will be hard to collect the income taxes due on employer-paid parking subsidies if even the chair of the President's Council of Economic Advisors will not admit the fair market value of her free parking space at work. In contrast, the option to cash out employer-paid parking should be a popular fringe benefit. Commuters who do not drive to work will naturally insist that employers must not understate the fair market value of a free parking space at work.

It is important to note that parking cash out gives commuters a completely new interest in the fair market value of workplace parking and this interest will help to enforce the cap on tax-exempt parking subsidies. Commuters (like Laura Tyson) who drive to work alone want their employers to undervalue their free parking if the fair market value of this benefit would lead to a tax liability. By creating an interest in accurate estimates of the fair market value of free parking spaces, a parking cash-out requirement in the tax code will not only increase efficiency and equity in commuter transportation, but will also help to collect the taxes due on employer-paid parking subsidies that exceed the tax-free limits. Environmentalists, bicyclists and other similar interest groups can also be expected to publicize the parking cash-out requirement and to monitor compliance.

The IRS definition of 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 only where it does the most good.

Transition rules

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

- First, the requirement to offer parking cash out can begin with the case where a firm leases parking spaces to offer to commuters and where 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 object to parking cash out in this case.

- Next, the requirement can be extended to all leased parking spaces, regardless of the lease arrangements. Many parking spaces that are now bundled in the firms' leases for their premises can easily be unbundled. 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 be required to offer commuters anything in lieu of free 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 other firms or 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 be required to offer commuters anything in lieu of free parking.

- After parking cash out is required, cities can reduce the parking requirements for employment sites. The developers' cost saving from constructing fewer parking spaces can then fund the cash-out option for employer-owned parking spaces.

- 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 to give a greater tax exemption for commuters who do not drive to work alone.

With this phased implementation, employers, commuters and cities will have ample time to prepare for the transition to a more efficient and equitable 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 solo will want to see the benefits to which they will be entitled. Commuters will want to ensure that employers do not undervalue the free parking spaces, because this undervaluation would deny nondrivers of the benefits to which they are entitled.

The potential for parking cash out

We can estimate both the immediate and the tong-term potential for parking cash out. Suppose the first stage of a cash-out requirement begins with the case with firms that pay out-of-pocket cash to a third party to rent parking spaces for commuters. Chapter 23 showed that firms rent approximately six million parking spaces which can easily be cashed out. Table 28-1 presents an estimate of how offering six million commuters the option to cash out their employer-paid parking will affect vehicle travel, fuel consumption, vehicle emissions and tax revenue. This estimate is based on the case study results in Chapter 25. Column 2 shows the benefits produced per person offered the option to cash out

employer-paid parking.[169] Column 3 shows the per-person effects in column 2 multiplied by six million persons. Offering six million commuters the option to cash out their employer-paid parking will reduce commuter travel by 3.9 billion VMT per year, save 156 million gallons of gasoline per year and reduce 2.2 million metric tons of CO_2 emissions per year. Given the likelihood that the commuter's fuel is imported, parking cash out will also improve the nation's trade balance. Finally, income tax revenues will increase by $390 million per year as commuters voluntarily trade their tax-exempt parking subsidies for taxable cash.

TABLE 28-1

THE EFFECTS OF OFFERING PARKING CASH OUT
TO SIX MILLION COMMUTERS

Variable	Reduction	
	Per person	US 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 NOx emissions per year	0.683	4,098,000
Kilograms of ROG emissions per year	0.819	4,914,000
Kilograms of PM10 emissions per year	0.5	3,000,000
Kilograms of CO emissions per year	7.2	43,200,000
Kilograms of CO2 emissions per year	367	2,202,000,000
Gallons of gasoline consumed per year	26	156,000,000

See Chapter 25 for the per-person reductions shown in Column 2.

Generalizing results from Southern California to the nation must be viewed with caution, but the commuter mode shares at the case-study firms before cash out were almost identical to the nationwide mode shares found in the 1990 Census (see Chapter 25). Also, the clichés that "California loves cars" and "Los Angeles doesn't have good public transit" suggest that getting drivers out of their cars is more difficult in Los Angeles than elsewhere, so parking cash out could produce even greater benefits in the rest of the nation than estimated here.[170] To put these benefits in perspective, the average vehicle travel for commuting in the US is 6,492 VMT per household per year.[171] Therefore, offering commuters the option to cash out six million employer-paid parking spaces (and reducing the parking supply accordingly) can reduce the equivalent of all vehicle travel and vehicle emissions for commuting by 600,000 households.[172]

This estimate refers to the first stage of cashing out employer-paid parking in rented parking spaces where the leases allow firms to vary the number of spaces they rent (only 7 per cent of all employer-paid parking spaces). But parking cash out can be required in further stages, leading to an equal tax exemption for parking subsidies and all other commuting benefits. With this staged approach, employers and commuters will have ample time to prepare for the changes in the tax treatment of commuting benefits.

Reforming the tax exemption for employer-paid parking will not only produce major benefits in the US, but also serve as a model for other countries. Although employer-paid parking is more common and better documented in the US, employer-paid parking occurs around the world. Therefore,

parking cash out can be a cheap and effective way for cities in many countries to reduce traffic congestion, energy consumption and air pollution while increasing personal incomes and government revenues.

Fiscal impacts of parking cash out

Beyond reducing vehicle travel and vehicle emissions, parking cash out increases tax revenue because many commuters will choose to take taxable cash in lieu of tax-exempt free parking. In the case studies presented in Chapter 25, state and federal tax revenues increased by $65 per year per employee offered the option to cash out their employer-paid parking because some commuters chose taxable cash instead of a tax exempt parking space. At this rate, offering commuters the option to cash out six million free parking spaces will increase state and federal income tax revenues by $390 million a year ($65 x 6,000 000).[173]

By reducing gasoline consumption, parking cash out also reduces gasoline tax revenues. At the federal gasoline tax rate of 18.4 cents a gallon, reducing gasoline sales by 156 million gallons a year will reduce federal gasoline tax revenues by $29 million a year. At the average state gasoline tax rate of 19 cents a gallon, states will lose $30 million a year.[174] Parking cash out will thus reduce total gasoline tax revenues by $59 million a year. But parking cash out reduces gasoline tax revenues only because it reduces vehicle travel and road use. By reducing road use, parking cash out also reduces the need for spending on highways. Reduced highway spending can thus offset the reduced gasoline tax revenues, with no net fiscal impact on highway finance. Further, parking cash out produces the greatest reduction in VMT during the morning and evening rush hours when congestion overwhelms the highway capacity. Parking cash out can thus improve highway finance by reducing the demand for additional (and expensive) peak-hour highway capacity. Therefore, the net effect of reduced gasoline tax revenue and reduced peak-hour VMT should be a fiscal surplus.

Note that the fiscal impact of parking cash out will be very different from the fiscal impact of the Corporate Average Fuel Efficiency (CAFÉ) standards.[175] Higher fuel efficiency reduces gasoline consumption and gasoline tax revenue without reducing VMT. Indeed, higher fuel efficiency makes driving cheaper and thus increases VMT. Thus, CAFÉ standards 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.

Keep the tax exemption for employer-paid parking

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

There is a subtle but crucial difference between (1) eliminating the tax exemption for employer-paid parking and (2) conditioning the tax-exemption for employer-paid parking on the right to cash it out. Offering free parking without the option to cash it out discriminates in favor of solo drivers and discriminates against both women and minorities. This discriminatory offer does not merit a tax exemption. But that is no reason to eliminate 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.

This proposal to condition rather than repeal the tax-exemption for employer-paid parking has a subtlety that escapes even some experts. Because the condition is so easy to meet, most employer-paid parking would remain a tax-exempt fringe benefit. Nevertheless, the requirement to offer parking cash out as a condition for tax exemption has several advantages. First, it would remove much of the unfairness and inefficiency of employer-paid parking. Second, it would automatically apply to all employers. Third, it would not require the tax authorities to establish the taxable value of all employer-paid parking spaces. Fourth, the proposal put a condition on the tax-exemption for employer-paid parking is politically much easier to defend (and far harder to oppose) than is a proposal to repeal the tax exemption for all employer-paid parking.

28.3. Allow employer-paid parking in cafeteria benefit plans

My second proposal deals with "cafeteria plans" that allow employees to select among one or more non-taxable fringe benefits or taxable cash. Cafeteria plans give employees choices in designing their preferred benefit plans by selecting different types and levels of benefits appropriate to their individual circumstances. Benefits that employers offer in a cafeteria plan include most benefits that result in no taxable income to employees if they are provided outside a cafeteria plan, such as health insurance, dental insurance, life insurance and disability insurance. Section 125(a) of the Internal Revenue Code authorizes cafeteria plans in this way:

> 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.[176]

Including employer-paid parking in a cafeteria plan would allow commuters to trade free parking for these 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 . . . 132).

Because "other than section . . . 132" refers to the tax exemption for employer-paid parking, the tax code thus prohibits including employer-paid parking in any cafeteria plan for fringe benefits.[177] That is, employers cannot allow commuters to trade 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 US and it is unwise to prohibit commuters from trading free parking for fringe benefits they prefer. Why not allow commuters the option to choose health insurance instead of free parking at work?

This question suggests another valuable reform of the Internal Revenue Code: simply delete the two words "section 132" from Section 125(f). This minor change will allow employers to offer commuters the option to choose other tax-exempt fringe benefits in lieu of free parking at work. This offer will both reduce solo driving to work and improve employees' health insurance benefits at no cost to employers. Improved health insurance will also benefit employers by reducing the incidence of major illnesses and sick days for their employees. Few commuters could choose to give up their

health insurance to get free parking because most commuters already park free at work. But many commuters could choose to give up their free parking for health insurance or better health insurance or simply an employer-paid contribution toward health insurance. KPMG Peat Marwick has estimated that the total annual capital plus operating cost of employer-provided "free" parking amounts to between $31.5 billion and $52.1 billion per year.[178] Including employer-paid parking in cafeteria plans could thus become an important new source of finance for health insurance, without new government spending or regulations.

Including employer-paid parking in cafeteria plans will: (1) reduce solo driving to work, (2) improve employers' benefit packages for employees at no cost to the employers and (3) increase the number of workers with health insurance. Deleting the phrase "other than section 132" from Section 125(f) of the Internal Revenue Code will help to achieve each of these objectives.

28.4. Conclusion: Align the tax code with our transportation objectives

The Internal Revenue Code creates a serious transportation problem: it encourages employers to give free parking to most commuters in the US and the free parking in turn increases solo driving to work. To solve this problem, the tax exemption for employer-paid parking should 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 a public transit benefit or taxable cash in lieu of the parking itself. Employers can continue to offer free parking as long as they offer commuters the option to cash it out. If an employer chooses to offer free parking without the option to cash it out, the parking subsidy should not be a tax-exempt fringe benefit. Employers themselves will thus choose whether their parking subsidies are tax exempt. Second, employer-paid parking should qualify for inclusion in cafeteria benefit plans. Employers should be able to offer commuters the option give up free parking in exchange for other tax-exempt fringe benefits.

These two minor tax reforms will significantly reduce the economic and environmental costs of employer-paid parking. Requiring employers to offer commuters the option to cash out their tax-exempt parking subsidies and giving commuters the option to choose other tax-exempt fringe benefits in lieu of free parking will:

1. Conserve gasoline.
2. Improve air quality.
3. Reduce traffic congestion.
4. Reduce the risk of climate change.
5. Increase tax revenues without increasing tax rates.
6. Increase employee benefits without increasing employers' costs.

Two minor tax reforms will create all these economic and environmental benefits simply by allowing commuters to choose how they wish to spend their own income.

APPENDIX G:

COMMUTE SUBSIDIES AT THE CASE STUDY FIRMS BEFORE AND AFTER PARKING CASH OUT

Case 1 initially paid $110 per space per month to rent parking spaces and offered free parking to all commuters; it also offered $55 per month to all commuters who did not take a parking space. After cash out, the firm ended all parking subsidies and offered $55 per month to all commuters other than solo drivers.

Case 2 initially paid $65 per space per month to rent parking spaces and offered free parking to all commuters; it also offered $45 per month to all commuters who did not take a parking space. After cash out, the firm continued to pay $65 per space per month to rent parking spaces and to offer free parking to all commuters; it also offered $65 per month to all commuters who do not take a parking space.

Case 3 initially paid $100 per space per month to rent parking spaces and offered free parking to all commuters; it offered no other commute benefits. After cash out, the firm continued to pay $100 per space per month to rent parking spaces and to offer free parking to all commuters; it also offered $100 per month to all commuters who do not take a parking space.

Case 4 initially paid $120 per space per month to rent parking spaces and offered free parking to all commuters; it also offered $50 per month to transit riders and $90 per month to commuters who walked or cycled. After cash out, the firm continued to pay $120 per space per month to rent parking spaces and to offer free parking to all commuters; it also offered $150 per month to all commuters who do not take a parking space.

Case 5 initially paid $145 per space per month to rent parking spaces and offered free parking to all attorneys, a parking subsidy of $120 per month to administrative employees with more than three years of service and a parking subsidy of $90 per month for administrative employees with less than three years of service; it also offered a transit subsidy of $15 per month. After cash out, the firm paid $165 per space per month to rent parking spaces and offered parking to all commuters at $65 per month; it also offered $150 per month to all commuters who do not take a parking space.

Case 6 initially paid $55 per space per month to rent parking spaces and offered free parking to all commuters; it also offered a transit subsidy of $15 per month. After cash out, the firm continued to pay $55 per space per month to rent parking spaces and to offer free parking to all commuters; it also offered $55 per month to all commuters who do not take a parking space, plus an additional $15 per month to transit riders.

Case 7 initially paid $77 per space per month to rent parking spaces and offered parking to all commuters at $15 per month; it also offered up to $175 per month to vanpoolers, up to $75 per month to transit riders and $25 per month to commuters who walked or bicycled. After cash out, the firm continued to pay $77 per space per month to rent parking spaces and to offer parking to all commuters

at $15 per month; it also offered $77 per month to all commuters who do not take a parking space or up to $165 per month to vanpoolers.

Case 8 initially paid $40 per space per month to rent parking spaces and offered parking to all commuters at $10 per month; it offered no other commute benefits. After cash out, the firm paid $36 per space per month to rent parking spaces and offered parking to all commuters at $25 per month; it also offered $50 per month to all commuters who do not take a parking space.

APPENDIX H:

THE VEHICLES OF NATIONS

If you can look into the seeds of time,
and say which grain will grow,
and which will not,
speak then to me.
WILLIAM SHAKESPEARE, *Macbeth*

Table H-1 shows the human and vehicle populations of the US and the world from 1900 to 1996. The US data are shown for all years and the world data are shown for all years in which they are available (every year since 1950, a well as a few previous years). The table allows comparisons between the vehicle-ownership rates in the US and the rest of the world.

In 1996 the US owned 778 vehicles per 1,000 persons, while the rest of the world owned only 84 vehicles per 1,000 persons—the same as the US rate in 1919-1920. Table H-2 shows the 1996 vehicle-ownership rates in 140 countries, arranged from the lowest (Ethiopia with 1 vehicle per 1,000 persons) to the highest (the US with 778 vehicles per 1,000 persons). Column 5 shows the year in which the US had the same ownership rate that each of the other countries had in 1996 (from column 8 in Table H-1). For example, Ethiopia in 1996 had the same vehicle-ownership rate that the US had in 1906. Monaco, which had the second-highest vehicle-ownership rate in the world in 1996 (656 vehicles per 1,000 persons) had the vehicle-ownership rate that the US had in 1977. The data from Tables H-1 and H-2 were used to produce Figures 1-1 and 1-2 in Chapter 1.

Most countries lag far behind the US in vehicle ownership. It took the rest of the world 66 years (from 1930 to 1996) to increase its vehicle-ownership rate from 5 to 84 vehicles per 1,000 persons, while the US vehicle-ownership rate increased by that much between 1910 and 1919. While, the US owned more than half of the world's vehicles until 1965, between 1950 and 1996 the vehicle population outside the US grew more than twice as fast as in the US (6.9 per cent a year outside the US and 3.2 per cent a year in the US, see Table H-3). The US thus owned half of all the world's vehicles in 1965 (when the US and the rest of the world each owned 90 million vehicles), but only a third by 1996 (when the US owned 206 million vehicles and the rest of the world owned 465 million vehicles).

The rest of the world's vehicle population grew much faster than its human population during the second half of the 20th century: between 1950 and 1996 the vehicle population grew by 6.9 per cent a year (from 21 million to 465 million vehicles) while the human population grew by 1.8 per cent a year (from 2,403 to 5,503 million persons). Therefore, the vehicle population grew almost four times faster than the human population.

TABLE H-1

VEHICLE OWNERSHIP RATES IN THE UNITED STATES AND THE WORLD, 1900-1996

	Motor vehicles (millions)			Population (millions)			Vehicles per 1,000 persons			US as % of world		Equivalent US year of vehicles/1,000 in rest of world
Year	United States	Rest of world	World	United States	Rest of world	World	United States	Rest of world	World	Vehicles	Population	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1900	0.01			76	1,574	1,650	0.1				4.6%	
1901	0.01			78			0.2					
1902	0.02			79			0.3					
1903	0.03			81			0.4					
1904	0.06			82			0.7					
1905	0.08			84			0.9					
1906	0.11			85			1					
1907	0.14			87			2					
1908	0.20			89			2					
1909	0.31			90			3					
1910	0.47			92	1,658	1,750	5				5.3%	
1911	0.64			94			7					
1912	0.94			95			10					
1913	1.26			97			13					
1914	1.76			99			18					
1915	2.49			101			25					
1916	3.62			102			35					
1917	5.12			103			50					
1918	6.16			103			60					
1919	7.58			105			72					
1920	9			106	1,754	1,860	87				5.7%	
1921	10			109			97					
1922	12			110			112					
1923	15			112			135					
1924	18			114			154					
1925	20			116			173					

TABLE H-1
VEHICLE OWNERSHIP RATES IN THE UNITED STATES AND THE WORLD, 1900-1996

	Motor vehicles (millions)			Population (millions)			Vehicles per 1,000 persons			US as % of world		Equivalent US year of vehicles/1,000 in rest of world
Year	United States	Rest of world	World	United States	Rest of world	World	United States	Rest of world	World	Vehicles	Population	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1926	22			117			189					
1927	23			119			196					
1928	25			121			205					
1929	27			122			220					
1930	27	9	36	123	1,947	2,070	217	5	17	74%	5.9%	1910
1931	26			124			210					
1932	24			125			195					
1933	24			126			192					
1934	25			126			200					
1935	27	11	38	127	2,173	2,300	209	5	16	71%	5.5%	1910
1936	29			128			223					
1937	30	13	43	129			233			69%		
1938	30	14	44	130			230			68%		
1939	31	15	46	131			237			68%		
1940	32	14	46	132			246			70%		
1941	35			133			262					
1942	33			135			245					
1943	31			137			226					
1944	30			138			220					
1945	31			140			222					
1946	34	11	46	141			243			75%		
1947	38	15	53	144			263			71%		
1948	41	17	58	147			280			71%		
1949	45	19	64	149			300			70%		
1950	49	21	70	152	2,403	2,555	323	9	28	70%	6.0%	1911

TABLE H-1

VEHICLE OWNERSHIP RATES IN THE UNITED STATES AND THE WORLD, 1900-1996

	Motor vehicles (millions)			Population (millions)			Vehicles per 1,000 persons			US as % of world		Equivalent US year of vehicles/1,000 in rest of world
Year	United States	Rest of world	World	United States	Rest of world	World	United States	Rest of world	World	Vehicles	Population	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1951	52	22	74	155	2,438	2,593	335	9	29	70%	6.0%	1911
1952	53	25	78	158	2,477	2,635	338	10	30	68%	6.0%	1912
1953	56	27	83	160	2,520	2,680	351	11	31	68%	6.0%	1912
1954	59	30	88	163	2,565	2,728	359	12	32	66%	6.0%	1912
1955	63	33	96	166	2,614	2,780	378	13	34	65%	6.0%	1913
1956	65	37	103	169	2,664	2,833	386	14	36	64%	6.0%	1913
1957	67	41	108	172	2,716	2,888	390	15	37	62%	6.0%	1913
1958	68	44	112	175	2,770	2,945	391	16	38	61%	5.9%	1913
1959	71	48	120	178	2,819	2,997	401	17	40	60%	5.9%	1913
1960	74	53	127	181	2,859	3,039	409	19	42	58%	5.9%	1914
1961	76	59	135	184	2,896	3,080	414	20	44	56%	6.0%	1914
1962	79	67	146	187	2,950	3,136	424	23	47	54%	5.9%	1914
1963	83	72	155	189	3,016	3,206	437	24	48	53%	5.9%	1914
1964	86	80	166	192	3,085	3,277	450	26	51	52%	5.9%	1915
1965	90	88	178	194	3,152	3,346	465	28	53	51%	5.8%	1915
1966	94	96	190	197	3,220	3,416	478	30	56	49%	5.8%	1915
1967	97	106	203	199	3,287	3,486	488	32	58	48%	5.7%	1915
1968	101	116	216	201	3,357	3,558	503	34	61	47%	5.6%	1915
1969	105	127	232	203	3,430	3,632	519	37	64	45%	5.6%	1916
1970	108	138	246	205	3,503	3,708	529	39	66	44%	5.5%	1916
1971	113	149	262	208	3,578	3,785	544	42	69	43%	5.5%	1916
1972	119	161	280	210	3,652	3,862	566	44	72	43%	5.4%	1916
1973	126	173	298	212	3,727	3,939	593	46	76	42%	5.4%	1916
1974	130	184	314	214	3,801	4,015	608	49	78	41%	5.3%	1916
1975	133	195	328	216	3,872	4,088	616	50	80	41%	5.3%	1917

TABLE H-1
VEHICLE OWNERSHIP RATES IN THE UNITED STATES AND THE WORLD, 1900-1996

Year	Motor vehicles (millions)			Population (millions)			Vehicles per 1,000 persons			US as % of world		Equivalent US year of vehicles/1,000 in rest of world
	United States	Rest of world	World	United States	Rest of world	World	United States	Rest of world	World	Vehicles	Population	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1976	139	203	342	218	3,942	4,160	635	52	82	41%	5.2%	1917
1977	142	219	361	220	4,013	4,233	645	55	85	39%	5.2%	1917
1978	148	231	380	223	4,083	4,305	667	57	88	39%	5.2%	1917
1979	152	242	394	225	4,156	4,381	675	58	90	39%	5.1%	1917
1980	156	255	411	227	4,229	4,457	686	60	92	38%	5.1%	1918
1981	158	269	427	229	4,303	4,533	690	62	94	37%	5.1%	1918
1982	160	279	439	232	4,382	4,613	689	64	95	36%	5.0%	1918
1983	164	292	456	234	4,460	4,694	700	66	97	36%	5.0%	1918
1984	166	307	473	236	4,538	4,774	705	68	99	35%	4.9%	1918
1985	172	316	488	238	4,617	4,855	722	68	100	35%	4.9%	1918
1986	176	324	500	240	4,697	4,938	732	69	101	35%	4.9%	1918
1987	179	336	515	242	4,781	5,024	738	70	103	35%	4.8%	1918
1988	184	355	540	244	4,866	5,110	754	73	106	34%	4.8%	1919
1989	187	370	557	247	4,950	5,196	759	75	107	34%	4.7%	1919
1990	189	394	583	249	5,034	5,284	757	78	110	32%	4.7%	1919
1991	188	407	595	252	5,115	5,367	746	80	111	32%	4.7%	1919
1992	190	423	614	255	5,195	5,450	746	81	113	31%	4.7%	1919
1993	194	423	617	258	5,273	5,531	753	80	112	31%	4.7%	1919
1994	198	431	629	260	5,351	5,611	761	81	112	31%	4.6%	1919
1995	202	445	647	263	5,428	5,691	767	82	114	31%	4.6%	1919
1996	206	465	671	265	5,503	5,769	778	84	116	31%	4.6%	1919

Sources:
Column (2): United States Department of Transportation (1995, Table MV-200) and United States Department of Transportation (1996, Table MV-1).
Column (3) = Column (4) - Column (2).
Column (4): American Automobile Manufacturers Association (1998), Ward's Automotive Yearbook (1999).
Column (5): United States Bureau of the Census (2000b).
Column (6)= Column (7) - Column (5).
Column (7): United States Bureau of the Census (2000a)
Column (8) = 1,000 x Column (2) / Column (5)
Column (9) = 1,000 x Column (3) / Column (6).
Column (10) = 1,000 x Column (4) / Column (7).
Column (11) = Column (2) / Column (4).
Column (12) = Column (5) / Column (7).
Column (13) is Column (9) compared with Column (8).

TABLE H-2

VEHICLE OWNERSHIP RATES IN 1996

Nation	Motor vehicles	Population (thousands)	Vehicles per 1,000 persons	Equivalent year in US
(1)	(2)	(3)	(4) = (2)/(3)	(5)
Ethiopia	66,021	58,733	1	1906
Myanmar	69,000	46,822	1	1906
Bangladesh	225,000	125,340	2	1907
Uganda	51,000	26,605	2	1907
Somalia	20,000	9,940	2	1907
Sudan	75,000	35,594	2	1907
Vietnam	176,183	75,124	2	1907
Afghanistan	67,000	23,738	3	1909
Burundi	20,000	6,053	3	1909
Chad	23,990	7,166	3	1909
Rwanda	27,800	7,738	4	1909
Mali	41,800	9,945	4	1909
Guinea	33,000	7,405	4	1909
Tanzania	133,800	29,461	5	1910
Mozambique	88,800	18,165	5	1910
Burkina Faso	54,933	10,891	5	1910
Madagascar	73,960	14,062	5	1910
Niger	51,600	9,389	5	1910
Malawi	54,300	9,609	6	1910
Central African Republic	20,000	3,342	6	1910
India	6,752,000	967,613	7	1911
Gambia	9,000	1,248	7	1911
Ghana	135,000	18,101	7	1911
Haiti	53,000	6,611	8	1911
Pakistan	1,100,000	132,185	8	1911
Sierra Leone	41,934	4,892	9	1911
Nigeria	953,500	107,129	9	1911
Benin	54,900	5,902	9	1911
China	11,450,000	1,221,592	9	1911
Cameroon	153,000	14,678	10	1912
Liberia	28,100	2,602	11	1912
Mauritania	26,510	2,411	11	1912
Congo	530,000	47,400	11	1912
Samoa	2,600	220	12	1912
Kenya	346,900	28,803	12	1912
El Salvador	80,100	5,662	14	1913

TABLE H-2

VEHICLE OWNERSHIP RATES IN 1996

Nation	Motor vehicles	Population (thousands)	Vehicles per 1,000 persons	Equivalent year in US
(1)	(2)	(3)	(4) = (2)/(3)	(5)
Senegal	160,000	9,404	17	1913
Cote d'Ivoire	255,000	14,986	17	1913
Guatemala	199,000	11,558	17	1913
Angola	223,000	10,624	21	1914
Indonesia	4,439,290	209,774	21	1914
Paraguay	121,000	5,652	21	1914
Syria	352,900	16,138	22	1914
Papua New Guinea	99,300	4,496	22	1914
Jamaica	58,900	2,616	23	1914
Zambia	215,500	9,350	23	1914
Togo	109,267	4,736	23	1914
Beliza	5,400	225	24	1914
Sri Lanka	468,900	18,762	25	1915
Dominican Republic	206,031	8,228	25	1915
Egypt	1,703,300	64,792	26	1915
Philippines	2,053,373	76,104	27	1915
Algeria	920,000	29,830	31	1915
Peru	775,000	24,950	31	1915
Zimbabwe	358,000	11,423	31	1915
Honduras	185,000	5,751	32	1915
Nicaragua	144,640	4,386	33	1915
Iran	2,239,000	67,540	33	1915
Gabon	39,500	1,190	33	1915
Costa Rica	118,992	3,534	34	1915
Swaziland	36,755	1,032	36	1916
Yemen	511,699	13,972	37	1916
Morocco	1,334,799	30,391	44	1916
Colombia	1,700,000	37,418	45	1916
Cape Verde	18,000	394	46	1916
Guyana	33,000	706	47	1916
Bolivia	429,554	7,670	56	1917
Tunisia	531,000	9,183	58	1917
Ecuador	679,760	11,691	58	1917
Yugoslavia	1,333,000	22,350	60	1918
Jordan	265,000	4,325	61	1918
Botswana	99,869	1,501	67	1918

TABLE H-2

VEHICLE OWNERSHIP RATES IN 1996

Nation	Motor vehicles	Population (thousands)	Vehicles per 1,000 persons	Equivalent year in US
(1)	(2)	(3)	(4) = (2)/(3)	(5)
Turkey	4,327,885	63,528	68	1918
Dominica	5,700	83	69	1918
St. Vincent & the Grenadines	8,200	119	69	1918
Mauritius	82,273	1,154	71	1918
Fiji Islands	59,000	792	74	1919
Namibia	129,000	1,727	75	1919
Russia (former)	23,565,300	293,020	80	1919
Hong Kong	507,000	6,300	80	1919
Panama	226,800	2,693	84	1919
Venezuela	2,025,000	22,396	90	1920
Chile	1,375,000	14,508	95	1920
Thailand	5,700,000	59,451	96	1920
Brazil	16,055,000	164,511	98	1921
Seychelles	8,500	78	109	1921
Trinidad & Tobago	155,000	1,273	122	1922
Mexico	12,230,000	97,563	125	1922
Oman	293,430	2,265	130	1922
Romania	2,905,181	21,399	136	1923
Saudi Arabia	2,882,600	20,088	143	1923
Malaysia	2,984,957	20,376	146	1923
Suriname	65,663	443	148	1923
South African Republic	6,280,000	42,327	148	1923
Singapore	536,817	3,462	155	1924
Libya	904,000	5,648	160	1924
Uruguay	525,000	3,262	161	1924
Argentina	6,070,869	35,798	170	1924
United Arab Emirates	400,000	2,262	177	1925
Barbados	48,500	258	188	1925
Korea, South	9,553,092	45,949	208	1928
Bulgaria	1,911,767	8,653	221	1935
Antigua & Barbuda	14,673	66	222	1935
Poland	9,063,987	38,700	234	1938
Taiwan	5,225,000	21,656	241	1939
Hungary	2,603,021	9,936	262	1941
Israel	1,473,859	5,535	266	1947

TABLE H-2

VEHICLE OWNERSHIP RATES IN 1996

Nation	Motor vehicles	Population (thousands)	Vehicles per 1,000 persons	Equivalent year in US
(1)	(2)	(3)	(4) = (2)/(3)	(5)
Qatar	182,400	665	274	1947
Bahrain	172,144	603	285	1948
Greece	3,279,344	10,583	310	1949
Czech Republic	4,922,022	15,712	313	1949
Kuwait	693,000	2,077	334	1950
Ireland	1,218,738	3,556	343	1952
Malta	141,200	379	373	1954
Portugal	3,680,700	9,868	373	1954
Denmark	2,092,871	5,269	397	1958
The Netherlands	6,420,000	15,653	410	1960
Finland	2,229,222	5,109	436	1962
Cyprus	333,676	753	443	1963
Sweden	3,981,424	8,946	445	1963
Spain	17,954,118	39,244	457	1964
Norway	2,053,334	4,404	466	1965
Iraq	10,400,000	22,219	468	1965
Belgium	4,838,331	10,204	474	1965
United Kingdom	28,485,858	58,610	486	1966
Switzerland	3,568,754	7,249	492	1967
Iceland	141,532	273	518	1968
Germany	44,166,773	84,068	525	1969
France	30,755,000	58,470	526	1969
Andorra	39,596	75	528	1969
Brunei	163,780	308	532	1970
Japan	68,801,378	125,717	547	1971
Austria	4,478,016	8,054	556	1971
New Zealand	2,066,950	3,587	576	1972
Canada	16,815,000	29,123	577	1972
Italy	33,515,500	57,534	583	1972
Australia	10,750,000	18,439	583	1972
Luxembourg	248,331	422	588	1972
Monaco	21,000	32	656	1977
United States	206,365,156	265,229	778	-

Sources:

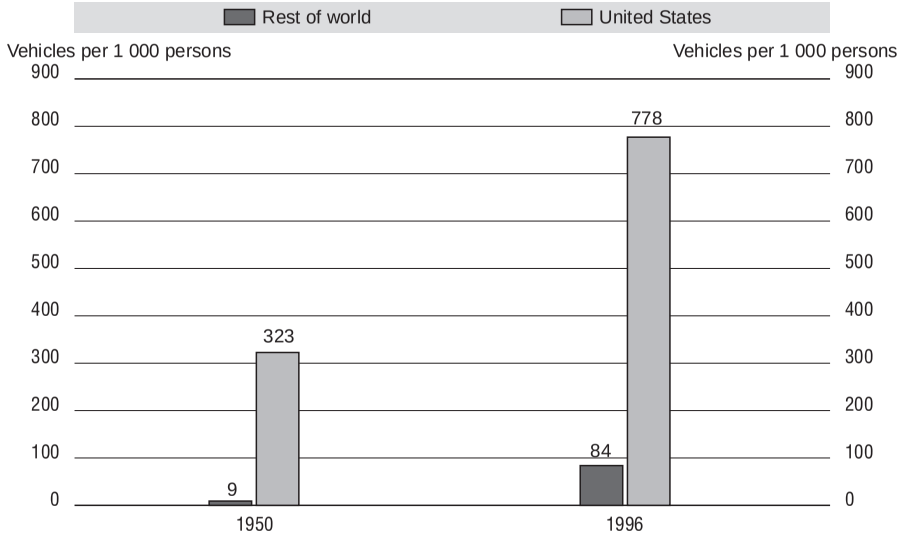
Columns 2 and 3: American Automobile Manufacturers' Association (1998, 9-11)
Column 4: Column (2)/Column (3)
Column 5: From Table H-1.

TABLE H-3

VEHICLE OWNERSHIP RATES IN THE UNITED STATES AND THE WORLD, 1950-1996

	Number of vehicles (millions)			Number of persons (millions)			Vehicles per 1,000 persons		
	1950	1996	Growth rate	1950	1996	Growth rate	1950	1996	Growth rate
United States	49	206	3.2%	152	265	1.2%	323	778	1.9%
Rest of world	21	465	6.9%	2,403	5,503	1.8%	9	84	5.0%
World	70	671	5.0%	2,555	5,769	1.8%	28	116	3.2%
US as % of world	70%	31%	–	6.0%	4.6%	–	1,172%	669%	–

Sources: Table H-1



The rest of the world's *vehicle* population grew much faster than its *human* population during the second half of the 20th century: between 1950 and 1996 the vehicle population grew by 6.9 per cent a year (from 21 million to 465 million vehicles) while the human population grew by 1.8 per cent a year (from 2,403 to 5,503 million persons). Therefore, the vehicle population grew almost four times faster than the human population.

Although the vehicle population was growing faster in the rest of the world than in the US from 1950 to 1996, the US added 1,390 more vehicles (beyond replacement) for each 1,000 more persons (157 million more vehicles for 113 million more people), while the rest of the world added only 143 more vehicles for each 1,000 more persons (444 million more vehicles for 3.1 billion more people). Population increase was therefore accompanied by almost 10 times more additional vehicles in the US than in the rest of the world (1,390 ÷ 143).

Figure H-1 (derived from Table H-1) shows the growth of the human and vehicle populations in the US since 1900. The number of humans without vehicles has slowly decreased in the US since 1945, but most children still don't own cars, so the human population exceeds the vehicle population.

FIGURE H-1
PEOPLE AND VEHICLES IN THE US

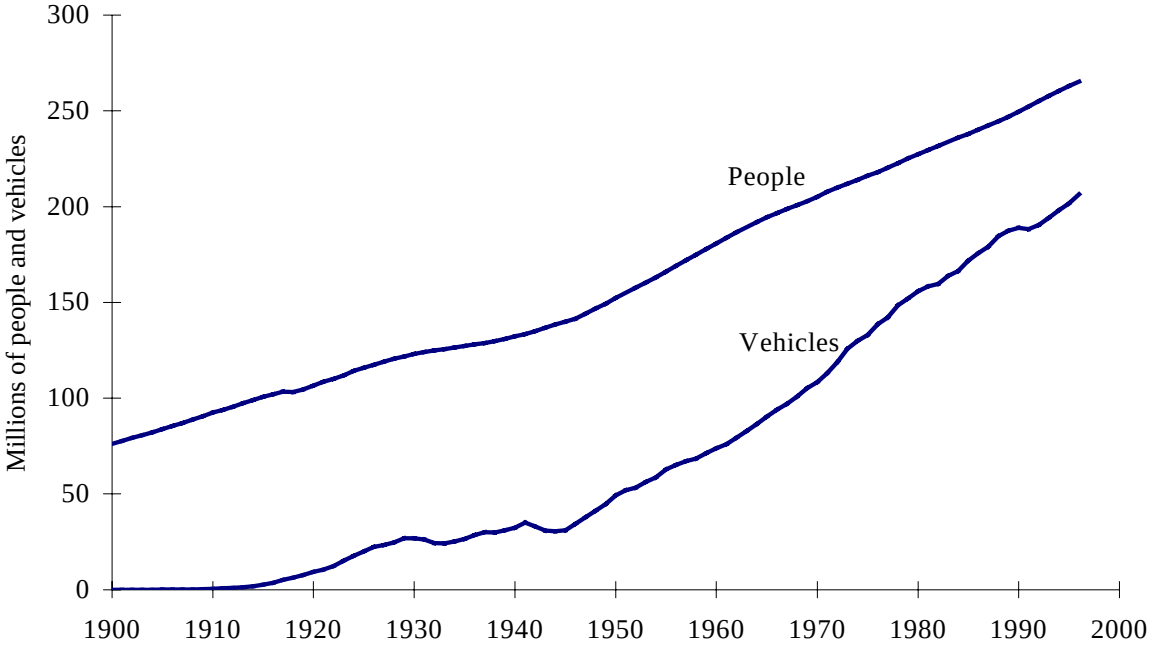
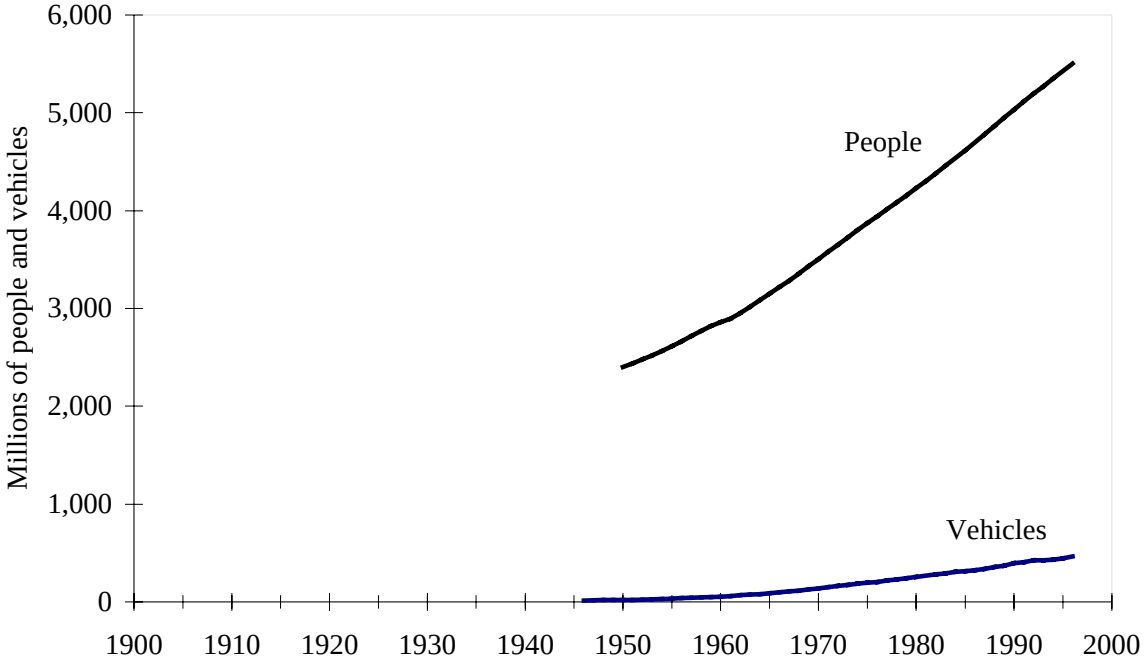


Figure H-2 (also derived from Table H-1) shows the growth of the human and vehicle populations outside the US since 1945. Because the vehicle stock outside the US started from a low base, the number of humans without vehicles increased despite the higher growth rate of the vehicle stock. But if the rest of the world ever does achieve the US vehicle ownership rate, so that every adult on earth owns a car, parking will be a monumental problem.

FIGURE H-2
PEOPLE AND VEHICLES OUTSIDE THE US



To conclude on an optimistic note, cars may change as dramatically in the 21st century as they did in the 20th century. To cite one example, pollution-free fuel cells may power most cars in the near future. If so, parked cars may become a major source of electric power. The fuel cells in cars parked at home may generate electricity that households will use or sell to the grid. Timothy Lipman speculates:

> *If we suppose that half the vehicles in California's South Coast Air Basin were fuel-cell powered (say by 2020 or so), with each vehicle able to supply 50 kW of power to the grid half the time, the total generating capacity of these vehicles would be nearly double the present level of installed generating capacity in the entire state. . . This arrangement would require some additional equipment where the electricity produced by the vehicle interfaces with the electrical grid. However, if "smart meters" could monitor the spot price of electricity and activate the system when the price is right, electricity generated by the fuel cell could be sold to the grid at a profit. Imagine getting a check from the utility company instead of a bill! Particularly with the early fuel-cell vehicles, which will be expensive, this arrangement could help to offset some of the vehicle's cost. For example, a 50kW automotive fuel-cell system producing electricity an average of twelve hours per day could see a profit of $0.02 per kWh, which would net approximately $4,380 per year for the vehicle's owner.*[179]

In this fuel-cell-powered future, parked cars can become a resource, not a liability and they may earn enough money to pay for their parking. Just as computing power moved from mainframe machines to personal computers in the late 20th century, electricity generation may move from power plants to parked cars in the 21st century. But whatever the future holds for automobile technology, planners should allow markets to determine the number of parking spaces.

NOTES

1. The 1990 Nationwide Personal Transportation Survey (NPTS) asked respondents, "*Did you pay for parking during any part of this trip*?" for all automobile trips made on the previous day. Ninety-nine per cent of the responses to this question were "*No*." Free parking at home does not help to explain the high per cent of trips with free parking because the NPTS asked the "pay for parking" question for all vehicle trips *except* the trips that ended at home. See Shoup (1995) for details of the NPTS finding. *Monopoly*® is the trademark of Hasbro, Inc. for its real estate trading game. See Stewart (1996 and 1997) and Collins (1998) for the probability of landing on "Free Parking" in the game of *Monopoly*.

2. Motor vehicles include all vehicles owned by individuals, businesses and the government. Appendix H shows the data on human and vehicle populations from 1900 to 1996. Monaco had the second-highest vehicle-ownership rate after the United States.

3. See Appendix H. The data for the total number of vehicles in the rest of world are available in only selected years before 1946 (1930, 1935 and 1937-1940).

4. Transportation accounted for 66.4 per cent of US oil consumption in 1996 and highway transportation accounted for 78.3 per cent of US oil consumption for transportation. Therefore, highway transportation accounted for 52 per cent of US oil consumption (66.4% x 78.3%). The US also consumed 25.7 per cent of the world's oil production in 1996. Therefore, highway transportation in the US consumed 13.4 per cent (slightly more than an eighth) of the world's total oil production (52% x 25.7%). Highway transportation refers to travel by cars, trucks, motorcycles and buses. See Stacy Davis (2000, Tables 1.3, 2.10 and 2.7) for the data on energy consumption for transportation in the US.

5. The 5,769 million persons on earth in 1996 owned 671 million vehicles. If 5,769 million persons owned 778 vehicles per 1,000 persons, they would own 4.488 billion vehicles—almost seven times the actual number of vehicles on earth in 1996. If the human population both grows *and* reaches the 1996 US vehicle-ownership rate, the world will have more than 4.5 billion vehicles.

6. Not all motor vehicles are cars, but vehicles other than cars—such as trucks—occupy even larger parking spaces, so estimating the space required to park 4.4 billion cars will underestimate the space required to park 4.4 billion vehicles. A typical parking lot holds about 130 cars per acre (335 square feet per car), which is equivalent to 83,200 cars per square mile (130 cars per acre x 40 acres per square mile). At this density, 4.448 billion parked cars would occupy 53,942 square miles (4.488 billion cars ÷ 83,200 cars per square mile). The area of England is 50,516 square miles and the area of Greece is 50,548 square miles.

7. See Shoup, *Parking Cash Out*, Chapter 7, for the ratio of parking spaces to cars. The area of France is 212,000 square miles and the area of Spain is 192,000 square miles. Another way to imagine the area needed to park 4.5 billion cars is to look at a parking lot big enough to hold 100 cars. Forty-five million of these 100-car lots would be needed to park 4.5 billion cars.

8. The Worldwatch Institute (2001) estimated that the land area devoted to roads in the US is approximately seven times greater than the land area devoted to parking.

9. These data come from the 1995 *Nationwide Personal Transportation Survey*. See Table 22-1 for the share of automobile commuters who park free at work. Hu and Young (1999, Figure 10 and Table 21) show that 91 per cent of all commuters drive to work. US Department of Transportation (1997, 25) reports that 91 per cent of commuters' vehicles are solo-driven. The 1990 Census found that 92 per cent 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.

10. In total, 103 million commuters parked free at work in 1995 and only 5.8 million commuters paid to park at work. 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.

11. Center for Urban Transportation Research (1989).

12. Southern California Association of Governments (1996). Williams (1991) found that only 4 per cent of drivers who park at federal facilities in downtown Washington pay the market rate for parking.

13. Port Authority of New York and New Jersey (1984).

14. 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.

15. KPMG Peat Marwick (1990) estimated the capital and operating costs of both structured and surface parking. For structured parking they estimated that the capital cost is $10,941 per space, with a 40-year economic life and an 8-per cent capital recovery factor and that the operating cost is $369 per space per year. The total capital and operating cost for structured parking is thus $107 per month. For surface parking they estimated that the capital and operating cost is $21 per space per month. They also estimated that 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 per cent more free parking spaces for commuters than KPMG Peat Marwick assumed. The capital cost of parking structures cited in Shoup, *Parking Cash Out*, 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.

16. KPMG Peat Marwick (1990, 7).

17. Department of Transport (1992) for London, England; Kwon and Kwon (2001, 11) for Seoul, South Korea; and Cape Town City Council (1993, Annexure E) for Cape Town, South Africa.

18. 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. The resulting number of cars per 100 employees is quite insensitive to moderate variations in this assumption.

19. Three of the seven studies reported in Table 22-2 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 or not 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 per cent of the market value, not to 100 per cent. Also, some employees had not been offered free parking before the price increase, so their price of parking did not 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 per cent for the four remaining cases (rather than 25 per cent 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).

20. 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 that 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 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 22-2 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 per cent 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 per cent 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 of the market price. The price change is therefore 200 per cent and the midpoint elasticity is half of the per cent change in quantity. See Mansfield (1983, 533) or Samuelson and Nordhaus (1989, 425) for an explanation of the midpoint formula.

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

22. 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.

23. Bernard Feeney (1989, 236).

24. Young, Thompson and Taylor (1991, 64).

25. 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 that those who do not 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.

26. 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.

27. To show the effect of parking prices on mode shares, Willson held all the independent variables (except the price of parking) constant at their mean values in the sample.

28. These mode shares were estimated by setting the values of all the other variables at their median values.

29. 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.

30. 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 per cent of the commuters who paid to park drove to work solo, while 72 per cent of the commuters who could park free drove to work solo (Willson and Shoup 1990a, 150). This 32-per cent-point difference in the solo-driver share between matched samples of similar commuters with and without employer-paid parking strongly suggests that endogeniety is not a serious problem in the mode choice model.

31. 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.

32. The price elasticity of demand is calculated as the arc elasticity, as explained earlier in the discussion of the seven case studies in Table 22-2. 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.

33. Note that the *per-employee* spending for parking is the total spending on parking for all employees divided by the total number of employees (including transit users and carpoolers).

34. 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 vehicle miles traveled by automobiles and excludes passenger miles traveled on public transit. To measure the distance traveled 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 traveled 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.

35. In every year since 1983 Los Angeles has topped the Roadway Congestion Index calculated by the Texas Transportation Institute (1999) for 70 cities. See the TTI webpage at <http://mobility.tamu.edu/>. 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 (US Environmental Protection Agency 1995).

36. This value includes depreciation, insurance and operating cost (American Motor Vehicle Manufacturers Association 1988).

37. These estimates refer only to the money costs of parking and driving and do not purport to measure all the benefits and costs of commuting.

38. See Fisher (1972). Eighty-two per cent 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.

39. 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 driving solo 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) money cost into one total cost measure will understate the effects of parking cost alone, especially for shorter trips.

40. Because 70 per cent of all transit riders were identified as choice transit riders and 51 per cent of the choice transit riders would drive to work if their employers offered free parking, 35 per cent of all transit riders would drive to work if their employers offered free parking (70% x 51%).

41. 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 per cent of all *commuters* (not just of all *drivers*) in the Bay Area could park free at work.

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

43. Hensher and King (2001, 191).

44. Because another person always adds 5 minutes to travel time and 5 minutes is 1/12th 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.

45. 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. If these effects are converted to 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.

46. 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.

47. This finding was reported by Peter Jones, Director, Transport Studies Group, University of Westminster, London. It was extracted from the *Review of Available Evidence on Public Reactions to Road Pricing* (p. 104), prepared for the London Transportation Unit of the U.K. Department of the Environment.

48. The Center for Urban Transportation Research (1989, 40-41) conducted this survey of 4,000 commuters who live close to public transportation routes in 17 cities; 72 per cent of the respondents—including 52 per cent of bus riders—opposed charging for commuter parking as a way to increase transit ridership.

49. *Chronicle of Higher Education* (August 11, 1993). Professor Townes won the Nobel Prize for his work in the field of quantum electronics, which led to the widespread use of lasers.

50. "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.

51. "Life among the Nobelity; For Southland's Laureates, the Thrill of Winning Comes in Small Ways," *Los Angeles Times* (October 14, 1994).

52. 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."

53. 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.

54. Shoup (1992) contains the text of the parking cash-out law.

55. California Health and Safety Code Section 43845. Information about the cash-out law is available online at <http://www.arb.ca.gov/planning/tsaq/cashout/cashout.htm>.

56. 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 that 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.

57. 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 allowances is smaller for commuters who are offered smaller parking subsidies.

58. Southern California Association of Governments (1996, 13).

59. These data are from the *1995 Nationwide Personal Transportation Survey.*

60. To simplify the example I have assumed that no commuters carpool, but carpoolers can easily be added to the analysis.

61. Chapter 25 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.

62. Beebe (1991) and Shoup (1995).

63. Total trips fell even where there were large per cent 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.

64. 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 did not provide it "free."

65. Verhoef, Nijkamp and Rietveld (1996, 402). The sample size was 2,116 respondents.

66. Verhoef, Nijkamp and Rietveld (1996, 403). They estimated that a conservative value of the land use for on-street parking was 1 guilder per day per parking space. At an exchange rate of 1 guilder = $0.40, this is approximately $9 per month for 22 work days per month.

67. 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 per 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.

68. Pfizer is a pharmaceutical company that is well known as the maker of Viagra. The cash-out program is described in the brochure, "Check-In, Cash-Out," available from Pfizer Global Research and Development in Sandwich, Kent, England. 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.

69. Pfizer uses a "point" system to keep record of 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.

70. Surber, Shoup and Wachs (1984).

71. 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 (6-9 a.m. and 3–6 p.m.) was 37 per cent higher than during the other 18 hours of the day

(9 a.m.-3 p.m. and 6 p.m.–6 a.m.) and 59 per cent higher than during the night and owl periods (9 p.m.-6 a.m.).

72. Transport Canada (1978). See Table 22-2 in Chapter 22.

73. Shoup (1995).

74. 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.

75. Erik 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.

76. 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, p. 293). The case studies of parking cash out reported in Chapter 25 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.

77. 19.5 million x 31% = 6 million. This calculation assumes that the national per cent of unbundled parking is the same as in Southern California.

78. Ho (1993).

79. Shoup (1992) includes the text of California's parking cash-out law.

80. US 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 tyre labeling to inform consumers that some tyres have lower rolling resistance and therefore produce higher automobile fuel efficiency; this innocuous-sounding proposal was never adopted because (I am told) American tyre manufacturers objected that it would disclose the lower rolling resistance and higher fuel efficiency of most imported tyres.

81. Nevertheless, 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.

82. For example, if your employer pays for your expenses at a convention in Hawaii, 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.

83. 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."

84. See Leibowitz (1983) and Gruber (1994).

85. For example, if you deduct $1,000 in charitable contributions from your federal taxable income and you are in the 25-per cent tax bracket, your tax saving is $250. Your after-tax price of the contribution is only $750.

86. The new tax-exemption for transit and vanpool subsidies has been slow to produce changes. A nationwide survey of employers in 1995 found that fewer than one per cent offered any transit subsidies, while 81 per cent 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.

87. See TITLE 26, Subtitle A, CHAPTER 1, Subchapter B, PART III, Section 132 of the Internal Revenue Code, available online at < http://www.fourmilab.ch/ustax/www/t26-A-1-B-III-132.html>. The exemptions are indexed to the cost of living and rounded to the next lowest multiple of $5.

88. *Los Angeles Times* (June 2, 1994).

89. 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)].

90. Association for Commuter Transportation (1996). KPMG Peat Marwick estimated the tax revenues forgone as a result of tax-exempt parking subsidies.

91. The Joint Tax Committee of Congress used an average marginal income tax rate of 19 per cent 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 US 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.

92. See row 9 in Table 22-3.

93. The tax exemption for employer-paid parking does not cause all of this additional VMT because many firms would offer free parking even if it were not a tax-exempt fringe benefit.

94. 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.

95. 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.

96. California enacted its cash-out legislation before Section 132(f)(4) was added to the Internal Revenue Code by the 1992 National Energy Policy Act added, so California was unaware of the not-in-lieu-of-compensation provision.

97. *Corliss v. Bowers*, 281 US 376, 378 (1930).

98. 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 eliminate 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 eliminate the not-in-lieu-of-compensation problem for *all* transportation fringe benefits, including transit and vanpool subsidies.

99. Information about parking cash out is available on the Environmental Protection Agency's website at <http://www.epa.gov/oms/transp/comchoic/ccweb.htm> and on the Federal Transit Administration's website at <http://www.fta.dot.gov/library/policy/cc/cc.html>.

100. See Shoup (1997c, 41 and A-25) for the calculation of taxable income. The increase in taxable income of $255 per employee per year is per employee *offered the cash option*, not per employee *who chose the cash option*. 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.

101. As mentioned earlier, the federal government assumes a 19-per cent 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 per cent to calculate the effects of changes in taxable wage income. In making federal conformity estimates, the Franchise Tax Board also calculates that California income tax revenues rise by one-third of the rise in federal income tax revenues; given the 19 per cent federal marginal tax rate, this rule of thumb yields a 6.3-per cent marginal tax rate for California.

102. TEA-21 did not make employee-paid parking automatically tax exempt. That is, commuters can 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. That is, an employer can provide tax-exempt parking subsidies to some employees but not to others and can provide different subsidies to different employees.

103. The simple addition of the two separate marginal tax rates assumes that 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 24.25 per cent.

104. In 1998, wages above $68,000 a year were exempt from the 6.2 per cent tax rate for Social Security, but were subject to the 1.45 per cent 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 been considered, the employer's savings could be higher than calculated here.

105. California has not yet amended its income tax to conform to the changes in the federal tax code, so the payment for parking is not exempt from state income tax.

106. 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.

107. Letter from Kenneth J. Kies, Chief of Staff of the Joint Committee on Taxation, June 19, 1997. Employers and employees will pay Social Security taxes on the cashed-out parking subsidies and these additional Social Security tax payments will eventually increase the employees' Social Security benefits. A higher retirement income will therefore compensate commuters for the Social Security taxes they pay on their cashed out parking subsidies.

108. 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.

109. For the 9 per cent 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 per cent 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 from nothing 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 per cent (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 per cent (one minus the marginal tax rate).

110. Association for Commuter Transportation (1996).

111. If an employer offered a commuter cash in lieu of a parking subsidy, the employer should therefore also have reported the parking subsidy itself as taxable income for the commuter if the commuter took the parking. See Section 132(f)(4) of the Internal Revenue Code, explained in Chapter 24.

112. This research was conducted for the California Air Resources Board. Shoup (1997c) 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.

113. Five of the eight firms offer a cash payment larger than the parking subsidy (Cases 1, 4, 5, 7 and 8). Two firms subsidize public transit or vanpooling more than they subsidize other modes (Cases 6 and 7). Two firms reduced parking subsidies while increasing rideshare subsidies (Cases 5 and 8). One firm ended parking subsidies but retained rideshare subsidies (Case 1).

114. 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 http://www.aqmd.gov/trans/index.html.

115. The full texts of the interviews are available in Shoup (1997c).

116. These mode shares were found in annual surveys conducted by the 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.

117. Alan Pisarski (1996, 49) reports that, excluding those who work at home, the mode shares for commuting in the US 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' modes shares before cash out.

118. For example, for every 100 commuters the number of solo drivers fell from 76 to 63 or by 13 solo drivers. This is a 17 per cent decrease in the number of solo drivers ($13 \div 76 = 17\%$). For every 100 commuters, the number of carpoolers rose from 14 to 23 or by 9 carpoolers. This is a 64 per cent increase in the number of carpoolers ($9 \div 14 = 64\%$).

119. 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 per cent of the 1,694 employees were on vacation, sick or did not commute for some other reason, so the average "attendance rate" was 90 per cent. The eight firms' attendance rates ranged between 73 per cent (at Case 2) and 95 per cent (at Cases 3 and 6).

120. 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.

121. 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 (5 days per week for 52 weeks, minus the conventional eight national holidays) to find the number of vehicle trips per employee per year. See Shoup (1997c, 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 per employee per day and it fell to .67 vehicle trips per employee per day after parking cash out.

122. Southern California Association of Governments (1991). In calculating the VMT reductions associated with reducing a vehicle trip to work, the SCAQMD assumes that the average one-way distance for each avoided vehicle commute trip is 15 miles.

123. Southern California Association of Governments (1996).

124. 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 reduced average distance to work after cash out explains why the VMT per employee fell by 11 per cent while vehicle trips per employee fell by only 9 per cent. In the other case studies, the average distance to work is assumed to be the same before and after cash out, so the per cent 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 per cent while the average vehicle trips per employee fell by only 11 per cent.

125. Fricker (1986, 34).

126. Fricker estimated an average circuity factor of 1.071 for carpooling. That is, a commuter would drive 7.1 per cent 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 per cent 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 one per cent 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 (1997c, p. A-21) for a sensitivity test which shows that an assumed circuity factor of 1.00 (no circuity) leads to an estimated reduction of 2.32 VMT per employee per day; an assumed circuity factor of

1.12 (significant circuity) leads to an estimated reduction of 2.20 VMT per employee per day. This result implies that circuity is a minor factor in estimating the VMT reduced by parking cash out and that the effects of circuity in carpooling can be ignored in the present case.

127. Shoup (1997c, Table 3-2).

128. Table 25-1 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 solo. 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 ridesharing subsidies, this firm experienced the average reduction in solo-driver share for all 1,694 employees. Therefore, this "outlier" case did not influence the average reduction in solo share found for the eight firms.

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

130. California Air Resources Board (1990).

131. 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 that 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.

132. The 1995 Nationwide Personal Transportation Survey found that commuting VMT was 31 per cent of total household VMT (Hu and Young 1999, Table 23). Because 95 per cent of all commuters park free at work, employers subsidize 30 per cent of total household VMT in the US (31% x 95%). Transportation accounted for 66.4 per cent of US oil consumption in 1996 and highway transportation accounted for 78.3 per cent of US oil consumption for transportation. Therefore, highway transportation accounted for 52 per cent of US oil consumption (66.4% x 78.3%). See Stacy Davis (2000, Tables 1.3, 2.10 and 2.7) for the data on energy consumption for transportation in the US.

133. The full fuel cycle includes the entire set of sequential processes or stages involved in the utilization of fuel, including extraction, transformation, transportation and combustion. Emissions generally occur at each stage of the fuel cycle (US Department of Energy 1994a, 79).

134. 26 x 19.6 x 1.57 = 800.

135. Chapter 22 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 that 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 foregoes 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.

136. Hanemann (1991) explains the endowment effect.

137. A survey of the literature on the endowment effect found evidence that the availability of substitutes for a good reduces the divergence between the prices that one will pay for the good and accept for it (Adamowicz *et al.*, 1993). This evidence suggests that one's willingness to pay for parking and willingness to accept cash instead of parking will tend to converge 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 solo-driver shares—22 and 16 per cent—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 per cent. The three smallest reductions in solo-driver share—8, 7 and 3 per cent—occurred in the lower-density areas of Santa Monica and West Hollywood.

138. 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 per cent of the actual $33 a month increase.

139. 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 per year for rideshare incentives—such as free carpool parking and subsidies for vanpool and transit users. The company's *net* saving was $80,000 per year or $4.76 per employee per month.

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

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

142. 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, p. 56) found that 72 per cent of the firm's ridesharing 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 per cent of the ridesharing 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.

143. Because my estimates of VMT reductions were made for 1993-1995, using the 1990 values for congestion costs without adjusting for subsequent inflation gives a conservative estimate of the benefits of parking cash out.

144. South Coast Air Quality Management District (1995). These values imply a different weighting of emissions reductions than implied by the California Air Resources Board's procedure of counting reductions in ROG, NOx and PM10 as equally valuable and counting seven grams of CO as equivalent to one gram of the other three emissions.

145. 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 or 3.2¢ per VKT) appears reasonable.

146. 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.

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

148. Similarly, a 1996 survey of 2,925 commuters in Southern California found that 85 per cent of White commuters and 84 per cent of Asian commuters drove to work solo. In comparison, only 75 per cent of Latino commuters and only 66 per cent of Black commuters drove to work solo.

The survey also found that 12 per cent of Black, 7 per cent of Latino and one per cent of both Asian and White commuters commuted by bus (Southern California Association of Governments 1996, 24).

149. 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 per employee per year after cash out. The average marginal income tax rate of all taxpayers in the US who report a positive tax liability, weighted by the number of taxpayers paying each marginal tax rate, was 19 per cent in 1996 (Shoup 1997c). Using this 19-per cent rate, the 1,694 employees' state and federal income tax payments increased by $82,140 a year or $48 per employee per year. This tax revenue is a transfer to the government from commuters who would otherwise have received the full value of the cash-out payments.

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

151. Memo from John Anzulis of Pacific Holding Company to all employees on October 12, 1992.

152. *Crossroads*, March 1997.

153. This description of the Legislative Analyst's Office is available online at the agency's website at <http://www.lao.ca.gov/laofacts.html>.

154. California Legislative Analyst's Office (2002, 1).

155. 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.

156. 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 per cent of that amount; firms subsidized the other 93 per cent of the cost of parking (Greater Hartford Ridesharing Corporation, 1983)

157. The parking woes at the Lawrence Berkeley Laboratory continued unchanged 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 in the Laboratory, but the "shortage" has been solved by eliminating permits for new graduate research assistants; all students who already had permits were "grandfathered," and the natural turnover of research

assistants eventually phased out the student permits. The senior scientists successfully dodged a market solution to their parking problem.

158. Van Hattum, Zimmer and Carlson (2000, 14).

159. Shoup (1992).

160. A Pareto-optimal allocation of resources is one in which no one can be made better off without making at least one other person worse off. It is named after the Italian economist Vilfredo Pareto (1848-1923) who developed this concept of an efficient allocation of resources.

161. Letter from the California Chamber of Commerce to the Senate Environmental Quality Committee on April 29, 1997.

162. Letter from the Council for Economic and Environmental Balance to the Senate Environmental Quality Committee on April 29, 1997.

163. 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 waste materials. The California Air Resources Board advised the Legion that outdoor fires are allowed as recreational activity and that ceremonial flag burning is therefore allowed as a recreation. The purpose of SB 731 was to create a more dignified basis for burning American flags that are 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).

164. Schelling (1978, 127-129).

165. See Chapter 24.

166. The IRS issued this rule because parking subsidies greater than $180 a month (in 2001) are taxable income; the value is indexed for inflation annually.

167. 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 it 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.

168. *New York Times* (February 19, 1994).

169. These per-person results were summarized at the conclusion of Chapter 25.

170. Chapter 25 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 should not alter anyone's evaluation of whether offering commuters the option to cash out employer-paid parking is a good idea.

171. Hu and Young (1999, Table 5).

172. 3.9 billion VMT ÷ 6,492 VMT per household = 600,000 households.

173. In the case studies, California tax revenues increased by $17 per year per person offered the option to cash out employer-paid parking, but California has a higher income tax rate than most other states.

174. US Department of Transportation, Federal Highway Administration, Office of Highway Policy Information, *Highway Statistics 1998,* Table MF-121T, Tax Rates on Motor Fuel-1998. Available online at <http://www.fhwa.dot.gov/ohim/hs98/mfpage.htm>. The federal and weighted-average state gasoline tax rates are their values in 1998.

175. See Agras and Chapman (1999) for a discussion of CAFE standards and gasoline taxes as complementary ways to reduce vehicle emissions.

176. TITLE 26, Subtitle A, CHAPTER 1, Subchapter B, PART III, Section 125. Available online at <http://www.fourmilab.ch/ustax/www/t26-A-1-B-III-125.html>

177. 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 fringe 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.

178. KPMG Peat Marwick (1990) and Association for Commuter Transportation (1996). KPMG Peat Marwick estimated the tax revenues forgone as a result of tax-exempt parking subsidies for the Association for Commuter Transportation (1996).

179. Lipman (2000, 11).

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COMPANY MANAGEMENT OF STAFF'S TRAVEL CHOICES IN THE UK

SUMMARY

Edinburgh, May 2001

1. INTRODUCTION

1.1. Purpose of report and definitions

This report has been commissioned by the ECMT to provide an up-to-date review of policy and practice in the company management of staff's travel choices in the UK today. At this early stage it should be stated that, in the UK, this technique for managing travel demand is normally known as a (company) travel plan; in continental Europe, as (site-based) mobility management; and in the USA, as Transportation Demand Management (TDM). From this point on, this report will use the term *travel plan.*

1.2. Structure of the report

The report is wide-ranging in scope but will bring together what is necessarily a broad-brush review into a number of key recommendations and conclusions for policymakers in its final sections.

The report will first explain the content of and the motivation for typical travel plans in the UK. It will then deal with the policy context for travel plans – the role of travel plans in transport policy, and their links to land-use planning policy. It will also provide, here, a brief history of the development of the policy.

It will then describe in some detail how staff travel choices in the UK have been managed to date, including case study examples of travel plans. The following section will generalise these case studies and consider estimates of current take-up of travel plans in the UK, and their likely impact on overall traffic levels. It is important to point out here that the take-up of travel plans in the UK to date has not been that widespread, although there is evidence (DETR, 2001) that it is increasing significantly.

The next part of the report will then consider key barriers to the wider implementation of travel plans, and ways that these may be overcome:

- Companies' self interest and the business case for travel plans;
- Internal organisational barriers;
- Lack of regulatory requirements for travel plans;
- Personal taxation and commuting;
- The nature of public transport provision in the UK;
- Lack of examples due to novelty of the concept.

Finally, the report will draw some conclusions and recommendations for national and international policymakers and make suggestions for further research. Overall, the paper will argue that travel plans in the UK have the potential to make a contribution to the reduction of peak hour vehicle trips, but that the conditions necessary to realise this potential are not yet in place.

2. CONTEXT

2.1. What is a travel plan?

A travel plan provides a strategy for an organisation to reduce its transportation impacts and to influence the travel behaviour of its employees, suppliers, visitors and customers. The adoption of travel plans by employers in the UK is an important element of the Government's integrated transport strategy, outlined in the 1998 Transport White Paper, "A New Deal for Transport: Better for Everyone" (DETR, 1998). The Scottish White Paper, "Travel Choices for Scotland", was published shortly after and also features travel plans by employers as an important element of transport policy for Scotland.

A travel plan can incorporate a range of transport-related initiatives to address different transport aspects, including commuter journeys (specifically devised to manage travel to and from the workplace), business travel (all journeys made in the course of the working day), and fleet management (lorries, company cars). The elements of a travel plan are varied. It can incorporate a broad package of complementary measures, depending on the objectives and targets set.

2.2. Background

It is useful here to briefly outline the history of the concept of travel plans. Although travel plans are relatively new in the UK, transportation plans for an organisation have been evident in the US since the late 1970s and early 1980s. Initially, the main focus was to promote car sharing and vanpool schemes to alleviate recruitment and retention issues associated with long journeys to work. In the late 1980s, local authorities in areas of high economic growth recognised the demand management potential of travel plans and began to require these to be implemented in new developments (e.g. City of Pleasanton, 1980).

Interest in travel plans emerged in Europe in the mid-1980s. The Netherlands Ministry of Transport introduced the idea of travel plan measures as a method of reducing traffic congestion. In 1989, targets for the adoption of travel plans were included in the Second National Structure Plan. Within six years, it was hoped that all employers with 50 employees would have their own travel plans, but this was to be achieved by voluntary means. This was revised in 1997 to a target of 42 per cent of these employers "actively implementing" travel plans. Neither target has yet been achieved.

The initial schemes in the UK emerged from interest in the Dutch and US initiatives in the early 1990s. Nottinghamshire County Council was one of the first organisations to adopt a travel plan, and since then a much larger number of private and especially public sector organisations have developed travel plans. In the US, implementation has been encouraged through government legislation, such as that governing air quality in Southern California. In contrast, in the Netherlands implementation has primarily been on a voluntary basis, guided by government requirements. Currently in the UK there are no government regulations to require existing organisations to have a travel plan (although see sections below, referring to requirements for new or expanding organisations).

2.3. Travel plan development in the UK

In the UK, the impetus to develop travel plans has resulted from a number of principal motivating factors, detailed below.

2.3.1 Estate management, accessibility and amenity

This heading encompasses a range of site-specific problems, including parking difficulties, access and egress issues and accessibility and congestion problems.

A significant incentive to develop and implement a travel plan is the need to address a parking problem. In some cases, the space or funds for increasing capacity are simply unavailable, in others, a travel plan is considered a much more cost-effective solution to the parking problem. This is especially the case with less cash-rich organisations, such as hospitals, for which the income stream from parking charges may be attractive. Some organisations have a vested interest in attempting to minimise their parking requirements in order that the land can be used for more commercially viable purposes.

In addition to site-specific issues, accessibility and amenity around the site can be worsened by traffic. This affects not just the employer and employers but also and significantly the wider local community.

2.3.2 External regulation

Planning regulations are an increasingly common motivator for travel plan development in the UK. One of the most potentially powerful tools to encourage travel plan development currently at the disposal of local authorities is the Section 106 Agreement. This permits local planning authorities to forge a legal contract for the provision of measures related to the development as part of the approval of a planning permission; the development of a travel plan is now often included for larger developments.

However, there is enormous variation in the specifications and interpretation of these agreements, with some requiring the developer simply to take all reasonable steps to implement a travel plan, whilst others are required to develop a travel plan with targets and obtain approval from the local authority before the planning consent is agreed. Furthermore, local authorities often do not have sufficient information or knowledge about travel plans to use the Section 106 Agreement effectively. There is insufficient evidence at the present time to indicate that a travel plan of a given nature can produce a modal shift reduction of *x* per cent, and it is therefore difficult to defend stringent requirements for travel plans in S106 planning agreements if they are challenged legally.

2.3.3 Image

A small number of travel plans have been implemented as a result of distinct company ethos and environmental values. In this way, organisations such as The Body Shop and The Royal Society for the Protection of Birds have established travel plans to reflect their corporate environmental beliefs. Similarly, the associated image of a “good” or “conscientious” employer may encourage travel plan development.

The motivation to address "transportation" in many of the large national and multinational companies has emerged from their commitment to "environmental responsibility". Increasingly, organisations are starting to exert pressure on their suppliers to demonstrate "green credentials", through ISO14001 or EMAS accreditation. This can be a motivating factor for companies to start thinking about travel plans, although most UK companies that are ISO or EMAS accredited do so only to comply with environmental legislation (which does not include staff travel to work) (Buchan, 2001).

Enhancing public relations (PR) can also be an extremely important motivator for some organisations to design a travel plan, although it is important to note that PR "serves a purpose". For example, a travel plan is often one of a number of initiatives an organisation may involve itself with in an attempt to promote itself as the "employer of choice" in a region, to assist with recruitment and retention.

2.3.4 Leading by example

Government and local authorities are under increasing pressure to lead by example to encourage other organisations to develop travel plans. For some companies the core business revolves around expanding the "environmental market" and therefore it is in their commercial interest to lead by example to develop environmental products or approaches.

2.4. Travel plan measures

Within those organisations that have implemented a travel plan, a broad range of incentives and disincentives has been used to influence travel behaviour. Measures include, for example, provision for cycling, car sharing, promotion of public transport, telecommuting and teleworking, parking control and new terms and conditions of work (see Table 1).

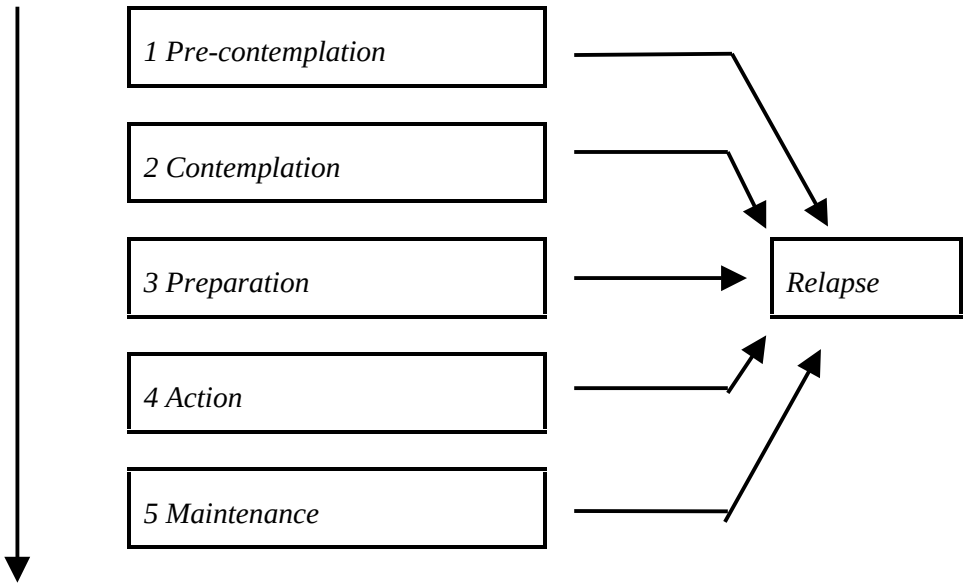
Table 1. **Travel Plan Measures**

Mode	Measure
Overall for whole plan	Travel co-ordinator (member of staff)
	Promotion and publicity
	Implementation process e.g. steering group
Walking	Improved lighting and walkways
	Incentives for walkers e.g. vouchers for sports shops
	Crossings in/adjacent to site
Cycling	Changing/shower facilities
	Pool cycles
	Bicycle loan scheme
	Good, secure parking provision
	Discount purchases of cycles & equipment
Public Transport	Provision of PT information at workplace
	Access to Rail Planner
	Discounted season tickets, paid for by operator
	Liaise with local operators to operate new services
	Pay for new services
	Pay for subsidies for fares on existing bus services
Car share	Staff travel survey to identify potential sharers
	Priority parking spaces for car sharers
	Guaranteed ride home (taxi)
Parking	Reduce parking supply
	Ration parking through permit allocation
	Charge for parking
New conditions of employment	Flexi-time
	Telecommuting/ working
	Company car initiatives (phased out/altered)

2.5. Travel plan development within organisations

To help conceptualise how travel plans evolve within an organisation it is useful to consider their development with reference to a basic stages-of-change model. The model can be used to illustrate the process of changing travel behaviour at a number of different levels. However, the stages of change are not necessarily sequential and it is possible to begin the travel plan process at any stage of the model, and to progress at different speeds. Relapse can occur at any stage during the evolution process, as illustrated in Figure 1. It is also important to note that specific elements of a travel plan may progress at different speeds to one another, depending on the significance of the barriers that need to be overcome before its implementation.

Figure 1. **Stages of Change Model**



2.5.1 Pre-contemplation

At this stage organisations may only be vaguely aware of travel plans, or have only a basic understanding and little idea about how to progress. A strong car culture and an absence of a motivating factor may provide little impetus to proceed. This is currently the stage of a majority of organisations in the UK.

2.5.2 Contemplation

The organisation becomes aware of the purpose and potential of a travel plan. This is often prompted by a specific transport issue, such as parking problems or Section 106 Agreement, which encourages further investigation.

2.5.3 Preparation

An organisation may now devote resources to develop a travel plan. A staff travel survey is carried out to ascertain mode splits, staff attitudes to transport and so on. Negotiations with local transport providers and local authorities may also be undertaken.

2.5.4 Action

At this stage, an organisation starts to implement elements of their travel plan, possibly through a number of smaller stages:

- *Basic* - information provision, interest-free loans, car share scheme;
- *Incentives* - priority spaces, discounted or subsidised tickets, provision of showers and changing facilities, cash-out parking spaces;
- *Disincentives* - changing parking policy, restructuring company car policy.

Most organisations with a travel plan have implemented basic measures and some incentives. To date, few have introduced significant disincentives.

2.5.5 Maintenance

Organisations will need to continue to monitor impacts and manage the evolutionary process of travel plan implementation. This can be a time-consuming process and usually requires the allocation of at least some of the time of a specific staff member to be given responsibility for the day-to-day running of the plan. A continuous programme of review and marketing is required to reflect changes in circumstances and behaviour.

2.5.6 Relapse

This can occur at any stage and may be as a result of a number of factors, such as organisational restructuring, the departure of key members of staff or the disappearance of the problem, which precipitated the plan's implementation.

2.6. Travel plans in UK transport policy

The context for UK transport policy has changed somewhat since 1997, as the Government has, to an extent, been federalised, with the creation of Assemblies for Wales and Northern Ireland and a separate Parliament for Scotland. National policy on travel plans has been devolved to these levels, and the manner in which the policy is pursued varies accordingly. Much of the information referred to in this paper relates to the Department of Environment, Transport and the Regions (DETR) in England, which has been the most active in its promotion of travel planning as a part of transport policy.

Since the publication of the 1989 National Road Traffic Forecasts (NRTF), with their predictions of exponential growth in traffic, there has been a shift in UK transport thinking away from a "predict and provide" mentality, as the forecasts made it obvious that it would be impossible to build enough roads to satisfy demand. Instead, transport professionals have increasingly searched for ways to manage and reduce demand for private road transport. Travel plans, along with many other demand management measures, are part of this.

The idea of travel plans has spread in a number of ways. Firstly, travel awareness campaigns - such as Hampshire County Council's *Headstart* and (originally) Hertfordshire County Council's *Travelwise* - have emphasized the role of employers in increasing awareness of the need to use modes of transport other than the private car. Secondly, the national transport lobby group, Transport 2000, has been active in promoting the idea with publicity and information packs, based (in particular) on experience with travel plans in the Nottingham area of the UK. Thirdly, there have been several national conferences organised on the topic, first in 1993 and then annually since 1996. The UK Confederation of British Industry (CBI) has published a booklet which sets out some ways in which businesses can reduce the environmental impacts of employee travel (CBI/BAA, 1996). Finally, there

is a wide variety of promotional material and guidance available for organisations wishing to pursue travel plans: these are available from government (see below) and from pressure groups such as Travelwise, The UK Association for Commuter Transport and Transport 2000.

Travel plans have taken on a political importance since their incorporation into both the previous UK government's Green Paper, "*Transport - the Way Forward*" (DETR, 1997a) and into the new government's transport consultation document, *Developing an Integrated Transport Policy* (DETR, 1997b). Shortly after taking power, the new UK Transport Minister, Gavin Strang, launched two guides for employers to help them to reduce the impact of their staff's travel. Strang commented:

> *Employers who help fight pollution, congestion and improve staff health with green commuter plans and better fleet management of company cars are leading the way in changing attitudes to car use. I hope that the two new guides will encourage more companies to take action and encourage staff to make more use of public transport, bikes and walking.* (DETR, 4/6/97)

In July 1998, the Government's White Paper on transport policy was published (DETR, 1998), with the intention to reduce transport dependence on the private car. Among numerous policy actions in this White Paper, the "widespread voluntary take-up" and development of travel plans represents one of several policy mechanisms in the crucial area of managing travel demand (sections 5.10-5.25). However, besides instructing its own departments and other parts of the state sector to adopt travel plans, any more interventionist government policy mechanisms to encourage their "widespread voluntary take-up" were conspicuously absent. The Government is committed to *encouraging* existing organisations to take up travel plans, rather than pursuing a more mandatory approach, as has been the case in parts of the USA and now, it appears, in Italy.

Since the publication of the White Paper in 1998, the Government has, however, produced considerable research and advice to organisations on travel planning. Almost all of this is available freely on the Internet at: www.local-transport.detr.gov.uk/travelplan. Examples of guidance include:

- *Travel plan resource pack for employers* (January 2000);
- *Developing an effective travel plan: advice for government departments* (January 2000);
- *Preparing your organisation for transport in the future: the benefits of green transport plans: The Guide* (June 1999).

All (central) government departments have themselves been required to prepare travel plans for all their key buildings (some 1 848 in all). Additionally, local authorities in England are required by the DETR to put in place strategies for encouraging local organisations to adopt travel plans as part of the local authorities' overall Local Transport Plan for their area. This includes developing travel plans for their own buildings.

The DETR has also provided free advice from visiting consultants to organisations to help them to develop travel plans. This programme was begun as a pilot in 2000, but has now been expanded. In addition, some 111 bursaries have been made available to local and transport authorities to employ staff whose job it will be to encourage organisations in their areas to develop travel plans.

2.7. Travel plans and land-use policy

More than any other country in Europe, the UK - but again, particularly England - has linked travel plans to land-use planning policy. The aim of this is to ensure that new developments over a

certain size include a travel plan which works, from the day the development opens, to reduce the proportion of trips made by single-occupant cars.

National government in the UK issues guidance to local authorities on the way in which they should develop planning policy and exercise their powers in relation to planning permission for new development. This is issued in the form of Planning Policy Guidance (PPG) and the last two editions of PPG13, on transport, have given much weight to travel plans, as part of their overall theme of managing the travel demand generated by new development. They advise that local authorities should include travel plans as a part of their own planning policy (the Local Plan document) and should also require developments above a certain size to include a travel plan. Related to this, the latest edition of PPG13 (DETR, 2001) includes new restraint-based national maximum parking standards, the intent of which is to manage the number of vehicles that will be attracted to a new development. This forces developers to consider other ways in which people will be able to reach the development; a travel plan is one facet of this. It should be noted that national Planning Policy Guidance is intended to be interpreted at local level to suit local circumstances and so, as the following paragraphs indicate, the degree to which travel plans are in fact encouraged through the development process varies from place to place.

A survey of local authorities in England carried out for DETR (2001) showed that some 58 per cent of the 284 councils that responded use the planning process to encourage the take-up of travel plans by organisations, through a legally-binding planning agreement. This is much increased from the 8 per cent measured by Bradshaw and Lane (1998), but still shows that a significant proportion *do not* use the planning system in this way. Whilst the reasons for not doing so were not reported, it is likely that, in less economically buoyant areas, local authorities are reluctant to attempt to impose conditions on development that might be perceived to deter the development from locating in that area; a travel plan could be perceived in this way. The corollary of this which was reported in the study was the geographical distribution of councils that *do* use the planning system to secure travel plans: unsurprisingly, these councils are concentrated in the economically buoyant South-East of England and the West Midlands.

The use of travel plans in the land-use planning process is a relatively new practice: most councils in England have only been using them for one or two years. This leads to some practical difficulties:

- There is still relatively little data on the level of trip reduction that can be achieved by travel plans. Thus councils find it difficult to judge whether a travel plan that has been proposed by a developer is capable of achieving the trip reduction potential that the developer claims. This is critical in trying to assess the impact of the development on the local road network and therefore any contributions to improved infrastructure that may be required from the developer.

- Developers are not used to the requirement for a travel plan and do not know how to write one. They submit very poor travel plans and there is then a long process of education and negotiation between authority and developer before the travel plan is accepted.

- There is no consensus between local authorities on whether to require developers to attain particular mode share targets for the trips generated by developments, or whether only to ask a developer to make a "good faith" effort to implement a travel plan.

As more data and experience are gathered then these difficulties will be overcome. As noted below, recent work on the evaluation of travel plans may be of particular assistance. But it appears

that, for the time being, travel plans are an accepted part of UK land-use planning practice and it is this, perhaps more than any other motivating factor, that is driving the wider implementation of travel plans in this country.

3. EXAMPLES OF EXISTING PRACTICE

3.1. Introduction

The following sections of the report consider examples of travel plans that have been implemented in the UK. They first look at overall levels of take-up before considering some examples that typify travel planning in its different forms. These include an individual private sector employer, a municipality, a hospital, a university and two business parks. Some examples of the impact of travel plans on modal split is then presented before an attempt is made to generalise the results. It should be pointed out at this stage that examples of *individual* employers' travel plans are discussed, as well as travel plan initiatives that have occurred in areas occupied by several different employers, such as a business park.

3.2. Levels of take-up

Surveys to ascertain levels of plan take-up in the UK were first carried out in 1997, by Bradshaw and Lane (1998) and Rye and MacLeod (1998). These found, respectively, that 8 per cent of English and Welsh local authorities and 4 per cent of a random sample of larger UK employers (with 100+ employees) had travel plans. A much larger survey of English travel plan activity was carried out for the DETR in early 2001 (DETR, 2001) and this shows that activity has increased significantly since the late 1990s. It has also revealed patterns in the distribution of activity that are echoed elsewhere in Europe.

The DETR survey used several different questionnaires, sent to all English local authorities and a sample of businesses, hospitals and higher education institutions. The response rates were:

- Local authorities – 296 of 388;
- Businesses – 554 of 1 000;
- Hospitals – 45 of 60;
- Higher education – 29 of 40.

The proportions of these respondents that have a travel plan in place were respectively 23 per cent, 7 per cent, 62 per cent and 50 per cent. (For the latter two groups, these percentages include those that are developing a travel plan as well as those with a travel plan in place and operating.) This demonstrates that travel plans are far more frequently implemented in the public sector than in the private sector. This is for three main reasons:

- Whilst not compulsory for local authorities, there is a strong moral obligation upon these organisations to have a travel plan, since they are supposed to "lead by example" and indeed, in the survey, many of them cited this as a key motivation for their travel plan.

- Hospitals are required to develop measures to control their transport impact as part of the UK National Health Service's own risk management process, known as the Controls Assurance Scheme. Thus hospitals must conduct a systematic review of their transport impact, and then take steps to reduce this. Additionally, many hospitals are growing and/or relocating. This puts pressure on the land that is available for parking, and often requires the hospital to apply for planning permission, which will include a requirement for a travel plan.

- Higher education institutions are, in their location and estates strategies, in many ways similar to hospitals. Shortage of parking, constrained sites and plans for redevelopment force them to find ways to manage transport demand.

- In contrast, relatively few private sector employers find themselves in such a predicament. The private sector includes a much wider range of sizes of organisation than either hospitals, higher education institutions or local authorities. Private sector companies also feel little need to lead by example, or to introduce travel plans for other altruistic reasons. Indeed most private companies are bound by law (the Companies Act) to maximise profits for shareholders and, therefore, to spend money without justification on the "greening" of staff travel would be illegal. Thus, in the main, it is those private sector organisations with *problems* – be it with parking, recruitment of staff due to poor transport links, or on-site congestion – that develop travel plans.

Travel plans appear to be mainly limited to large organisations – those with at least 200 employees. There are examples of smaller organisations with travel plans but they are rare. There are several reasons for this: smaller organisations have fewer resources to devote to such "peripheral" activities as a travel plan; the immediate transport problems of smaller organisations tend to be felt less acutely (for example, overspill parking can be more easily absorbed onto surrounding streets); and smaller organisations may see less of a link between their own travel patterns, and problems on the road network around their site.

The DETR research (*op. cit.*) identified a clear tendency for organisations with travel plans to be located in urban and suburban locations, rather than in rural areas. It was, however, unable to establish any regional pattern in the distribution of travel plans amongst private sector organisations. In contrast, it found that, amongst local authorities, travel plans were more likely to have been implemented in certain parts of England: the South East, Greater London, the South West and the West Midlands. With the exception of the South West, these are the most congested and most economically buoyant areas of the country. Similar work in Scotland (Scottish Executive Central Research Unit, 2001) has also shown this clear and unsurprising trend north of the border: organisations with travel plans are concentrated in Edinburgh and Aberdeen and, to a lesser extent, Glasgow: all major cities with congestion problems.

Within urban areas, organisations located in central areas have less need to develop travel plans. This is because their location at the centre of the local public transport system, and in the most congested part of the urban area, leads to a much larger proportion of their staff travelling to work by means other than the car. At its extreme in central London, only about 10 per cent of staff drive to work. Organisations in central areas are also less dependent on private transport to provide accessibility for staff who do not have access to a car, so recruitment difficulties caused by this are less acute. Travel plans appear to be required more for organisations that are located on the edge of

urban areas or in suburban areas; they find that they cannot satisfy all their accessibility needs by car, but that public transport is also not adequate because of their off-centre location.

Having considered these general levels of travel plan take-up, some individual employers' travel plans will be discussed, to typify the types of initiative that are being implemented in different parts of the UK. This selection of travel plans is not random and the examples described below tend towards best practice. It will be noted that most of the case studies considered below are motivated, at least in part, by parking problems, site expansion and related planning requirements. Where such motivations do not exist – as in most cases – then travel plans tend only to reach the stage of including very cheap, basic measures. The implications of this are discussed in sections 3.4 and 3.5.

3.3. Examples of travel plans

3.3.1 Sheffield University

Sheffield is the main city in the South Yorkshire conurbation, in northern England. Sheffield University has an inner suburban campus with 12 000 students and 4 000 staff, but only 1 000 on-site parking spaces. Up until 1997, it allowed all staff and students living over one mile from campus a parking permit, and 8 000 were issued, leading to a parking "free-for-all". To solve this problem, it has implemented a travel plan that includes the following measures.

Car parks are divided into categories A, B and C. All staff may apply for a permit to park in any car park, and students may apply for B and C permits. Category A parking is secure and mostly underground. A permit costs £28.75 a month and at this level demand is roughly level with supply, so users are guaranteed a space. Category B permits vary with income: those on less than £16k pay £5.75 a month, those on £16-28k pay £11.50 a month and those on more than £28k pay £17.25 a month. Cleaners pay nothing but must be off campus by 10.00 am. Category C car parks are "pay-and-display", £2.20 per day, £1.20 for four hours or 50p for an evening.

Permits for category A and B car parks are awarded on a points/criteria basis. Applicants gain points if they need a car for work; have to drop children *en route* to the University; live far from the University; and/or have no direct bus or tram route to the University. There is an appeals body, consisting of a member of personnel and a union member, which assess appeals from those staff who feel they have been refused a permit unfairly. Sufficient category B permits are awarded to ensure that these car parks are always full.

The money raised from car park charges is ring-fenced to fund transport alternatives and security measures, such as:

- Campus signing at £100/sign (continual rolling programme);
- Campus maps;
- Cycle parking, with secure covered parking soon to be installed;
- University public transport guide (£2 000);
- Lighting - £800 for car park floodlights;
- CCTV - £1 500 per camera;

– A one-km extension of the existing 60A/60B bus from campus into University Halls and an increase from 2 to 3 buses per hour to use as a park-and-ride service - £4 200 per year subsidy;

– Local public transport information on Intranet;

– Improved pedestrian security.

While figures are not currently available, this travel plan - which fits the "action–disincentives" stage of the stages-of-change model - has been correlated with a reduction in the proportion of staff and students driving alone to work.

3.3.2 Nottingham City Hospital, Nottingham, East Midlands

Nottingham was one of the first cities in the UK to try to implement travel plans, and there are now a number of employers in the area with active travel plans. For more information, the reader is referred to http://utc.nottscc.gov.uk/index.htm. However, in this paper, only one example is discussed, since one aim of the paper is to demonstrate that travel plan activity is not confined to a single part of the UK.

Much of the information in this section is based on Walker (2000). Nottingham City Hospital is located about 5 km to the north of the centre of Nottingham, a conurbation of about half a million people, itself located about 165 km north of London. The site has 5 000 staff and generates about 14 000 two-way car trips per day (including visitors, patients and deliveries). The site is spread out across a large campus and is undergoing redevelopment and new construction. There is a need - driven partly by this expansion and associated planning requirements - to reduce the number of car trips made by the site, in the context of an overall increase in trips to the site.

To address this need, in 1997, the hospital introduced a number of measures in its travel plan. These included:

– Improved pedestrian and cycle access to the site, including formalising existing informal accesses ("gaps in the boundary fence") and improving on-site security;
– Installing improved cycle parking, showers and lockers;
– Negotiating with one of the two main providers of bus services in the city, so that three cross-city routes now terminate on-site at the hospital. These services are run on a commercial basis (i.e. for profit) with no subsidy from the hospital;
– Transport information on the Intra- and Internet sites.
– Parking charges of £1 to £2.50 per day, with ring-fencing of half of this revenue (£250 000 per year) for improving non-car-based transport links to the hospital.

The results of this travel plan are discussed in section 3.4 below. Clearly, if this plan is compared to the stages-of-change model set out in section 2.5, Nottingham City Hospital is at the stage of action, incorporating both incentives and disincentives.

3.3.3 Fife Council, Fife, Scotland

Fife Council is typical of many UK employers that are adopting travel plans, as it formally adopted its policy only relatively recently, in May 2000. The key motivation for the plan is to lead other local employers by example. The key target for the plan is to reduce solo car travel to work by

4 per cent by 2005 and 10 per cent by 2010. To do this, a travel survey has provided a baseline of existing travel patterns. Measures will be implemented, including safe and secure cycle parking, lockers and showers, public transport information and a car-share database, with reserved car parking spaces for car-sharers. In addition, the council will investigate potential public transport season ticket discounts for staff.

This plan is at the "basic action" stage of the stages-of-change model. Because Fife Council has fewer urgently pressing transport problems compared to many of the other case studies presented here, management has been less willing to justify expenditure of more resources on the plan at this early stage in its development. The majority of plans in the UK are at this stage of development.

3.3.4 Hewlett Packard, Edinburgh, Scotland

At the Hewlett Packard (now Agilent) site on the outskirts of Edinburgh, the travel plan was implemented for a number of reasons:

- General environmental concerns/social responsibility;
- Specific health and safety concerns regarding the site car park circulation and capacity, particularly in the context of a large increase in employee numbers in 1996-97 and again in 2000;
- To reduce the risk of overspill parking on local streets;
- To offer employees greater choice of modes to work.

The main components of the travel plan are low cost and low intervention, as follows:

- Cycle parking, showers and lockers;
- Preferential parking for car-sharers with three or more in the team; a car-share database to promote carpool formation;
- A discount of up to 40 per cent on rail season tickets to Dalmeny station (adjacent to the site) negotiated with and paid for by the train operator, Scotrail;
- Promotion of and information about alternative modes;
- The phasing out of company "perk" cars and their replacement with clean-fuelled pool vehicles.

Interviews with senior management revealed that they were happy to keep the travel plan at this level but would be unlikely to commit further significant resources to it, unless there were changes in the external environment (such as introduction of a local government levy on the employer for each employee parking space they provided – a possibility at the time). Thus, a full cost-benefit evaluation of or business case for the travel plan was not seen to be necessary. HP implemented its travel plan in 1997 in tandem with expansion of on-site car parking, and further increases in staff numbers in 2000 are being dealt with using a similar "two-pronged" approach.

3.3.5 Stockley Park Business Park, near Heathrow Airport, West London

Stockley Park Business Park is now entering its third and final stage of development. Since 1998, the developer, the Stockley Park Consortium – which builds offices, then sells or leases them to individual employers – has operated the Stockley Transport Plan. The plan commits the developer to work with occupiers to reduce car usage by 20 per cent over a five-year period by encouraging people to use public transport, cycle or car share. The plan is available for download at www.stockleypark.co.uk.

The plan is motivated by a desire on the part of the developer to maximise the accessibility of the site, to attempt to maximise productive land use (i.e. devoting less space to car parking) and the plan is also driven by planning requirements.

Key aspects of the plan have included, since 1998:

- An Internet site, with travel information, a car-sharing scheme and a virtual bicycle-users' group;
- A travel co-ordinator;
- A survey of all staff at the park;
- Publicity and information;
- On-going support for two key bus services, linking the park with Heathrow (about £50 000 per year);
- A pledge of up to £2.3 million in contribution to further related sustainable transport improvements, including a new railway station.

The results of the plan are further discussed below. This plan is at the "action – incentives" stage of the stages-of-change model. Individual building occupiers control the car parking associated with their building and so the developer cannot easily introduce disincentives to car use, e.g. parking charges.

3.3.6 Gyle/New Edinburgh Park (NEP), Edinburgh

The Gyle/New Edinburgh Park is a large and growing employment area on the western edge of Edinburgh. The Gyle is an industrial estate that has grown organically, whilst New Edinburgh Park (NEP) is a high-profile planned business park, with a management company. The area also includes a major regional shopping centre. Originally attractive because of its excellent accessibility by private transport, it now finds its sustainable growth somewhat threatened by a lack of public transport and the need to devote large areas of valuable land to car parking. Such pressures led to joint working between employers on travel plans.

Certain Gyle/NEP employers have worked together on travel plan issues since November 1998, when they formed a Travel Forum that has continued to meet every six weeks until now. This is because, although they have individual problems with parking and transport (to varying degrees), they also recognised that these problems are in part shared and therefore require joint solutions. At the same time, some individual employers have developed their own travel plans. It is certainly the case that certain employers on the Forum have been much more active than others. One, the Royal Bank of Scotland, has been subject to acute parking problems and so has put most resources into travel plan measures, with significant results. The management company in NEP, which manages the business park on behalf of all occupiers, has also been very active because their site is still expanding and subject to planning conditions relating to transport.

The joint activities of the group have included:

- Data gathering/sharing;
- Lobbying public transport providers, which has resulted in much improved services to the city centre;
- Lobbying the local council for better parking control, which has also brought results;
- Attending meetings of the forum;

– However, there has *not* been any joint funding of services or other measures as yet (May 2001).

Individual employers' travel plans include, or have included:

– Discount bus tickets and promotion of public transport;
– Car-sharing and (within the same enterprise) linked parking management (parking permits are only given to car-sharers);
– Cycle facilities;
– Bus services, on a temporary basis, paid for by the company.

The Gyle/NEP shows that joint working on travel plans has some benefits but that companies with a problem will continue to work alone even if there is no joint action. Where a management company acts on behalf of many organisations, as in the New Edinburgh Park Business Park, there is more scope for effective area-wide initiatives.

3.4. Results of travel plans

There is still a paucity of data on the results of travel plans. Some examples from data supplied by the DETR and elsewhere are set out as follows. These data are based on surveys of staff carried out before and after the implementation of a travel plan. Since only the more motivated organisations reach the stage of "after" monitoring, it is likely that these organisations represent best rather than typical practice.

– Astra Zeneca, a large and growing pharmaceutical firm located to the south of Manchester, has decreased individual car commuting to its site by 8 per cent over the past two years against a background of increasing staff numbers;

– At Buckinghamshire County Council's headquarters in High Wycombe, a travel plan that includes discounts of 30 per cent on local buses and 50 per cent on train fares has secured a reduction of 15 per cent in vehicle-km travelled to work by staff, over an 18-month period;

– Nottingham City Hospital reduced its individual car commuting by 17 per cent between 1997 and January 2001;

– The Head Office of a supermarket chain in Bracknell, to the west of London, launched a free bus link between the railway station and the site in June 2001. In four months, the bus usage had increased by 25 per cent;

– At Stockley Park, car use decreased from 88 per cent in 1997 to 84 per cent in 1999; public transport use increased from 10 per cent in 1997 to 12 per cent in 1999; cycling has more than doubled. This is in the context of an increasing number of employees.

– A staff travel survey carried out at Hewlett Packard Edinburgh in 1997 and replicated in 1999 found a statistically significant modal shift: the proportion of staff driving alone fell from 65 per cent to 59 per cent due to an increase in rail use from 8 to 14 per cent.

These data illustrate that travel plans in the UK have been shown to work. However, there are too few results available from the UK at present to be able to generalise. In order to begin to estimate the effects of the traffic reduction achieved from travel plans, it is necessary to consider countries with a longer history of travel plan activity – notably the US and the Netherlands.

In the US, under Federal Clean Air Law, travel plans were mandatory for organisations with more than 100 staff in several major urban areas during the early 1990s, until the legislation was repealed due to lobbying from businesses. However, the State of Washington retained its own state law, requiring travel plans in its most urban areas for employers with more than 100 staff. Between 1994-99, the percentage of employees who drove alone to work fell from 72 per cent to 68 per cent (a 5.5 per cent reduction) (Washington State TDM Office, 1999). About half of employees in the regulated areas work for employers that have to have travel plans, so the law affects about 12 per cent of all trips made in these areas, since about a quarter of all trips are made to or from work.

In the Netherlands, reviews of the trip reduction achieved by travel plans have been carried out by Touwen (1997) and Ligtermoet (1998). They found a strong relationship between the measures in the travel plan and the trip reduction achieved. They concluded that, on average, the trip reduction from a travel plan was as follows:

- About 5-8 per cent for a plan with only basic measures that cost little;
- About 8-10 per cent for a plan with the basic measures and other more expensive measures, such as additional bus services to the site and reduced fares; and
- About 10-15 per cent for a plan with all the above measures, and disincentives to car use, such as car park charging.

In the UK, very few travel plans include disincentives. Taking into account the results from the UK, the US and the Netherlands, a liberal assumption of the average effectiveness of UK travel plans might be a 6 per cent reduction in trips alone by car to work.

The UK workforce totals some 22 205 million people, excluding those in the armed forces and the self-employed. These people are not distributed evenly between categories of employer, nor between sizes of employer. Table 2 shows the numbers of employees that work in an organisation with a travel plan, assuming that the levels of plan take-up found in the DETR (2001) study can be extrapolated to all UK organisations. This also assumes that 50 per cent of private sector employees work in companies with fewer than 100 people, which would be unlikely to implement travel plans. By applying average mode share and distance travelled to work, it is possible to calculate in very broad terms the vehicle-km reduced by travel plans in the UK at the present time. The estimate in Table 2 indicates that travel plans have removed up to 128 000 two-way trips to work from British roads. This sums to 3 700 000 km per day, which equates to 0.6 per cent of the total vehicle-km travelled to work by car overall. Given the assumptions on which this figure is based, it should not be treated as a precise figure but rather an indication of the order of magnitude of traffic reduction currently possible. It would increase significantly were levels of plan take-up in the private sector to also increase.

Data on travel plan costs is notoriously difficult to gather (see, for example, Schreffler and Organisational Coaching, 1996). However, indications are that costs are low – perhaps Euro 1.50 per trip removed from the road network per day – compared to the cost of new infrastructure. Therefore, if these levels of trip reduction can be achieved more widely, travel plans can be seen to be a highly cost-effective method of managing our limited transport infrastructure (Ernst and Young, 1996).

Table 2. **Effect of plan take-up on total km travelled to work, Great Britain (all figures except percentages in thousands)**

Employer type	Plan take-up	Employees		Current % by car	Current car trips	Car trips after plan	Reduction in km
		Total in GB	Covered by TP				
Hospitals	62%	1 500	930	70%	651	612	1 133
Higher education	40%	750	300	70%	210	197	365
Government	60%	1 303	782	70%	547	514	952
Private	11%	18 652	1 026	70%	718	675	1 249
Total		22 205					3 700/day
Average journey to work distance by car 2-way						29 km	
Total v-km Britain, trips to work/year						155 000 000	0.6%

Sources: ONS (1999); HMSO (1998); DETR (2001).

3.5. Barriers to wider travel plan take-up

The report now turns to discuss very briefly the reasons why travel plan take-up, particularly amongst private sector employers, is lower than it might otherwise be.

3.5.1 Companies' self interest and internal organisational barriers

To most private companies, employee travel to work does not present them specifically with any great problems. Thus it would be irrational for them to spend money on what is essentially an altruistic venture: influencing the way that their employees get to work, to realise wider societal benefits. It is only when there are specific operational problems affecting that company that it becomes rational to devote resources in this way. There are exceptions to this general rule, such as those companies with an environmental image, but this is also rational, since their image is linked to their position in the market place.

The lack of a rationale for a travel plan obviously affects, negatively, the business case for spending resources upon it. It also means that, even where there are staff within the organisation that are committed to a travel plan, only if they are very senior will the plan command many resources.

Whilst these arguments hold particularly true for the private sector, they are also true for much of the public sector.

3.5.2 Lack of regulatory requirements for travel plans

Where there are regulatory requirements for travel plans, more are produced - as paper documents. The evidence from Washington State, cited in 3.4 above, also demonstrates that regulation can indeed impact on the percentage of trips made by car alone to work. In the UK, planning requirements - a form of regulation - are probably the largest single motivating factor for travel plans. But the regulation must be effective; travel plans must be checked and regulators able to predict with some certainty that they will work; and monitoring must be in place to measure any effects. The resource requirements of such a regulatory system must not be underestimated.

3.5.3 Personal taxation and commuting

In the UK, historically, any employer contributions to employees' commuting costs have been subject to personal taxation. This has had an impact on the type of measures that are implemented in travel plans in the UK, and on the number of organisations willing to implement potentially taxable measures - which tend to be the more effective (e.g. large discounts on public transport) (Potter, Rye and Smith, 1998). This situation has been gradually changing over the past three years, such that many travel plan measures are no longer taxable. The Government is about to consult on the possibility of making employer contracts to carry employees on local bus services no longer taxable. Thus these barriers are gradually being removed.

3.5.4 The nature of public transport provision in the UK

Outside London, the bus system – the backbone of most areas' public transport – is operated in a deregulated environment, for profit. This makes it extremely difficult for employers to secure additional services to their sites, particularly if these are out of town or city centres, since these are unattractive to public transport operators due to their highly peaked demand. Also, until the last two to three years, instability in the network, poor information and often very old vehicles have made bus travel very difficult to market to employees as a desirable product. This situation is changing gradually as bus operators have improved both the quality of their services and their marketing.

The perception of rail services has also suffered recently due to difficulties with infrastructure maintenance and safety. Overall, therefore, public transport remains a difficult product to market, yet it is key to the success of most travel plans.

3.5.5 Lack of examples due to novelty of the concept

Travel plans are still a new idea, and so there are very few examples of their having worked successfully, particularly in the UK. This makes it difficult to market what appears to be an untested idea. This paper has presented a number of results from travel plans; as more are gathered, this barrier, too, will gradually be overcome.

4. CONCLUSIONS

This paper has shown that travel plans can work, and make a significant contribution to modal shift at the site level. At the network level, however, the impact is much less clear, since trips removed by a travel plan may simply be replaced by others that were previously suppressed by congestion. Travel plans also have an awareness-raising impact that may contribute to modal shift.

The factors that contribute to the success of travel plans are, firstly and most importantly, a site-specific problem with congestion, parking and/or transport-related staff recruitment. Additionally, a supportive organisational culture can be of great benefit, as can staff dedicated to the travel plan.

Joint work between organisations has also been shown to be of some use in raising awareness, building morale amongst transport staff in companies and lobbying public transport providers.

There are barriers to travel plan implementation, but these can be overcome. Marketing by organisations and by public transport operators *can* improve often poor perceptions of alternative modes. In certain types of organisation, a rational and technical approach which identifies the costs and benefits of travel plans, can pay dividends in gaining management support, which is critical. However, a travel plan may never be needed in the first place if the organisation locates in the right place with appropriate (public transport) infrastructure and reduced parking – at nodal points in the public transport network, for example. This is an issue for the land-use planning system that goes beyond travel plans.

The travel plan literature, and experience, shows that the biggest barrier to the implementation of travel plans is the organisation's perception that there is no problem with transport or parking. The choice for policymakers is, therefore, whether they wish to "create such conditions" through planning control on new development, parking taxes or traffic restraint.

This paper has demonstrated that travel plan activity in the UK has increased considerably over recent years. It has also shown that travel plans may already be reducing peak hour trips to work and have considerable potential to do more.

The wider adoption of travel plans is partly the result of organisations' own transport difficulties; also, significantly, because of the much increased importance of travel plans in land-use planning. Essentially, local and national government, especially in England, have chosen to "create a problem" for new/expanding organisations through requirements for travel plans in planning agreements, and by reducing the amount of parking that is allowed in new development. The difficulty of this for wider travel plan implementation is that it does not affect existing organisations, and it is critically dependent on the level of economic activity, which drives planning applications. The question remains for government: if it desires the wider adoption of travel plans by existing organisations, then it must find some way beyond "encouragement" to do this – or otherwise accept that travel plans will be limited mainly to new/expanding organisations.

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SUMMARY

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1. INTRODUCTION

A recent survey of 3 735 businesses, carried out by the British Chambers of Commerce, provides a sharp reminder of the importance of transport in the economic life of Britain and of its current shortcomings. The findings include:

- 87 per cent of UK firms experience problems with road congestion;
- Of these 87 per cent, over half have suffered increased costs and/or been forced to raise prices;
- Over a third have lost business as a result of transport and cost problems.

Businesses in London suffer more than in any other region from the effects of road congestion. Almost half of these companies (49 per cent) report lost business as a result.

Opinion polls of the general public have shown that over 50 per cent of car drivers now find their regular journeys by car to be subject to delay and to be both frustrating and stressful. National traffic forecasts are predicting a doubling of traffic volume on the roads of Britain by 2010 and traffic speeds in central London are now slower (at 10 mph) than they were at the turn of the century. London's M25 orbital motorway was designed so that it would not be at capacity until 30 years after opening (a forecast that turned out to be wrong by 29 years and six months) and the British Chambers of Commerce calculate that the UK economy is losing £20 billion each year through traffic congestion alone.

There can be very little doubt that current transport policies and transport behaviour from the individual to the level of government are detracting from the efficiency, productivity and profitability of UK public limited companies (PLC).

Transport problems are frequently perceived as being very difficult to solve and this has led to an incrementalism and lack of imagination in central and local government policy, where new road links are added, car parks are built and public transport services allowed to decline in frequency and reliability. This results in more congestion and more frustration. International experience shows that incrementalism of this kind does not work and that bold measures to bring about a better balance of different types of transport does work. In Portland (Oregon), a new mass transit system has taken cars off the roads and revitalised a declining down-town area. In Zurich (Switzerland), a large-scale, integrated, highly efficient and common-ticketed public transport system has produced low rates of car use in the city and very high rates of public transport use. In Groningen and Delft in the Netherlands, over 50 per cent of all journeys to work are by bicycle. In York (UK), over 20 per cent of all journeys are by bicycle and in Amsterdam, road space is being removed and car parking reduced to enhance the environment of the historic core area.

In all areas where bold steps are being taken the response is positive: car users are willing to shift to another mode of transport and there is agreement that everyone, including businesses, gains from this transition to a different kind of transport model.

One of the bold steps currently being taken is the rapid development and diffusion of company transport plans in the UK. A large number of the leading companies in the UK have now adopted transport plans and the UK Government is currently funding a free (to the client) transport advisory service that will provide five days' consultancy input to companies requesting this service. In the next twelve months, 250 companies will receive support of this kind at a total cost of £500 000 (GBP).

2. A COMPANY TRANSPORT PLAN VIGNETTE: THE CASE OF PFIZER IN KENT

Pfizer is a US-based, multinational pharmaceutical company. It is a very successful company and has its main UK manufacturing and research facility in Sandwich, Kent (near Dover) and a European corporate headquarters in Walton Oaks, Surrey (30 miles to the south of London). Pfizer has adopted company transport plans at both locations and has done this to deal with unacceptable levels of traffic congestion which cause delay to staff and adversely affect staff productivity. Pfizer's manufacturing plant in Kent, whilst not in one of the UK's most congested areas, has experienced significant amounts of congestion and frustration amongst staff, which the company regards as unacceptable.

The conditions on the main road from Ramsgate to Deal/Dover provide a perfect microcosm of the international transport crisis. Here, 20 000 cars per day struggle at the two main peaks to get to their destinations. The road does not have the capacity to cope with this volume of traffic and detracts significantly from the quality of life of those who live within 500 metres of the centre-line. It also bisects an area of significant landscape and ecological value, which severely limits the potential for expansion/replacement. The flows of vehicles constantly interfere with each other, as one cohort of vehicles struggles with another for access to a roundabout or for the privilege of executing a right-hand turn. Sandwich, which is a jewel in the crown of Britain's historic towns, is transformed into a large traffic roundabout for many hours a day. It is one of the best examples in Britain of a population under siege from air and noise pollution and a rich cultural and architectural heritage sacrificed to the journey to work by car and unprotected by its bypass.

The traffic situation on this corridor is already a serious source of concern for Pfizer staff. Many staff with demanding and responsible jobs are arriving for work in a less than well-composed frame of mind. They are then met by difficulties in finding a parking space and walking back from the parking space over long distances to the office location. This situation will deteriorate further as Pfizer expands. This is not an acceptable situation for a company at the leading edge globally in its economic sector, preparing to enter the 21st century on an up-beat note. The situation requires urgent attention.

Company transport plans are a vital part of overall logistics and master-planning. Attention given to balancing the overall use of transport modes can manage the traffic situation so that congestion is eliminated and staff are "delivered" to their eventual destination with as little fuss and delay as possible. Managing the transport function in this way allows the maximum potential productivity of all staff to be fully realised and expansion plans to be achieved without major blockages and bottlenecks. It also guarantees a co-operative relationship with the planning authorities and conformity with current and future government transport plans.

Company transport plans have been endorsed by the UK Government. The Minister of Transport has given a ringing endorsement to "green commuter strategies":

> *"..it is imperative that we reduce our dependency on the car. That is an objective to which this Government is firmly committed. However it is not something that Government can or should achieve on its own. We have shared aspirations, we also need shared actions. Green commuter plans are one way in which organisations of all sizes, and in all sectors, can make a valuable and cost effective contribution to achieving our aspirations...I believe that employers have a duty to their organisations and staff and to the wider community to ensure that the impact of their transport patterns on the environment is kept to a minimum."* (Dr Gavin Strang, Foreword to "Changing Journeys to Work", Transport 2000, London, 1997)

A company transport plan (sometimes referred to as a "green commuter strategy") depends on co-operation and a consensus that changing behaviour is in everyone's interest, including the interests of residents in the transport corridor and in Sandwich. The process itself builds a strong sense of identity and shared ownership of problems and solutions that has a wider significance for team building and productivity increases in the company as a whole. Pfizer staff have responded enthusiastically and positively to the idea of a transport plan and have now embarked on one of the more demanding and innovative strategies of all UK companies (see below).

3. THE BUILDING BLOCKS OF A COMPANY TRANSPORT STRATEGY: PFIZER IN SANDWICH

A company transport strategy is unique to that company and is conditioned by the geography of the location, the culture of the company and the enthusiasm for managing change within the organisation. These elements are built into this strategy through the "capture" of information from those central to the process of change. The main sources of information used are:

1. Detailed discussions with senior managers responsible for master-planning and transport;
2. A questionnaire sent to out to all Pfizer staff and to contract staff, resulting in 2 200 completed returns;
3. Focus group discussions with approximately 250 staff in groups of 3-10 in size;
4. Discussion with local authorities about their plans for the area and the transport corridor serving Pfizer's main site;
5. Discussion with privatised transport providers (Stagecoach and Connex South East);
6. Discussion with transport consultants about the corridor study on which Pfizer and the local authorities are represented;

7. Discussions with the regional transport authority (Kent County Council) about the allocation of government funds for rural buses and the preparation of their funding bid for the next round of transport funding from central government.

4. BENCHMARKING

An important source of information about what is feasible and practical in transport plans lies in experience elsewhere. UK experience in this area is still relatively new but there are a number of well-established company transport plans in existence. These include:

- Boots PLC Nottingham;
- Queens Medical Centre, Nottingham;
- Derriford Hospital, Plymouth;
- Riverside NHS Community Trust (Kensington, Chelsea, Hammersmith and Fulham);
- Stepping Hill Hospital, Stockport;
- Bristol Frenchay Hospital;
- Southampton General Hospital;
- Stockley Park (near Heathrow Airport);
- Manchester Airport.

Much of the UK experience with transport plans lies with the National Health Service (NHS), which has plans in place at large hospitals. In this paper, the emphasis is more on the private sector and companies in the manufacturing and service sectors of the economy.

Outside the UK, there are best-practice examples in the Netherlands (Port of Rotterdam) and Germany (BASF). At the BASF site in Ludwigshafen, car sharing has reduced car trips to the site by 2 600 per day. In Munster (Germany) and Bologna (Italy), new "mobility centres" have been established which will provide a full range of information on all the public transport and cycling options for journeys in those cities, particularly travel plans for commuters. In Kamloops (British Columbia, Canada), commuter strategies are expected to reduce road construction costs from $120 million to $15 million.

In California, employers who are located in areas not meeting air quality standards and employing more than 50 staff are required to establish a "parking cash-out" programme. This requires employers to offer commuters the option of receiving cash in lieu of any parking subsidy offered. Its goal is *"to level the commute subsidy playing field between people who drive alone to work and people who rideshare or take public transit"*. The theory and the practice is that employees will take the cash and not drive to work alone.

In Denver (Colorado) the Regional Transport Authority has instituted an "Eco-Pass" programme which purchases transit passes for full-time employees. The objective is to encourage commuters and others to switch from the car to public transport. The cost is met by the employer but is fully tax deductible and is "enhancing morale and productivity". The pass also brings with it a guaranteed ride-home service in case car-share or transit cannot cope with an emergency (e.g. a child sick at school) or the failure of a share arrangement. In the summer of 1996, the Eco-Pass programme had

over 1 100 participating companies with over 32 000 employees. In 1996, each employee who used the Eco-Pass card eliminated 300 single-occupancy vehicle trips, drove 5 000 less miles, saved 200 gallons of gasoline and reduced air emissions by 200 pounds of pollutants.

Washington State has a "Commute Trip Reduction" (CTR) Law which was passed in 1991. Under this law, all employers must participate in a programme to reduce single-occupancy vehicle use (SOV) and vehicle miles travelled (VMT) on a 1992 base:

by 15% on 1.1.95

by 25% on 1.1.97

by 35% on 1.1.99

By 1995, nine hundred employers were participating and the following reductions realised:

- 80 million VMT were eliminated;
- 12 000 vehicles were removed from the roads during commute times;
- Carbon dioxide emissions were down by 33 000 tons per year;
- Gasoline consumption had been reduced by 4.5 million gallons.

5. COMMUTER MANAGEMENT STRATEGIES

A commuter strategy is based on the existence of "win-win" scenarios and the ability of well-informed groups of employees to detect the advantages of making a shift. A shift away from the single-occupancy vehicle (SOV) is frequently the core objective of a commuter strategy and the advantages for the person who makes the shift are very clear:

- A less problematic journey to work;
- Less time spent in traffic jams and in queues waiting to get into and out of car parks;
- Financial savings;
- Improvements in health for those who walk and/or cycle more;
- More time to spend on social, leisure and family activities;
- A better environment in the work place;
- Time savings arising from better-run meetings;
- Higher satisfaction from higher productivity;
- More opportunities for quality thinking and working time for those who choose to work at home one or two days per week.

For the company, the advantages are equally impressive:

- A healthier, more productive and less troubled workforce;

- A site which is impressive for staff and visitors alike and with all the qualities of efficiency, environmental excellence and ambience that one would expect from a world leading company;

- The space to expand and develop without the irritation of gridlock and thrombosis looming up every time 100 extra staff are hired;

- The public relations (and, in this case, real as well as publicity) value of improved environmental conditions for the local residents of the Ramsgate-Sandwich corridor and of Sandwich itself. A company with high standards will not want to be the major source of health-damaging pollution in this corridor.

All these gains can be captured by the company and its staff. The benefits are real and quantifiable and are reviewed with evidence in DETR (1999).

The principles of a commuter strategy are now well established:

5.1. A clear hierarchy of preferences

A commuter strategy establishes a hierarchy of preferences for the mode of transport (from the highest preference to the least preferred):

- Walking;
- Cycling;
- Public transport and walking;
- Public transport and cycling;
- Car sharing (two or more in one car);
- One person in one car.

The objective of the strategy is to do whatever is possible, within the constraints of local geography and company culture, to encourage a decisionmaking process on the part of every employee, which routinely scans all these alternatives to check and re-check how one can move to a higher position in this list. Similarly, the company should check and re-check that every policy on parking, vehicles, expense claims, company cars, travel information, etc., also advances the progression up the hierarchy of preferences.

5.2. "Big juicy carrots" and a hint of "stick"

For 20 years or more, the received wisdom in UK transport planning has been that progress towards what is now called "sustainable transport" can only be achieved by a mixture of "sticks and carrots". The "sticks" are selected from parking restrictions, fuel taxes, car parking charges, road pricing, congestion charging and (more recently) area-wide car-free zones. The "carrots" are selected from much-improved public transport services (in price, frequency, directness, cleanliness, safety, security and reliability), a range of incentives to encourage cycling (bicycle loans and grants, high-quality segregated routes, showers and lockers and convenient parking) and car-share incentives (computer matching, the "best" car parking places, financial rewards). These carrots have now grown in size and become more organic with the addition of "parking cash-out" schemes on the US model and the growing recognition of telematics and teleworking as a very successful boost to productivity and traffic reduction. Every site requires its own mixture of sticks and carrots and this theme will be returned to in our solutions section.

5.3. Travel blending

Commuter strategies are not about the total abandonment of cars, nor are they about the sudden shift of large numbers of people from using the car five days a week to using the bus five days a week. They are about encouraging a different blend, or travel blending. If every Pfizer employee uses an alternative to the car on one day a week then this represents a shift of 20 per cent away from the car. For each individual there will be a slightly different shift. Some will take the bus, some will car-share, some will cycle and some will work at home. The important thing is to make all these options available and attractive. A commuter strategy needs as many high-quality options as possible to match as many geographical, life-style and flexi-time situations of staff as possible.

5.4. Targets and objectives

The experience of commuter strategies in the UK is that a 20-30 per cent shift away from SOVs to the other modes is feasible on a three to five-year time scale. The degree of shift can be greater, e.g. in the case of Riverside NHS Trust in central London, where the public transport density is the highest in the UK and the potential for change away from the car is accordingly greater. In Riverside, the consultants recommended a 50 per cent shift away from the SOV. One of the most important tasks of the consultants working on the Pfizer company transport plan is to recommend a target that is very soundly based on the evidence of the questionnaires and the focus groups.

5.5. Flexibility

A transport plan has to be flexible and to respond to the unexpected. In the Derriford Hospital (Plymouth, SW England) strategy the forecast of bus use was not achieved and the forecast use of car sharing was exceeded. The overall forecast was on target. Staff in any organisation will always have a propensity to do something that is different to some extent from what was anticipated, even when that anticipation was based on what they said. A plan has to be flexible enough to adjust targets and objectives, go back to the bus companies and suggest changes to their services and help people to overcome barriers to working at home. The main task of a transport manager is to keep the whole situation under constant review and respond quickly to the opportunities that arise.

6. WHAT ARE THE SPECIFIC TOOLS AND MEASURES USED TO BRING ABOUT A SHIFT AWAY FROM THE CAR AT INDIVIDUAL COMPANY LEVEL?

First of all, it is very important to realise that every transport plan is distinctive and is the result of the very specific local geography, the spread of home addresses of staff, the willingness of local/municipal authorities to design, fund and improve walking, cycling and bus priority measures and the culture of the company itself. For most companies there is a real concern to make sure that recruitment and retention of valuable staff is not damaged by a transport policy and a great deal of research and planning goes into making sure that the transport plan will have the opposite effect. A well-designed transport plan will widen the catchment area for staff, improve labour market efficiency and create a socially responsible and eco-efficient identity for the company. This is

attractive to customers, visitors and staff alike and a company that takes care of its staff with healthy transport policies will be more attractive to job applicants than a company heavily locked into car dependency.

Even though every transport plan is different, there are a number of clearly defined areas of policy that must be addressed and modifications to reflect local detail will occur in some form in most plans. They include the following:

6.1. Management, organisation and resources

- Appoint a full-time transport officer who will oversee the fine-tuning and implementation of the transport plan. The costs of this post would be met by the savings generated through the operation of the transport plan. Transport has to be viewed as a priority management function with appropriate management input;

- Initiate staff car-parking charges. Staff car parking is a real resource that involves costs and is currently made available at no charge. This gives a strong financial signal in support of the car when policies are in place to discourage car use. There is no equivalent signal in favour of the sustainable alternatives. Income from staff car-parking charges would be ring-fenced and used to fund transport initiatives (including the full-time post of transport officer). This will require very careful discussion with all staff and a very clear line on fairness and equity so that charges are applied to all sites;

- Establish, with the support of the local authority, a "Public Sector Transport Working Group" (PSTWG) to bring together the county council, the company, local hospital sites and other organisations in a co-ordinated effort to improve walking, cycling and public transport opportunities in the area.

6.2. Information

- Inform every member of staff in detail about the public transport services that are available for their journey to work;

- Inform every member of staff about safe cycle routes from home to work and also safe walking routes where distances are appropriate to this kind of transport;

- Establish a bike users group to assist all actual and potential cyclists with information about cycle routes, bikes, cycle clothing, safe cycling;

- Inform all potential visitors to the site of the public transport options open to them;

- Alter all official notepaper so that it shows public transport information at the foot of the page;

- Provide attractive and prominent displays for all staff, students and visitors (including leaflets) showing public transport, walking and cycling options to the site;

- Continuously update information of all kinds as circumstances change and in ways that achieve greater awareness of transport choices. Consider using new technology, e.g. real-time information display systems, WAP phones, teletext.

6.3. Pedestrians

Detailed plans will need to be agreed (ideally by the PSTWG) with the local authority to provide a walking network, linking all sites with other origins and destinations, bus and rail services. A walking network should pay attention to ease of crossing roads, width of pavements, condition of pavements, lighting, tree planting, utilisation of any possibilities for taking the pedestrian away from heavy traffic whilst ensuring visibility and safety.

Conditions on the site should be "better than best". Walking around the site should be audited for safety and security. Where conflicts with parked vehicles and moving vehicles are identified, these should be removed.

6.4. Bicycles

Detailed plans will need to be agreed (ideally by the PSTWG) with the local authority to provide a cycle network linking all sites, paying attention to any possibilities for segregated routes (i.e. not a painted line on a highway) and networks that benefit the community at large through the provision of cross-site routes for local residents and others. This really has to be best practice and has to be of a standard that cyclists themselves regard as safe and attractive. There are standard cycle audit procedures that should be put in place by the local authority. It is the responsibility of the local authority to install best practice facilities and to do this in close co-operation with cyclists. Cycle facilities should also include measures to reduce traffic volumes, reduce speeds and reduce heavy lorry numbers on the highway system itself. The public highway system has to be made more cycle-friendly if the UK Government target of quadrupling cycle trips on a 1996 base by 2012 is to be achieved.

Cycle arrangements on site will need to include high-quality cycle routes within the boundaries of the site/company/factory, secure cycle storage in locations that correspond to the entrances that staff use when arriving at work, shower and locker facilities and facilities for meetings of cyclists in work time (with refreshments). Cycle parking should be under cover and ideally in locked "cages". Security is very important and should include CCTV and patrols.

6.5. Rail and bus

Fares are too high in the UK rail system and links to and from railway stations by bus, bike and walking are poor. These are matters in need of urgent attention (ideally through the PSTWG).

The company should investigate the potential for more rail-based commuting through discounted season tickets. Barriers to rail travel include a number of factors but the high cost of rail travel and comparisons with car travel are invariably flagged-up by staff at companies. Discounting should be part of a bigger package. The bigger package includes car park charges, bicycle-carrying on trains, bicycle loans (i.e. a company pool of bikes for loan to commuters), bike parking for staff at railway stations and extensive publicity on rail opportunities.

Buses are perceived as being of poor quality in the UK. This perception urgently needs attention. A bus users' group should be established and hold regular meetings with bus operators to identify the problems and work towards solutions. Contracts should be negotiated with bus operators to include better-quality buses, low-emission vehicles and attractive fare deals.

6.6. Car share

There is always potential for more car sharing even when levels are already quite high.

Car sharers should be exempt from staff car parking charges (if they are introduced) and should be allocated the best quality car parking places (see "Parking" section below).

The company should set up a car-sharing database using standard software.

The company should follow the example of Boots PLC in Nottingham and establish a "guaranteed ride home scheme". If a car share arrangement fails for the homeward bound journey because of work commitments then the person can request at no cost to themselves a taxi home. In practice, a scheme of this kind is used very infrequently and yet provides the high level of confidence that makes car share more acceptable and more popular. The scheme also applies to emergency situations, e.g. when childcare fails or a child becomes ill and has to be removed from school or kindergarten by a parent.

6.7. Parking

Parking numbers on-site are critical to the success of the transport plan. They also provide a very practical indication to the local authority of the seriousness of the plan. Staff parking numbers should not exceed a level that can be calculated in relation to staff numbers and the success of measures to bring about a shift away from the car. The new PPG13 (Planning Policy Guidance Note 13) on transport lays down maximum parking standards.

Car parking on-site should be strictly regulated to avoid parking on roads, on green areas, in loading bays, turning areas, etc., and in locations that would impede pedestrians, cyclists and public transport users.

The company should agree with the local authority on a strategy for avoiding parking by staff, students and visitors on residential roads.

A "priority operational parking" strategy should be negotiated and agreed with staff. Senior managers will need to take a lead here to avoid the suggestion that parking depends on seniority or status. A successful transport strategy has to reflect operational needs and not status. Examples of priority operational needs include; car sharers, staff having to leave and return to the site by car during the course of work on the same day, staff with equipment that has to be moved around and stored. It is very helpful in gaining overall acceptance of a transport plan if senior staff agree to the ending of named car parking places.

6.8. Pool cars, company vehicles, lease cars and low-emission vehicles (LEVs)

Some staff use their car for the journey to work because it is needed for a journey which is part of the work itself. Pool cars can assist in reducing car commuting and should be investigated.

The company should phase out lease cars.

The company should adopt a clear environmental policy for vehicle purchase focussing on emission standards and running costs. Low-emission vehicles (LEVs) should be purchased and not petrol and diesel vehicles.

The company should audit all its vehicle usage to establish the potential to reduce numbers, pool use and establish the case for shared use.

The company should monitor all vehicle fuel consumption and costs and do this by driver. Data should be published and reduction targets set. Rewards can be introduced for driving behaviour that reduces fuel use to target levels.

6.9. Teleworking, telematics

Staff should be encouraged, where it is operationally appropriate, to spend one or two days at home each week working on files, reports, accounts, strategies, etc. National and international experience is now very clear on the potential for this kind of work, on the equipment needs, costs and health and safety implications. Productivity goes up with telematics applications and one day a week at home is a 20 per cent reduction for a car user.

The company should investigate ways of reducing meetings that involve staff travelling from many sites to the meeting location. Video links are now routinely used for this purpose in large organisations and many meetings can be replaced by exchanges of information by e-mail. One company (Regus) specialises in this kind of flexible working with video conferencing: www.regus.com.

The company should reduce international air travel. Empirical research in the UK shows that video-conferencing can replace many air journeys for business purposes and the cost saving to the company is 76-95 per cent, depending on the location for the meeting which has been replaced by a video link. Reducing air travel makes a significant contribution to reducing greenhouse gas emissions and reduces car dependency. In spite of good rail links, most business travel to airports (Manchester and Heathrow) in the UK is still by car.

6.10. Motorbikes/mopeds

Motorised two-wheelers (MTW) have a significant potential to assist in the delivery of a transport plan. They take up less space, they move more freely in congested traffic, they use less fuel per mile and are less polluting if well maintained. The company should set aside covered parking for MTWs, arrange for safety instruction (see below) and link in with national and local road safety initiatives.

6.11. Safety and security

The safety and security of staff is in every respect at the highest level of priority. The transport plan will increase safety and security. A full safety audit of the transport plan will be required.

6.12. Local consultation

Consultation with staff is vital to the success of a transport plan. This should be initiated through focus groups. Consultation with the local community is also important and this should begin as soon as possible. This consultation should raise issues around what the local residents would like to see by way of improvement in their local environment and the extent to which the company can deliver on this.

6.13. Publicity

A transport plan is a serious exercise in improving the quality of life of staff, visitors and local residents. It is exactly the kind of thing that a responsible employer would want to do. The company should publicise their commitment to reducing traffic, reducing pollution and improving health and emphasize their role as both a high-quality supplier of health care and a good neighbour for the local community. Key messages include the "healthy workplace" and the "responsible neighbour" emphases.

6.14. Healthy workplace

Most people are very interested and concerned about health. In the UK there has been a dramatic growth in the use of holistic and complementary medicine (e.g. herbalism, homeopathy, osteopathy) and there are now approximately 10 million consultations with therapists each year. The lack of physical activity on the part of UK citizens (especially children) has led to the highest rates of overweight/obesity in the EU. Walking and cycling can make a significant contribution to reducing incidents of poor health. Cardiac and respiratory function improve with only modest amounts of walking and cycling and the British Medical Association has concluded that regular cycling will produce an increase in life expectancy of 2.5 years (BMA, 1992). A healthy workforce is a happier and more productive workforce. There are clear economic benefits flowing from this area of transport policy, both for the company (reduced absences of staff on health grounds) and for the national economy (reduced expenditure on national health facilities). Staff are very receptive to healthy workplace initiatives and transport plans link very well to this receptiveness.

7. BEST PRACTICE, BENCHMARKING

The first company transport plans in the UK were produced in the mid-1990s. A considerable amount of best practice has now accumulated and this is reviewed in this chapter. The topics selected are intended to give the flavour of some of the more successful and innovative measures that are being employed to change travel behaviour. The examples chosen are:

- Parking cash-out and reduced parking provision (Pfizer);
- A business park plan (Guildford Business Park);
- A central London commercial office development (Regent's Place).

7.1. Parking cash-out (Pfizer)

The parking cash-out scheme is being introduced to give staff a real financial incentive to adopt greener methods of transport to and from work. Given the high cost and limited availability of development land, providing parking space for employees at Sandwich costs Pfizer over £1 million per annum. Average UK figures show that the amortized cost of one parking place is £400 p.a. Workplace parking has to be seen as a valuable benefit which the company at present gives to employees who bring their cars to work, but not to people who use public transport or who cycle or walk to work. This means people who travel more sustainably get less benefit. This is a perverse result and contrary to both company objectives and national transport policy. Some companies are introducing workplace parking charges to redress the balance. Pfizer have chosen instead to continue to provide free parking to those who need it, but to offer permanent staff an equivalent benefit in cash if they choose to leave their cars at home. This was introduced experimentally in 2000 and was fully implemented with cash benefits in May 2001.

The system works by enabling staff members to accumulate points in their own parking cash-out accounts, rather like supermarket loyalty cards. The first time staff enter the workplace on any working day, they will use the security card as normal to operate the turnstile or access gate. At this point, the system will recognise that the individual has arrived at work and points will automatically be credited to that account. If the individual has travelled to work by car, he/she will need to use the same security card again when leaving to operate the car park barriers. The system will log this as well and the same number of points will be deducted from the account. Further points will not be gained or lost if the staff member has to go in and out of the turnstile or the car park several times on the same day.

This means that a member of staff travelling to work alone in a car will neither gain nor lose points on the day. But on any day when travelling to work by public transport, by bicycle, motorcycle or on foot, he/she gets to keep that day's points. People who car-share can take it in turns to operate the barrier and get to keep the points on alternate days – more often if more than two people share one car. Accumulated points will be converted into cash and paid through salaries one month in arrears.

Parking cash-out points awarded become subject to tax only when they are converted into cash and paid with salaries.

The value of the points awarded will be £2.00 a day before tax, which is slightly less than the annual cost to Pfizer of providing a car parking space.

7.2. A business park plan; Guildford Business Park

Many companies are now located on attractive business parks where there is some element of communal servicing/infrastructure and certainly shared interest in resolving transport problems. This is a very different situation to the "stand alone" character of Pfizer in Sandwich. Guildford Business Park is an attractive commercial location within two kilometres of the town centre of Guildford (SE England) and with good rail and road connections to London and to Heathrow and Gatwick airports. The site is adjacent to the campus of Surrey University and suffers from severe congestion

on the local road system and on links to the A3, which is the main road to London. Traffic congestion is a source of delay, economic loss and staff frustration. Surrey County Council (the transport authority for this region) estimates that economic losses to businesses in the county as a whole are £600 million per annum.

The main businesses on this site are Ericsson, Colgate Palmolive, Regus and National Grid. All these businesses have combined forces to produce a transport plan with a very specific aim of reducing the number of cars used for the commuter trip where there is only one person in that car (Single Occupancy Vehicle or SOV).

The Guildford Business Park Plan is rooted in local geography and in the results of a detailed questionnaire survey. Of the 3 000 staff on this site, 41 per cent said that they were willing to cycle to work if cycling facilities were improved. The equivalent figure for public transport was 75 per cent and for car sharing 60 per cent. This is an area of the UK which is above average in income and with some of the highest car ownership rates in the country as a whole. It is remarkable that there is such a willingness and a propensity to change in a car-dependent population.

The positive answers in the questionnaire are based on an expectation that the quality of the alternatives will improve. Specifically, improvements have been requested in the following areas:

- Dedicated bus lanes so that buses do not get held up in congested traffic;
- Dedicated buses that serve the businesses themselves (the main reception areas of the individual companies become the "bus station");
- Reduced fares on buses and trains through company-negotiated special deals and travel passes;
- New cycle routes that provide safe and well-surfaced facilities directly to the town centre and railway station;
- New facilities for safe bicycle parking, storage lockers and showers;
- A new pedestrian route, following an attractive footpath by the local river;
- A new pedestrian and cycle footbridge to replace one that was removed in the 1950s and to connect the business park to the campus of Surrey University;
- A business park-wide car-sharing scheme so that the possibility of finding car-share partners is much improved.

This plan was adopted in May 2001 and is now being implemented.

7.3. A central London commercial office development (Regent's Place)

Regent's Place is in north central London. It is at the heart of the capital's public transport network with several bus routes, the London Underground and three major railway stations in close proximity. It is a 4.2 hectare site with 8 500 employees. The site is served by:

- six tube lines and 220 tube trains per hour;
- ten bus routes and 160 buses per hour;
- the London designated cycle network.

Currently, 90 per cent of the staff use public transport and 6 per cent commute by car.

It is also on the boundary of the area that the Mayor of London has designated as the road-pricing area. Vehicles crossing the boundary marked by Euston Road (entering the central area) will have to pay a £5 charge when the strategy is introduced in 2002. In locational terms, this is the ideal area for the successful implementation of a transport plan. The site as a whole is managed by the British Land Company PLC. This company co-ordinates a travel plan that applies to 30 companies on the site including some of the most prestigious names in the UK (Logica, BT, NatWest Bank). The travel plan details can be found on www.vicinitee.com

Travel into central London for work purposes is much closer to models of sustainable transport than other locations in the UK. The modal split for central London (1995-97 National Travel Survey) is:

- Car/van: 15.7%
- Bus: 8.4%
- Train/Underground: 67.3%
- Walk: 4.1%
- Other: 4.5%

Travel to business parks on the M4 corridor to the west of London reveal modal split statistics, with 95 per cent of all trips to the site made by car. The decision on where to locate a new business or relocate an existing business is the most important decision that will ever be made in the transport arena. A best-practice company transport plan will only marginally change a fundamentally non-sustainable locational decision and should not be used to give a spurious justification to an office development on the edge of a city, on a greenfield site or in a rural area with poor public transport connections.

The three most important preconditions for a successful company transport plan are location, location and location.

Regent's Place is an excellent location.

8. THE UK GOVERNMENT'S PROGRAMME OF "SITE-SPECIFIC ASSISTANCE" (SSA)

The SSA programme was established in 1999 by the UK Government (Department of Environment, Transport and the Regions or DETR). Full details can be found on the Government Website; www.detr.gov.uk

The programme is managed by external consultants (AEA Technology) as part of their "Energy Efficiency Best Practice Programme" or EEBPP. AEA Technology have recruited approximately thirty consultants who individually deliver the SSA through direct contacts and site visits with employers/activities requesting this service. The service provides five days of consultancy advice free of charge to the client. The main elements of the SSA programme are as follows:

- Direct, practical assistance to help organisations develop and implement travel plans;
- Assistance to overcome barriers to action - lack of expertise, lack of resources;

- Consultants are qualified and experienced and have been selected through a competitive selection process;
- The funding is for England and Wales;
- Five days of consultant time is allocated to the client;
- A SSA consultancy must be completed in six months;
- 200-250 SSA will be completed by February 2002;
- Marketing of the SSA service involves mail-outs to 23 000 companies, 11 000 National Health Service managers and 16 000 fleet service managers. Additionally there are mailings to all local authorities and inserts in relevant publications.

8.1. SSA outputs

The objective of the SSA assignment is to work with the company, university or hospital and assist them to make rapid progress towards full implementation of their own transport plan. The detailed form of the assistance varies from client to client but will always resolve issues around the following:

1. Is there a high-level management commitment to the transport plan and, if not, how can this be achieved?

2. Is there sufficient data on which to base a transport plan and, if not, how can this be assembled quickly and painlessly through questionnaires?

3. Are the public transport, cycling and walking facilities in the immediate area of sufficient quality to present a real alternative to the car? If not, what improvements should be made? This links back directly to the questionnaire.

4. Is the organisation delivering the right policies within its control to encourage shifts away from the car? If not, what can be done? The key issues here are parking place numbers, car park charges, financial rewards for car users compared with the rewards for non car users, the costs of providing car parking spaces and how these costs are met.

5. Awareness raising, education, incentives, information, reinforcement, leadership from the top by example.

Each SSA assignment will have a final report covering the following themes:

- Objectives of the assignment;
- Site consultant contact details;
- Date of assignment, meetings;
- Type of company/site;
- Brief and concise description of current situation;
- Status of transport plan activities;
- Description of key issues as seen by the company;
- Action Plan with recommended measures, clear and detailed actions, procedures, timings, who "owns" the actions;
- Programme of future work. Who does what and when;
- Annex; copy of presentation materials, questionnaire, survey analysis.

8.2. An example of an SSA portfolio

The transport planning consultancy, Eco-Logica Ltd, based in Lancaster (UK), is one of the thirty consultancies delivering SSAs and has now completed eight assignments:

1. Field Studies Council;
2. Wrexham Maelor Hospital;
3. Glaxo Welcome Pharmaceutical Company;
4. St Martin's University College;
5. Ericsson Ltd, Guildford;
6. Kingston University;
7. South East England Economic Development Association (SEEDA), Guildford;
8. Durham County Council.

Three of these assignments are private sector companies, two are universities, one a hospital, one a local authority and one a provider of national environmental education and training.

All the assignments are monitored by EAE technology. Each company/university, etc., is asked to provide a report on the level of its satisfaction with the service delivered. The programme as a whole has also been subjected to evaluation and monitoring to ensure that it is delivering government objectives, consistency and high professional standards.

8.3. The National Travel Plan Evaluation Framework

Travel plans are still a relatively new area of organisational and transport planning. Best practice is still developing and it is very important indeed to know the difference between a "good" plan and a mediocre plan. This is especially important when the objective is to reduce the amount of car use on the part of staff travelling to work. A plan that is poorly prepared, with an inadequate information base and with unattractive measures applied to the alternative to the car, simply will not work. In order to address these issues, the UK Government has commissioned the production of guidance on the assessment of travel plans (Napier University, Transport Research Institute, 2001).

There is a need for this guidance for several reasons:

- When developing a travel plan, organisations need to be able to assess their work against a yardstick to gain some objective view of the strengths, weaknesses and likely outcomes of their plans.

- There is a general need to collect data measuring the impacts and outcomes of travel plans so that there is clearer evidence of their success. This will measure both the degree to which travel plans as a policy are successful, and provide evidence for organisations that are developing new travel plans of the effectiveness of different types of plan.

- Travel plans are increasingly being proposed as part of the development control (planning) process. It is difficult for both local authorities and developers to know whether the travel plans that they are proposing will meet the targets that are set for them. The methodology in this guidance sets out a means to assess the credibility of travel plan contents and targets.

At the heart of a travel plan are the targets for reducing car use, especially single-occupancy vehicle (SOV) use. The authors of the evaluation report have looked at over 100 travel plans and constructed a point-based scoring system for assessing what scale of reduction can be expected from what level of inducement/incentive/package of measures. They conclude that:

- A plan containing only marketing and promotion is unlikely to achieve any modal shift;
- A plan with the above plus car sharing and cycle measures may achieve 3-5 per cent reduction in drive-alone commuting (SOV);
- A plan with the above measures plus large (30%+) discounts on public transport plus works buses/additional public transport links will achieve around a 10 per cent reduction; and
- The combination of all of the above measures plus disincentives to car use can achieve a larger (15-30%) reduction in drive-alone commuting. Only in very exceptional cases will the reduction be greater than this.

These targets are based on empirical experience. They generally take between two and four years to achieve.

The implications of these scores is obviously that a travel plan containing only relatively inexpensive and organisationally undemanding elements is very unlikely to achieve a reduction in drive-alone trips to the workplace of more than 5 per cent, so to set a higher target than this would be unwise. If significant reductions in drive-alone commuting are to be achieved, then the use of disincentives (in the UK context, restrictions in car parking/car parking charging) are required.

These percentages are ***not*** prescriptive, but intended as a guide only. It may be that in some circumstances very high levels of trip reduction may be achieved using only, for example, teleworking. However, such developments will be the exception rather than the rule and to generalise about them here would be difficult; they must be treated on their merits.

Higher levels of trip reduction than those set out above ***may*** be achievable but the developer should be able to demonstrate exceptional commitment to the measures before more ambitious targets are given credibility. Examples of exceptional commitment would include:

- Very high levels of funding (> £200/employee/year);
- Senior managers prepared to lead by, for example, giving up reserved parking spaces and changing mode;
- Support from the developer or organisation for a network of bus services to serve the development, coupled with fare reductions of at least 30 per cent.

Setting a trip reduction target of more than 30 per cent

The figure of 30 per cent as a general upper limit for trip reduction is based on empirical experience. There are a few isolated examples of reductions greater than this, but they are the exception rather than the rule.

Source: Napier University, Transport Research Institute, 2001.

The Napier guide also points out that local geography is very important. Reductions in SOV use will very much depend on the locational choice itself. The Napier guide does not discuss locational characteristics as part of the evaluation. No travel plan, no matter how well-defined and executed, can make up for an inappropriate location. In the UK context, inappropriate location means:

- A greenfield site more than 10 kms from a railway station and on poorly-served bus routes;
- A business park location with generous car parking provision and with established patterns of 90%+ modal share for car trips;
- Any site with one parking space or more per employee;
- Any site in the UK with a rural/semi-rural location with narrow roads, lack of footpaths and poor/inadequate cycling provision on the rural road network.

These defects are so large that they cannot be remedied by the travel plan process, even if there is real management commitment to that process. The flawed locational decision itself must be reviewed against travel plan objectives and a new location sought.

8.4. The future

A travel plan is not just another kind of planning or management intervention, to be included on a list with waste minimisation, greenhouse gas reduction and energy efficiency. As important as these other things are, a travel plan goes much further. A travel plan is a completely new concept in solving transport problems. It is a process as much as a management tool and it demands a completely new style of engagement with partners. It is a declaration of intent to solve problems from the roots of the problem, i.e. the individual decision about how to travel to work. It requires a concerted attack on this problem from the company, a debate and constructive engagement between company and individual staff member and a constructive engagement between the company and the local/city authority. In the UK, companies (e.g. Pfizer) have entered into the debate with government (locally and centrally) with enthusiasm and have posed a new kind of contract. Pfizer are more than willing to spend £250 000 per annum on transport measures to bring about a modal shift away from the car, but they expect this commitment to be matched by government. What will government do to fulfil its part of the bargain? The reliability of buses and trains needs government attention, as does the provision of safe walking and cycling routes. Government also needs to be attentive to other issues and more holistic approaches to land use and transport planning. There is not much point in a company working very hard and spending a great deal of money to reduce traffic if government then approves several hundred new houses on an adjacent site or a new business park nearby. There is little point in Derriford Hospital (Plymouth, SW England) making great strides in traffic reduction if its immediate neighbour (Plymouth Airport) expands its car parking numbers and generates more traffic. Gains in one area must not be cancelled out by losses elsewhere.

Travel plans require a new kind of partnership and co-operative government and there are signs that this is happening.

There are still some unresolved issues around transport plans:

1. Integration with land-use planning and locational decisionmaking;
2. Poor quality public transport (a UK problem);
3. The taxation system;
4. School travel plans;
5. Telework.

8.4.1 Integration with land-use planning and locational decisionmaking

The UK planning system is in disarray. There is no clear guidance on what kind of facility can be located in what kind of location and no standards about accessibility. This leads to a great deal of greenfield business park activity with very heavy traffic generation consequences. It also discourages walking and cycling because these modes of transport can only perform well when there are well-planned developments of housing, retailing and commercial activity in circumstances where commuting distances are within walking and cycling tolerances. Currently, commuting distances are increasing and the planning system does not have the capacity to reverse this trend.

8.4.2 Poor quality public transport (a UK problem)

All questionnaire surveys of staff travel in UK companies reveal a uniformly high level of dissatisfaction with public transport. Bus privatisation (deregulation) in the mid-1980s has led to very poor levels of integration and co-ordination and a 25 per cent loss of passengers in cities. Rail privatisation in the mid-1990s has led to record complaints about poor punctuality (over a million complaints in one year), the high levels of fares (the highest in Europe) and very poor levels of integration with the services of rail companies. Rail passenger use has increased in line with the improved economic performance of the UK economy and lengthening commuting distances. Public transport is in very poor shape in the UK and there are no plans to require higher levels of integration, co-operation and quality standards. This is a significant obstacle in introducing company transport plans.

8.4.3 The taxation system

The UK taxation system rewards car commuting and discriminates against the bus, train, pedestrian and cyclist commuter. Car parking spaces, which in the UK are worth £400 p.a. to the user, are not taxed as a benefit. The user of alternative modes receives no such benefit. Expenditures by companies on alternatives to the car where this involves benefits to the member of staff are liable to income tax and to national insurance contributions (NIC). Potter (1998) concluded that:

> "*The existing tax system clearly discourages key Green Transport Plan measures and encourages unsustainable travel behaviour. There are no examples where 'Green' measures receive a preferential tax treatment over a non-Green alternative, indeed the opposite is so. Overall, the current taxation system is an entirely negative influence with often significant consequences* (Potter, 1998)."

Since Stephen Potter carried out this research, the UK Government has moved a little in the direction of dealing with these criticisms and some transport expenditures that benefit staff are now tax-exempt. The overall situation, however, remains largely unaltered and we still have a system of government fiscal disincentives to move in the direction of a company transport plan.

8.4.4 School travel plans

Every company in the UK, when asked about transport and traffic problems, reports that traffic congestion is much less during school vacations. Business efficiency, commuting times and delivery schedules are all improved in the periods when schools are shut. School traffic usually accounts for about 20 per cent of all traffic in the morning peak in a UK urban area. In the last 20 years there has been a steep decline in walking and cycling trips to school in the UK, with a compensating increase in car trips. The decrease in children's independent travel (i.e. children going to school with other children and without an accompanying adult) has been even steeper. Approximately 80 per cent of school trips were unaccompanied by an adult in 1971, falling to approximately 10 per cent in 1991 (Hillman, Adams and Whitelegg, 1992). Over 50 per cent of schoolchildren in Surrey (SE England) travel to school by car. This, together with the high levels of driving to work, gives Surrey higher than average levels of traffic congestion and pollution. The school "run" and the car commuter trip are also interlinked. Many parents drop their children off at school as part of the journey to work by car. When asked if they can switch to a more sustainable mode of transport for the journey to work they often argue that they cannot because of the "need" to drop children off at school. A successful company transport plan has, therefore, to take account of school trips as well as work-related trips.

The UK Government has embarked on a national "safe routes to school" programme, which in concept is very similar to the SSA programme referred to above. The same teams of consultants delivering the SSA programme are also delivering school transport plans. In Guildford, Surrey, there is a co-ordinated approach to both school and company transport plans. The London Road corridor, a major traffic artery into the town centre, serves a number of businesses, a large secondary school with 2 000 students (George Abbot School) and two primary schools. Working with the schools and the businesses within the same timeframe in the same area delivers a concerted effort to reduce traffic, improve safety for school travel, encourage more sustainable travel for schools and businesses and improve business efficiency. This is a model for other work in the UK.

8.4.5 Telework

The degree to which electronic communication, computers, modems, videoconferencing, etc., can substitute for physical trips is a longstanding concern of transport and urban planners. There is evidence that physical substitution is possible, i.e. teleworkers and telecommuters do travel less than those who engage in the daily drive to work. The evidence for this proposition is reviewed in Britton (1996).

Teleworking has a special place in a company transport plan. Many managers feel that they cannot switch to bus/bike/walk or cycle. This same group is usually concerned with high-level tasks that involve reading research material, reviewing strategy, formulating plans, legal, financial and accountancy tasks, etc., and all this can be done either at home or in specially designated telework centres that represent an intermediate stage between home and the main work place, i.e. a geographical location much nearer to home. A company transport plan will typically seek to reduce car use by 15-30 per cent over a 3-4 year timeframe. If a manager can stay at home one day a week working on tasks appropriate to that environment then that manager has reduced his/her car commuting by 20 per cent. The objectives of the travel plan have been delivered.

Surveys of large numbers of staff in UK companies indicate that 20-30 per cent of the respondents are willing to consider working from home some of the time or locating themselves at intermediate work centres some of the time and there is a great deal of scope for developing this kind of contribution to the overall objectives of a transport plan. The detailed arrangements for telework, including 27 collective agreements and 14 case studies, are summarised on a Website: www.telework-mirti.org

Surrey County Council in SE England (www.surrey.gov.uk) is currently introducing a telework pattern of working known as "Surrey Workstyle". This will apply to 20 000 employees and is based around a number of telework centres spread around the county.

9. CONCLUSION

Company transport plans are now well established in the UK as an attractive way to solve transport problems, increase company efficiency, involve a large number of partners in co-operative ways of working and contribute to greenhouse gas reduction. The fact that these transport plans reduce costs to companies in the private sector (DETR, 2000) and reduce greenhouse gas emissions

from the transport sector is one of the clearest examples of eco-efficiency at work. There is no conflict at all between the objectives of a transport plan and the overriding mission of a company in the private sector to remain competitive, productive and profitable.

A company transport plan also illustrates something rather fundamental about sustainable development and travel behaviour. Contrary to many arguments that have been put in the "great car debate", the choice is not between total dependence on the car on the one hand and absolute car deprivation on the other. Derailed work in dozens of company transport plans, backed up by the analysis of thousands of questionnaires and detailed discussion with over 1 500 individual members of staff in small groups, shows very clearly that the vast majority of staff (over 70 per cent) actually want to use the car less. The argument that there is great resistance to moves away from the car is a popular "urban myth" and is not true. The vast majority of staff simply want to make their journeys in a comfortable, reliable way. They would like to use the alternatives some of the time. They would like to cycle in summer, work from home one day each week, car-share some of the time and use public transport some of the time. The barriers to this intelligent approach to transport choices are simple and easily resolved. In the UK the quality of walking, cycling and public transport is poor and nothing is being done to bring about the step-change in quality that is needed. More importantly, the land-use planning system is delivering a spatial dispersion kind of "urban sprawl" that will lengthen travel distances well beyond what can be walked and cycled. The fundamental disintegrated and non-co-ordinated nature of the UK public transport system means that public transport is very often a poor alternative for journeys of more than 20 km. This lack of integration and poor quality of service has been thoroughly summarised in the Australian context by Mees (2000). His discussion of Melbourne's public transport system is equally relevant to the public transport system of most UK cities outside London.

Company transport plans have produced real change on the ground and have demonstrated fundamentally different ways of co-operative working to solve transport problems. The success of transport plans is clear but their future is still uncertain (in the UK at least). If central and local government cannot deliver the improvements in the external environment that mesh with the internal/company plan environment then disillusionment will set in. If urban sprawl, increases in highway capacity, road building and car parking extensions continue to account for significant public expenditure, then trends towards non-sustainability in transport will accelerate. If the taxation system continues to discriminate in favour of the car, then many transport plans will be operating under severe constraints. The next five years will reveal which way this perilous balance will tip.

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OTHER CONTRIBUTIONS

During the Round Table, several participants submitted written contributions. These contributions are reproduced below as complementary information.

AUSTRIA

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FINANCIAL MEASURES ARE NECESSARY BUT NOT EFFICIENT

Abstract
The key to changing staff commuting travel choices lies in the reorganisation of parking facilities at both the destination and the origin of journeys to work.
Keywords: Human behaviour, parking organisation.

1. The complexity of technical systems

One of the problems facing modern societies is the complexity of the system that technology has given them the means to build. The behaviour of this system can no longer be observed directly, nor does it readily lend itself to analysis. It is an open system that is dependent on flows of materials and energy. The behaviour of individual elements within this system is completely non-linear and is starting to change over time, in other words, the system has become dynamic and now behaves like a natural system in terms of its complexity.

Why do natural systems work so perfectly?

The reason is that they have had enough time to develop – over four billion years in fact. The length of this optimisation process made it possible for us to think in terms of "sustainability" and "quality", since these were the attributes we could recognise in our own environment.

In contrast to this gradual development, however, modern technology and economic requirements are evolving at such a pace that there is no time for us to wait until the system has reached a sustainable stage. Nor do we have the time needed to gain sufficient experience to be able to say that a given solution is the best one for the future; in many cases, a solution is considered to be acceptable if it is simply good enough for today -- or even yesterday. The credo of the current period is one of constant acceleration. It is highly unlikely that either quality or sustainability can develop within such an accelerated process; in fact, the chances are virtually nil.

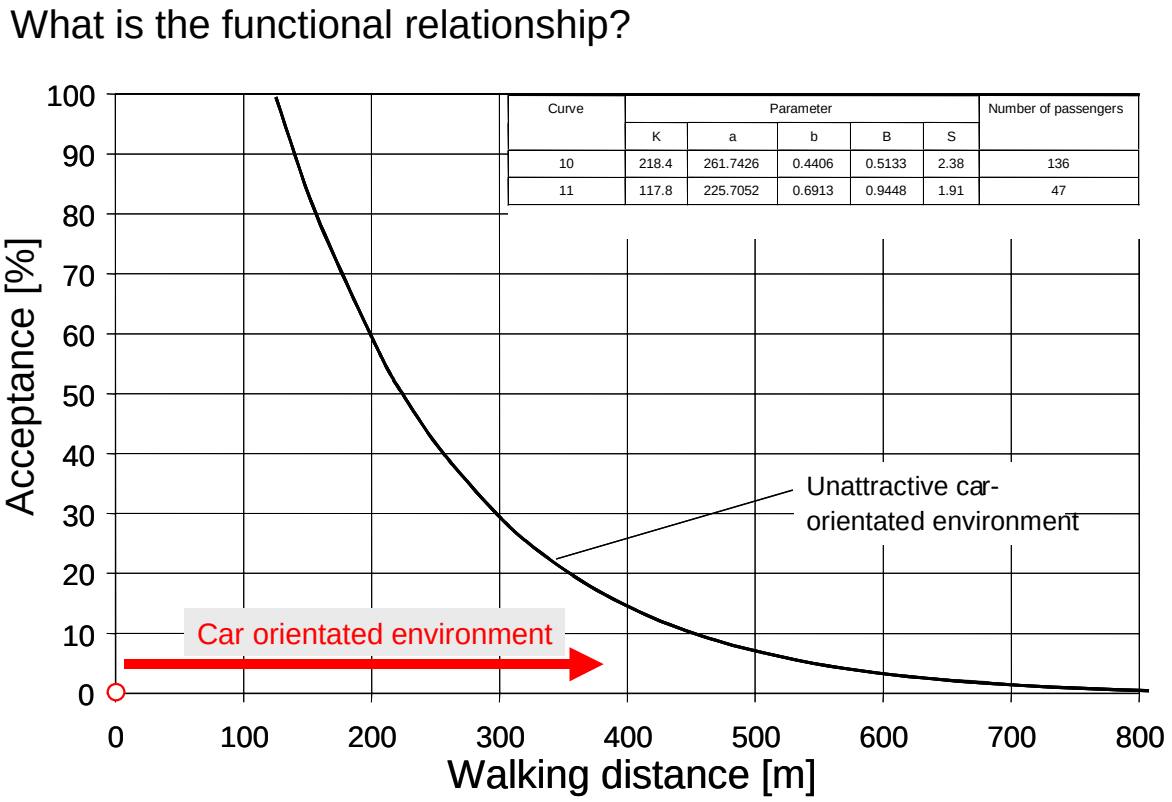
European systems have been based on American principles for decades.

2. Solving the problem

2.1 What is the answer?

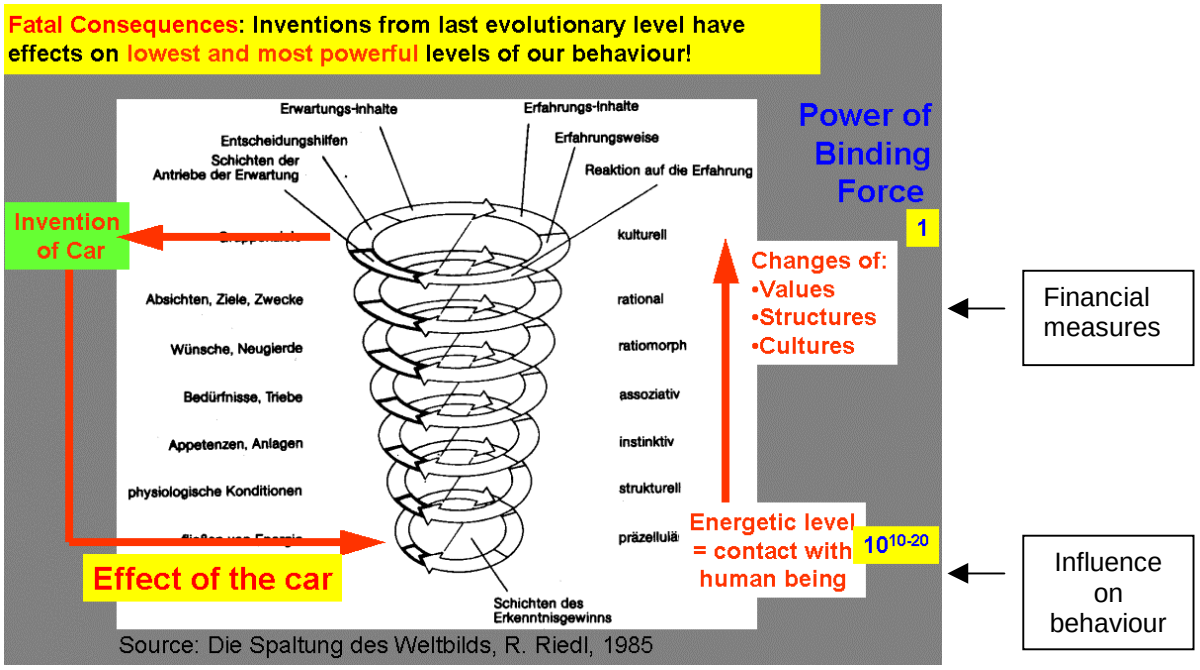
If the underlying structure responsible for system behaviour remains unchanged, no effective and sustainable solution is possible.

Figure 1. **Willingness to travel by foot is inversely proportional to distance**



Evidence of the inverse relationship between acceptable mobility and distance has been found not only in human behavioural patterns but also in the communication system used by bees (Frisch, 1965). The reason for this homology was found to lie in the perception of body energy (Knoflacher, 1981). This explains the tremendous power and influence that cars have over patterns of behaviour, societal values and basic structural changes in all economic and land-settlement patterns. The car, as a product of our civilisation, appeals to people at the most basic level of human evolution, namely, that of body energy.

Figure 2



If the cause lies in the energy structure, then any remedial measure must be administered at the same level if it is to be effective. While measures which do not take effect at the level of human body energy may be able to alleviate the problem or not, as the case may be, they cannot solve it.

2.2 Existing structure

Under present conditions, car owners have absolutely no incentive to walk to the nearest public transport pick-up point or to local shops. They are imprisoned within their cars and completely isolated from both the community and the structural fabric of the city (Figure 3). Local neighbourhoods are losing their appeal and the quality of city centres and traditional residential areas is deteriorating (Figure 4). The reason for this does not lie in the size of traffic flows but in the organisation of car parking facilities!

Figure 3: **Existing structure**

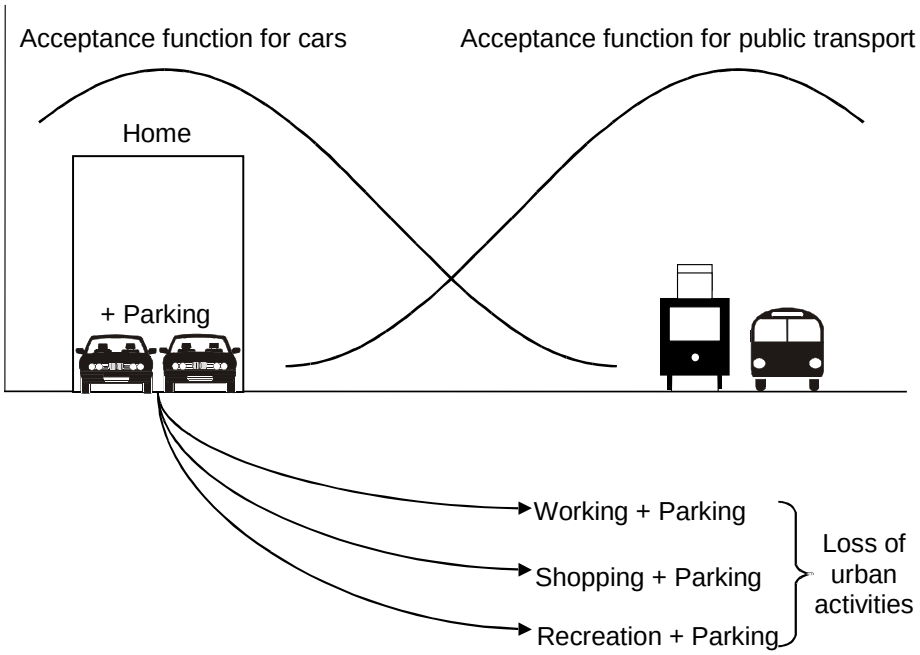
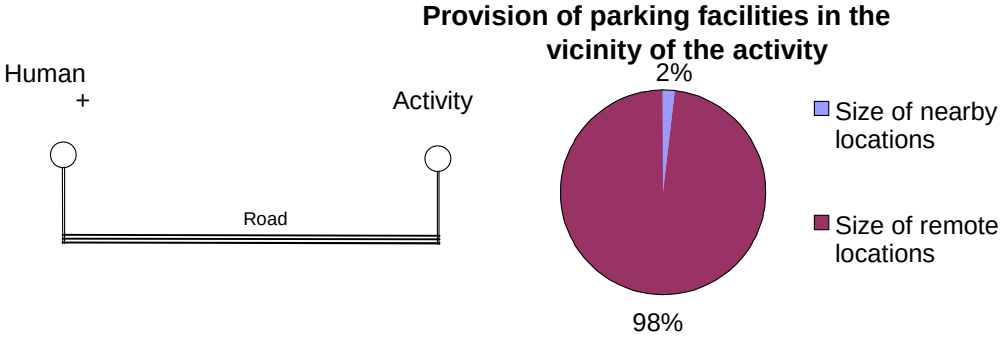


Figure 4. **Effects on existing structure**



2.3 The basic solution

It is only by changing the organisation of parking facilities that the system can be stabilized without any loss of mobility or accessibility -- for anybody! The distance to the place where a private car is parked must be at least as great as the distance to the nearest public transport pick-up point! Cars must be parked in garages or parking spaces located beyond the nearest public transport pick-up point (Figure 5).

This will make it possible for people to choose between modes and will attract many activities back into the city (Figure 6). It amounts to reintroducing market principles into urban transport systems that in the West have operated on a different basis for the past 100 years. Car traffic has in

many ways been spared the rigours of market economy principles. The main factor to be considered here is the organisation of parking facilities, and not the traffic flows on which many so-called experts in traffic engineering and economics have focused their attention. Once this principle is understood, it is clear to see why any attempt to introduce road pricing will ultimately be doomed to failure.

Figure 5. **The basic solution**

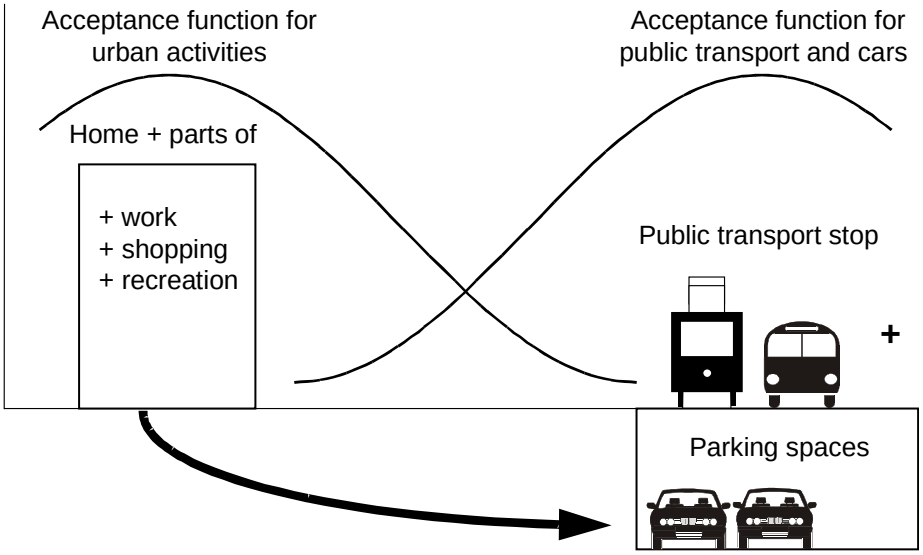
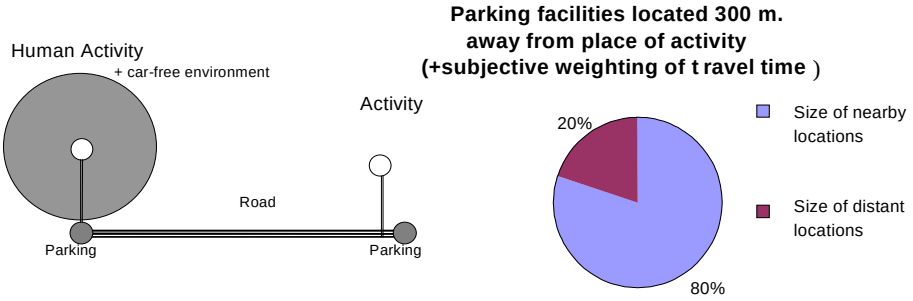


Figure 6. **Impact on parking organisation**

Outcome: Actual impacts including those on human nature



Real impacts, taking into account human behaviour:

80% of the city is revitalised

2.4 Conclusion

While the use of financial measures to influence choice of mode is a step in the right direction, the impact that physical structures have on commuters' decisions remains far greater. It is only by ensuring that the distance to parking facilities is the same as that to the nearest public transport pick-up point that there is any real possibility that commuters (and other car users) will choose to use another mode of transport.

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FRANCE

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COMPANY MANAGEMENT OF STAFF'S COMMUTING CHOICES: AN ECONOMIC VIEW[1]

SUMMARY

Marne-la-Vallée, November 2001

1. INTRODUCTION

"Company travel plans", also known as "mobility plans", appear to be the preferred instrument for managing employees' choice of mode for journey-to-work trips at the company level. The stated aim of all company travel plans is to reduce private car use. To my mind, however, it is important to say why car use should be reduced and why action is being taken at the level of companies. This will help us to understand the problems encountered and avoid any unintended impacts.

The traffic flows to be reduced in this instance are the excessive flows generated by the fact that motorists do not have to pay the full cost of their trips. If motorists had to pay the full cost to the community attributable to their trips, they would undoubtedly refrain from using their car for certain types of travel. These are the trips that they must be discouraged from making, not trips whose economic value, including all externalities, outweighs the total cost.

The reason for taking action at the company level is that firms help to disguise the actual economic costs of trips. They do this by bearing the cost of parking, that is to say, by redistributing this cost among all their employees, shareholders and customers. Sometimes they can do this involuntarily by making the use of other modes either inconvenient or unpleasant.

There is a second reason for taking action at company level but one which is much harder to justify and whose instruments are therefore far more contestable, in particular because there is no guarantee that the trips eliminated will indeed be those whose economic value is less than their total cost. This reason is the need to make good the shortcomings of authorities which fail to reduce car traffic externalities within their jurisdictions. For because a given authority does not charge for congestion or because it fails to provide adequate subsidies for public transport, it may seek to shift responsibility for these tasks onto firms.

This distinction between the two reasons for taking action is an extremely important one. In the first case, implementing the necessary instruments will be inexpensive to the firm and may even result in a financial gain. In addition, the same principles can be applied to all firms equally and therefore will not distort competition.

In the second case, the instruments may be expensive to deploy and this might penalise firms in terms of their competitive advantage. Since the aim of the action is to resolve problems caused by factors that are external to the firm, the measures to be taken are strongly conditioned by the local context; in which case, requiring firms to take action to remedy the shortcomings of local authorities may simply encourage them to move elsewhere.

In the following discussion we intend (i) to examine the reasons why action should be taken at the company level to change staff commuting choices; (ii) to review the reasons for excessive car use and, in each case, to present the different solutions that have been adopted at company level in different countries; and (iii) to propose a coherent approach by identifying the points where solutions will need to be tailored to the local context.

2. WHY?

Why seek to manage employees' choice of mode for their journey to work at the company level?

It is expensive to travel by car, particularly in Europe where taxes on car use are especially high. In addition to this financial cost, there is also a cost in terms of time which can be extremely high if the roads used for the trip are congested. However, if the motorist still decides to travel by car regardless of the cost involved, it is because the benefit he derives from his choice outweighs the total cost of the trip. If he decides against using a different mode, it is because from his standpoint no other mode offers an equivalent benefit.

From the standpoint of the community, this choice would not pose a problem if the cost to the motorist were equal to the total economic cost of the trip, if the taxes and charges paid during the trip were to cover the cost of the trip to the rest of the population in terms of congestion, pollution and consumption of scarce resources. However, while for some trips these other costs, known as external costs (because they are external to the choice made by the agent), are easily covered by the associated taxes, for others the external costs are greater than the taxes actually paid. This is usually the case for journey-to-work trips.

There are several reasons why most journey-to-work trips do not cover the external costs. Firstly, such trips are usually made during rush hours, cause congestion and delay other road users such as car drivers, buses, lorries, cyclists, etc. Estimates made of the cost of such trips show that they can be several times greater than the cost to the individual motorist. Secondly, a vehicle that is immobilised during the working day consumes a resource generally in short supply, namely, space. However, in most cases the employer provides free parking for employees who drive to work, in which case it is all the other employees or the firm's customers who bear the cost.

For these two reasons, the number of journey-to-work trips far exceeds the socially desirable level, thus justifying action by government to encourage firms to manage the choice of mode for journey-to-work trips by their employees. In addition to these two reasons there is also a third one, namely, that the decision to travel to work by car is sometimes based on lack of information about the benefits of other modes of transport or a result of poor access to these modes at the level of the firm.

Firms can remedy these three reasons for which employees may prefer to use their car rather than a more socially desirable mode of transport in three different ways.

In most cases, minor improvements such as moving a bus stop to a more convenient location, displaying public transport timetables or installing bicycle sheds, etc., may be all that is required to make alternative modes more attractive.

With regard to free parking spaces, employees should ideally be made to pay the market price for their parking space.

The answer to the problem of congestion, however, is far more complicated. The reason for this is that the responsibility for taking action to ensure that the congestion externality is internalised by motorists lies with government. The ideal instrument for dealing with this problem is congestion pricing; another instrument is the segregation of traffic flows. However, the technical problems and, above all, the political difficulties involved in implementing this type of instrument perhaps make it justifiable for government to place the burden of responsibility for this problem on firms. To carry out this task, firms can therefore more or less directly subsidise employees who use other modes, and either restrict or levy additional charges on private car use.

3. HOW?

Various countries have already adopted policies towards the company management of staff's commuting choices. For the most part, these policies have consisted of "travel plans" or "mobility plans", that is to say, more or less restrictive incentives for firms to gain an overall awareness of the problems that the mobility of their employees poses and to find coherent solutions to those problems.

In some countries, policies targeting more specific objectives have sometimes been introduced. In Southern California, for example, in addition to Transport Demand Management programs (TDM), "parking cash-out'" schemes have been introduced to combat the particular, although crucial, problem of free parking provided by employers.

These policies comprise a series of instruments designed to meet one or more of the following objectives: (i) improve the attractiveness of other modes; (ii) make motorists pay the full cost of parking; and (iii) discourage car use.

3.1. Enhancing the attractiveness of other modes

To make it more attractive for the employees within a firm to use other modes of transport rather than the car, it is often enough to make some inexpensive improvements such as moving a bus stop to a better location, building a bicycle shed or providing Internet access to the website of a public transport operator that can indicate the best route and estimated travel time for any particular trip.

As part of its travel plan, for example, the University of Sheffield in the United Kingdom improved signing on the campus, published guides to public transport services and improved the lighting and safety of pedestrian walkways by installing closed-circuit TV cameras. It also subsidised the extension of one of the bus routes serving the campus and increased the frequency of services. In addition, the university constructed a covered and secure bicycle parking area. It also provided information on public transport services on its Intranet. The cost of all these measures was fully covered by the initial revenue from the parking fees introduced on campus, as part of the same travel plan, under conditions that we shall examine in the following section.

Very similar measures were introduced under the travel plan implemented by Nottingham hospital. One of these measures consisted in making the openings that pedestrians and cyclists had forced in perimeter fencing "official" and easier to use. Another consisted in providing a secure

parking area, showers and lockers for cyclists. Again, all these improvements cost merely a fraction of the revenue earned from the parking fees introduced as part of the overall travel plan.

Another inexpensive measure consists in facilitating car-sharing. Under its travel plan, Fife Council in Scotland drew up a list of reference journeys to work based on a survey of its employees and then created a database to facilitate car-sharing. The travel plan introduced by Hewlett-Packard at its site in Edinburgh in Scotland also includes a database to facilitate car-sharing.

The understandable reluctance of employees to practise car-sharing is due to the fear of finding themselves without any means of transport in cases where an unforeseen event during the day might make it impossible for all the users of the same given car to return home at the same time. To overcome such fears, the travel plan adopted by Boots in Nottingham guarantees a free taxi-ride home for car-sharers who might find themselves in just such a situation. This option is included in most of the travel plans imposed under Regulation XV in California.

3.2. Making motorists pay the full cost of parking

For motorists whose workplace is located in the city centre or in densely populated inner suburbs, the cost of parking would be the single largest component of the cost of travelling to work unless free parking facilities were provided by the firm. Studies carried out in Paris show that, for journeys to work to the city centre, the supply of parking spaces, regardless of whether or not they are provided free of charge by the employer, is the determining factor in choice of mode (PDU, 2001).

When the premises of firms are located in a densely populated area, providing employees with the benefit of free parking is expensive. Furthermore, even though in most cases firms treat the provision of free parking as a benefit in kind designed to retain managerial staff, such treatment is unfair in that some employees may not use their car to travel to work. Lastly, from a social standpoint, this practice allows firms to avoid paying taxes and social contributions on the equivalent salary payment and also generates additional car traffic.

3.2.1 Principle

For all these reasons, the law should be modified to make it mandatory for employers to indicate this benefit clearly on payslips and to make it subject to the same taxes and charges as salary payments. Specifying the precise value of the benefit in kind afforded by provision of free parking is not a problem for firms which rent spaces in a car park that they do not own. While placing a value on this benefit is not quite so straightforward for firms which own their parking facilities, a value can easily be established by reference to the prices charged for parking spaces in the neighbourhood. To ensure a proper balance, the law must also give employees the right to refuse such a benefit in kind and to convert it into a bonus or add it to their salary. In this way, the subsidy represented by the provision of free parking facilities at the workplace will no longer be a factor in an employee's decision about whether or not to drive to work.

Such reforms may prove difficult to implement in some countries or within certain legal and political frameworks. It might therefore be easier to require all companies to charge all employees who drive to work the market price for the parking spaces they occupy. From an economic standpoint, the effect in the medium term is the same. Salaries will eventually be adjusted to compensate for the average additional expense incurred by employees but, as in the approach outlined above, there will no longer be any tax evasion and no incentive to drive to work.

Conversely, while in political terms it is difficult to withdraw the "vested right" to free parking, it is perfectly reasonable to demand that firms put an end to the discrimination between those who drive to work and those who use alternative means of transport by paying all non-motorists a cash bonus or equivalent benefit. Although the incentive to drive to work is removed under this third line of approach, the tax distortion will remain the same should the bonus be subject to income tax and social contributions, while the benefit in kind of free parking is not.

The table below lists the impacts and conditions for application of the three approaches to removing the incentive to drive to work offered by the provision of free parking facilities at the workplace.

Table 1. **Free parking at the workplace - Three ways to remove the incentive to drive to work - Conditions of application and effects**

	Policy 1	**Policy 2**	**Policy 3**
Most suitable instrument	Make the benefit in kind of free parking taxable and offer the option of exchanging the parking benefit for an equivalent cash bonus	Require firms to charge employees the market price for parking, even if it means redistributing the entire revenue to all employees (whether or not they drive to work) in the form of bonuses	Require firms to provide an equivalent benefit in the form of bonuses for employees who do not drive to work
Most suitable context	In cases where a small number of employees benefit from free parking, e.g. managerial staff	In cases where all employees are in principle entitled to free parking, but where not enough spaces are available	In cases where most employees benefit from free parking
Effects	Removes the tax distortion and the incentive to drive to work	Removes the tax distortion and the incentive to drive to work	Removes the incentive to drive to work but not the tax distortion
Problems with implementation	It must be possible to estimate the value of the benefit in cases where firms own their parking facilities	Determining the market price	Determining the market price

3.2.2 Examples of application of the principle

To the best of our knowledge, no country has fully implemented, on the basis of mandatory requirements, the policies described above. In the United Kingdom, the sole requirement for existing establishments is to draw up a travel plan; and if several public or private establishments have taken advantage of these plans to introduce parking fees for their employees, the reason is that levying such charges allowed them to solve the problem posed by a shortage of parking capacity at their sites. The "parking cash-out" scheme in Southern California, that is to say, the requirement that all firms offer their employees the choice of free parking or an equivalent cash bonus, applies solely to firms which do not own parking facilities and which therefore rent spaces in public car parks. Firms that have their own parking facilities, which means most firms and almost all large establishments, are not subject to

this requirement. Although incomplete, these two experiences are nonetheless highly instructive in that they have produced substantial improvements and illustrate the variety of approaches that can be adopted within different political and legal contexts.

With 4 000 employees, 12 000 students and only 1 000 parking spaces, the University of Sheffield, located at a site in an inner suburb of Sheffield, found itself faced with a serious parking problem. The University's travel plan introduced a three-tier system of parking fees in its car parks, with different rates for employees, students and visitors. There are also three different categories of car park - A, B and C - with different charging systems. Employees can use any of the three categories of car park, provided that they pay the applicable fee, while students are not allowed to use car park A and visitors can only use car park C where a half-day charge applies. A permit to use car park A costs £28.75 a month. This price is that of a balanced market in which all demand can be met. A category B permit costs between £5.75 and £17.25 a month according to the income of the holder, but since these rates are too low to match supply to demand, permits are granted according to a system of points awarded to individual applicants, which takes account of criteria such as distance and quality of public transport services between the applicant's place of residence and the campus, the need to take children to school in the mornings, etc.

Managing the university's parking space allocation system is by no means an easy task, but in a community that is highly sensitive to issues relating to social equity, a system of this nature was essential in order to make the reform acceptable to all concerned.

The problem of acceptability is central to reforms designed to introduce a certain degree of cost pricing into the fees charged for parking at the workplace. To overcome political obstacles, it is often necessary for planners to agree to design reforms which only partially or imperfectly apply the economic principles mentioned above. This is illustrated by the Californian example of "parking cash-out".

In the United States, 91 per cent of all journeys to work are made by car, and in 95 per cent of cases the drivers concerned also benefit from free parking at the workplace. The system appears to be so natural that a survey in 17 American cities of people who travel to work found that over half of those using public transport were opposed to the principle of charging fees for parking at the workplace (Shoup, Chapter 23).

Since it would have been politically risky to require Californian firms to charge their employees for the use of the parking facilities they provided, in 1982, Donald Shoup, Professor at UCLA, proposed that legislation be enacted to oblige employers to pay financial compensation to employees who did not wish to make use of the free parking provided by their employers. Since such employees were a very small minority, this measure represented merely a tiny additional cost and was therefore felt to be acceptable.

After ten years of studies and controversy, in 1992 the State of California finally enacted legislation known as the "parking cash-out program", implementing the system recommended by Donald Shoup, but made three amendments limiting the type of company to which it applied: (i) the law did not apply to companies with fewer than 50 employees; (ii) nor to companies which owned their parking facilities; (iii) nor to companies whose rented parking spaces could not be readily excluded from the lease on their other premises.

These three amendments sharply reduce the scope of application of the legislation, given that most American companies own their parking facilities (77 per cent of all parking spaces are owned outright). In addition, companies which rent parking for their employees are usually among the

smallest (83 per cent of firms which do not own their parking facilities have fewer than 50 employees), precisely, those firms which are not subject to the legislation. Lastly, it is estimated that only 31 per cent of parking facility leases can be cancelled because they are not included in the lease for other premises used by the firm. The parking cash-out legislation therefore applies to merely 1.2 per cent of all parking spaces provided free of charge to employees.

However, these figures, which are national averages, underestimate the importance of "cash-out" in that it is usually in the most densely populated urban areas that the lowest proportion of companies owning parking facilities is to be found.

An important factor in terms of both the principle and the acceptability of the programme is the role played by taxation. Ideally, free parking at the workplace, as a benefit in kind, should be subject to the same charges and taxes as salaries. This is not the case in the United States, where free parking provided by employers is specifically excluded from the normal taxes on benefits in kind. The outcome of this is that a motorist who agrees to forego a parking space costing 100 dollars will indeed receive a bonus of 100 dollars as a supplement to his salary, but the bonus is subject to income tax, whereas use of a free parking space is not. This differential treatment makes cash-out less attractive to employees who drive to work.

In fact, the federal tax code included another provision that had to be repealed before the "cash-out" legislation could be applied and that effectively delayed the entry into force of the 1992 Act by six years. Under this provision, the benefit in kind afforded by free parking can only be tax-free if it cannot be exchanged for a cash bonus. This provision meant that the employees of firms subject to the cash-out legislation, most of whom wished to continue to benefit from free parking, found themselves liable to pay more tax. This provision restored the equal treatment of employees who drove to work and those who did not, but only in the very small number of firms subject to the cash-out scheme, which made implementing the cash-out legislation politically hazardous. It was therefore necessary to wait until the federal tax code was amended before California could start to implement "parking cash-out" in 1998.

The studies which have been conducted show that the "parking cash-out" legislation has been highly effective. In companies where it has been introduced, car use for journeys to work has fallen from 76 per cent to 63 per cent.

There is a vast difference between the United States and Europe. In the United States it is easier to ask companies to pay compensation to those who use public transport to travel to work because the cost to the company will be relatively low, given the tiny number of people who use public transport. On the other hand, it is extremely difficult to ask American companies to charge their employees for the parking spaces they occupy. Even if the company were to redistribute the revenue from parking charges in the form of a salary supplement, this change would not be readily accepted by employees, not only because this supplement would be taxable but also, and perhaps chiefly, because it would require a change of attitude.

In Europe, free parking for all employees is usually only found in large industrial establishments located on the outskirts of urban areas. In cities, where traffic poses the most serious problems, companies usually reserve free parking spaces for management. Requiring companies to offer an equivalent benefit to the majority of employees who travel to work by public transport is quite simply impossible, given the huge expenditure it would entail.

3.2.3 What about parking spaces for visitors?

For the customers of private firms, parking costs are implicitly included in the price of the goods and services they purchase. Firms providing free parking for their customers know what this price is and take it into account in their trading policy. This is not the case for the users of public services such as hospitals and universities. In most cases, the establishment provides free parking spaces for visitors, but only in very small numbers. A parking space in a hospital car park has the same opportunity cost regardless of whether it is used by a hospital employee, a patient or a visitor. It would therefore be illogical to charge solely employees for use of a parking space.

The travel plan established by Nottingham Hospital in the United Kingdom introduced charges not only for the parking spaces used by its employees, but also for those used by visitors and patients. Reduced charges are only available to the parents of sick children who need to visit for long periods at frequent intervals.

Parking spaces used by employees have the same opportunity cost as those used by patients and visitors, provided that no account is taken of the congestion externality. The sound policy from an economic standpoint is therefore to charge visitors the same fee as employees. If the congestion externality is taken into account, visitors should be charged more than employees, given that a visitor's parking space generates more trips and therefore more congestion. However, policies such as these aimed at discouraging car use lie outside the scope of responsibility of firms.

3.3. Discouraging car use

Charging market prices for the parking facilities that firms provide for their employees removes the implicit subsidy that firms make to trips by car. However, this charge is not enough to make a motorist pay for the full cost of his trip in cases where the trip is made on a highly congested route. Because it is unable to ration the use of road space, government often chooses to ration the space used for parking by creating an artificial shortage. It does this by preventing firms from building the parking facilities they require. Another way to force firms to discourage car use is to make it a requirement for them to subsidise the cost of public transport use by their employees. A third approach is to set firms quantified targets for reducing the number of car trips made by their employees or customers within the framework of "mobility plans". The common thread to these three policies is that they go beyond a simple correction of the distortions for which firms are responsible. In doing so, they necessarily generate unwanted effects and care must be taken to ensure that the cost of such effects does not outweigh the benefits of a reduction in traffic flows. In particular, because the objective of such policies is an indiscriminate reduction in car trips, they can discourage car trips whose economic value, all externalities included, is greater than their total cost.

3.3.1 Rationing parking spaces

The instrument most commonly used to restrict the supply of parking spaces by firms is the introduction of town planning regulations that place a cap, according to the function of a given building[2], on the number of parking spaces that can be built. There are also land-use plans which limit the total number of parking spaces that can be provided within a designated area. Lastly, some regulations may prohibit the mixed use of private parking facilities (for example, residents at night and employer during the day).

One of the problems with regulations that specify the maximum number of parking spaces that can be provided in new buildings is that this number is based on a parameter such as number of employees, surface area of offices or even the surface area of shopping areas. Despite the variety of these ratios, they cannot take account of the widely differing requirements of firms. This drawback opens the door to appeals and exemptions. To avoid this pitfall and ensure that the objective remains intact, it is preferable, wherever possible, to issue regulations that specify a maximum number of parking spaces for an entire development area or district and to auction off a set number of negotiable permits to build parking spaces.

The outcome of all these measures is to increase the scarcity and cost of parking facilities provided by employers. If the price of existing spaces can be set freely by market forces, the increase in prices will discourage journey-to-work trips which generate demand for long-term parking, but will have very little or no impact on trips made for other reasons (business, shopping, visits) which make far greater use of the same given parking space and which usually generate much more value for an hour of parking. The impact on congestion may be positive if congestion occurs at the time when journeys to work are made. If such congestion is spread over a large part of the day, the impact of these measures will be negligible. It is to secure greater control over, or to prevent such adjustments that supplementary regulations are frequently added to segment the market and reserve certain spaces for a number of exclusive uses.

Even if the spaces thereby made available are not reassigned to another use, reducing the number of parking spaces used for journeys to work produces a commensurate reduction in the number of trips made, but does not reduce traffic volumes in the same proportion. In fact, reducing the number of parking spaces simply increases their price. The trips that will be eliminated are those in which the price of the parking space accounts for the largest share of the total cost of the trip, that is to say, the shortest trips in terms of both time and distance which are also those which increase congestion the least. The trips that make the largest contribution to congestion have a much higher cost in terms of time and fuel consumption and are therefore those which are relatively less sensitive to an increase in the price of parking; these trips will be the last to feel the impact of a policy of rationing the number of parking spaces.

Why not force firms to outsource the management of their parking spaces or make their management a separate activity?

3.3.2 Subsidies for public transport

It is also possible to discourage car use by using subsidies to make competing modes more attractive. In Los Angeles, since the late 1980s, employers who provide free parking spaces for some of their employees are obliged to pay a subsidy of 15 dollars to offset the cost of public transport tickets purchased by those of their employees who travel to work by public transport. Under their travel plans, many Californian firms pay an equal subsidy to employees who share a minibus with more than ten seats and more or less directly subsidise employees who opt for car-sharing.

Users of urban public transport services in France pay only a third (in Paris) or half (in the provinces) of the cost of providing such services. The difference is chiefly made up by a tax that employers pay on salaries, known as the Transport Charge (TC). Since its introduction in 1972, the argument used to justify this employer contribution is that it compensates for the benefit to firms of access to the public transport network. In view of this, the TC paid by firms that provide a pick-up service for their employees is reimbursed.

This argument is obviously highly tenuous. There is clearly no reason why the contribution should be proportional to the wage bill rather than to the number of employees, nor is there any reason for it not to take account of whether a firm has very good or very poor access to public transport services nor why a firm should be liable to pay the TC even if none of its employees uses public transport. Despite the many undesirable effects of this tax (particularly the fact that it discourages employment), the TC has remained in place and in fact has gradually risen over time.

In the Paris region, in addition to the TC, a measure with a more specific objective was introduced in 1983 under which firms are required to reimburse half the cost of the public transport season tickets used by their employees. This measure is an incentive to use the already highly-subsidised public transport network, but not necessarily for journeys to work. The season ticket in question (*Carte Orange*) is not restricted to a given itinerary or to periods during the day when journeys to work are made, and few firms check whether the employee whose Carte Orange is reimbursed also makes use of a free parking space. Fraudulent Carte Orange reimbursements can assume a variety of forms ranging from relatively minor offences such as claiming for a more expensive Carte Orange covering more zones than required for the journey to work to more serious offences such as claiming for a Carte Orange that has not even been purchased. Studies carried out in 1998 estimated that the cost of fraudulent Carte Orange reimbursements amounted to a billion francs, i.e. a third of the total reimbursements paid by firms (CCIP, 1998).

Fraud of a similar nature has been noted in California on subsidies paid to the users of car-sharing schemes (Shoup, 2001, Chapter 26, section 26.2).

3.4.2 The constraint imposed by mobility objectives

We have noted earlier that travel plans encourage firms to desist from promoting car use and to adopt an even-handed approach to other modes by introducing measures that are inexpensive to the firm and that on occasion can actually save it money. In some countries, firms' travel plans are subject to constraining objectives with regard to modal split or the reduction of air pollution. At this level, the aim is no longer that of correcting distortions introduced by the firm, but to secure the participation of the firm in the policy of combating car use and make the firm share the cost.

This is the case in California, for example, where "Regulation XV" (replaced in 1996 by "Rule 2202") requires firms, subject to penalties for non-compliance, to propose plans for reducing car use with quantified commitments to objectives for reducing pollutant emissions. The state government provides firms with software that enables the latter to calculate the impact of the various strategies they could adopt through the use of a wide array of instruments such as car-sharing, public transport subsidies, etc.

The preparation of these plans, their implementation and subsequent follow-up and monitoring require staff resources that are not always within the means of all firms, which is why "Rule 2202" has raised the threshold for application of the legislation to firms with more than 250 employees, as opposed to 100 under the previous Act. This legislation, which is highly complex, has led to the emergence of specialised consultancies which assist firms with the preparation of their plans (Wachs and Giuliano, 1992).

4. AT WHAT PRICE?

All these measure can help to rationalise and occasionally ration car use. Besides the problem of their political acceptability which, as we have seen, is a determining factor, it might well be asked whether they are economically efficient. Unfortunately, for the time being, no-one has made an empirical study measuring their impact in terms of costs and benefits. The existing studies, which are chiefly American, are case studies based on samples of varying sizes of firms that had been encouraged or obliged to implement certain measures for the management of staff commuting choices. For the most part, these studies solely considered the cost to the firm (occasionally providing a statement of tax revenues) and only measured the benefit in terms of physical parameters, such as changes in the modal split or trends in mobility. These studies therefore addressed cost-efficiency rather than cost-benefits.

According to these studies, measures with the best cost-efficiency ratio are those which confine themselves to remedying price distortions introduced at the firm level, primarily through the subsidising (whether implicit or not) of parking for employees. Policies which go further than that and which make firms pay part of the cost of efforts to promote the use of public transport and reduce car use have a far more chequered, if not negative, record (Guiliano and Wachs, 1992).

5. CONCLUSIONS AND RECOMMENDATIONS

The lack of an economic assessment of these policies means that it is not yet possible to estimate the overall effectiveness of company travel plans. Economic logic and the experience that has already been acquired does, however, allow a number of conclusions to be drawn regarding the principles that should apply to such plans. The first principle is that it is preferable, wherever possible, to take action through prices rather than regulations, that is to say, to use liberal rather than controlled interventionism. The second principle is that it is better to impose a certain degree of constraint on firms rather than to trust in their goodwill or sense of civic duty.

5.1. Liberal versus controlled interventionism

The problems posed by road congestion in urban areas are primarily attributable to the fact that the interests of individual motorists are diametrically opposed to those of other motorists and the population in general. The main reason for this conflict is that the pricing system with which a motorist is faced does not reflect the full economic cost of his decision to travel by car. Unlike regulatory policies, policies that attempt to reintroduce a degree of cost pricing do not generate any unwanted or undesirable effects in terms of efficiency. While, theoretically, they may have unintended effects in terms of fairness, such an objection still remains theoretical. As Donald Shoup (Chapter 25, section 25.8) has shown in the case of “parking cash-out”, re-establishing cost pricing plays a large part in restoring a fairer approach to the lowest paid employees, women and minorities.

While cost pricing can have unfair outcomes in some cases, it is always possible to correct such effects by adjusting prices to reflect the income level of employees, as in the case of the University of Sheffield, or through the targeted redistribution of the benefits generated.

On the whole, these policies are all the more effective if they ensure a certain degree of consistency in terms of tariffs and taxation.

5.1.1 Tariff consistency

The effectiveness of cost pricing trips at the firm level is that much greater because it applies to all trips. This means that if employees are charged the full economic cost of using a parking space, visitors must be charged too and no subsidies should be given to public transport. As result, at the level of the firm there will be no distortion introduced into the choice of mode of transport for the trips generated by the firm.

In contrast, if at the level of the firm car trips are encouraged through implicit subsidies such as free parking facilities, an equivalent subsidy must be offered to users of other modes. This will restore the balance, but because such a policy is a general incentive to mobility it helps to fuel overall demand for urban trips beyond the point at which it would be economically justifiable. In terms of trips made solely by the firm's employees, this pitfall can be avoided by respecting the principle of fiscal consistency.

5.1.2 Fiscal consistency

If employees are not charged for the use of parking facilities, the cash value of this benefit in kind must be estimated and added to their salaries so that it is subject to the same taxes and charges as salaries. However, the same approach must be adopted with regard to the public transport subsidy and an equivalent bonus given to employees who travel to work on foot or by bicycle. The subsidy then becomes a salary supplement.

If firms are asked to correct distortions that are not within their power to remedy, then the problem of consistency no longer arises because we are no longer within the domain of cost pricing. In this case, it is important to determine the economic cost of the policy pursued. This cost must then be compared with the outcome achieved in terms of the reduction in vehicle-km during rush hours, for example, or tonnes of CO_2 emissions. It may well become clear at this point that better results at a lower economic cost can be obtained through the use of policies with narrower and more specific targets, such as urban tolls or pollution regulations applicable to car manufacturers.

5.2. Constraint versus goodwill or civic duty

It is at the time they grant building permits that local authorities have the greatest latitude to require companies to provide facilities or to organise in such a way as to minimise the use of private cars by their staff.

Unfortunately, these mandatory measures can only apply to new developments and thus have only a minimal effect on the total travel demand of existing settlements.

Except for California, few governments act by constraint to impose travel plans on existing establishments. Generally, they act by exhortations and sometimes by incentives as, for example, in France, where Ademe finances 50 per cent of the cost of the studies prior to the implementation of a travel plan and 30 per cent of the cost of pilot experiments.

The aim of firms is to make a profit. Asking them to act as benefactors will only win over the few firms that have based their communications strategy on an ecologically-friendly or socially-responsible corporate image, that is to say, a minority of large firms. If travel plans are desirable, then some of their components must be made mandatory. To do this, it is better to begin with requirements that are inexpensive to firms and that treat all firms fairly.

An advantage of reasonably mandatory measures is that they can give the companies an opportunity (or an alibi) to implement a reform which they consider desirable, but for which they hesitate to assume responsibility *vis-à-vis* their personnel.

NOTES

1. The data presented in this paper have mainly been taken from Rye (2001) for UK case studies and from Shoup (2001) for the American case study.

2. This policy of regulating the maximum number of parking spaces is a reversal of the earlier and very widespread policy of specifying minima. It is interesting to note that minimum-based regulations were first introduced as a means of easing the pressure of demand for parking spaces on the public highway, at a time when it was thought to be impossible to introduce parking fees for on-road parking!

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SWITZERLAND

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PARKING AND ACCESS POLICY IN SWISS DEVELOPMENT AREAS: THE CASES OF ZURICH NORTH AND SIEMENS ZUG

SUMMARY

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INTRODUCTION:
PARKING AND ACCESS POLICY IN URBAN DEVELOPMENT AREAS

With the decline of some of the well-known machine industries in Switzerland in recent decades, key sites have become degraded or at best underused. In urban areas, new developments were at first only allocated for the same purposes as before, i.e. industrial production and craftsmanship (small and medium enterprises). In this way the urban municipalities (often with socialist governments) have tried to maintain workplaces in the traditional secondary sector of the economy.

Only when it became evident that there was no longer a substantial demand for land of that category, were the land-use regulations softened and the tertiary sector was allowed to establish itself in the former industrial areas. At the same time, however, the peak of demand for land for the tertiary sector was already visible, if not exceeded. Therefore, several of the relevant development sites were also allocated for residential purposes, with a style of housing (lofts) especially adapted to young urban professionals ("yuppies").

One of the accompanying problems of such redevelopment, however, was traffic. Most of the old industrial sites were located at the immediate edge of intensively built-up city centres. Industrial workers often lived in the vicinity of their workplaces, in co-operative or industry-owned residential blocks. With the trend towards tertiary land use, workers were commuting-in from distant, often more attractive, green suburban areas, the primary result being an increase in road traffic.

Yet as the former industrial sites were located on main roads into the city, the capacity of the network was already greatly overutilised. The urban governments had to extend the restrictive parking policy, developed for the inner-city areas, towards these new sites on the periphery, in order to lower congestion on the access roads to the cities.

Therefore the need was felt for a policy that would link parking regulations and/or pricing in the new sites with access control. The numbers of cars entering and leaving the sites should be adapted to the possibilities for traffic management on the road network.

Two solutions that are in the implementation stage at the time of writing will serve as examples for the above: the Zurich North Development Site and the Siemens Development Site in Zug, the main difference between the two being the way in which access management is/should be carried out.

1. ZURICH NORTH

1.1. The development project for "Zurich North"[1]

Zurich North (Zentrum Zürich Nord, ZZN) is one of two large urban renewal projects within the area of the City (municipality) of Zurich. The aim of these projects is to convert large, former industrial areas into a mixed-use system within new urban structures.

The site of ZZN lies in the immediate vicinity of one of the most important railway and rapid transit stations, right across the existing central business district of Zurich Oerlikon, one of Zurich's three main business centres.

The project is the result of a co-operative planning procedure, combining the interests of the municipal government and administration with those of the property owners (primarily ABB) and the Swiss Federal Railways. The site development plan and a special building ordinance - which equals a partial revision of the construction and zoning ordinance of the city of Zurich - were approved by the municipal council in 1998. The concept comprises residential and business buildings, a shopping centre, parks, squares and alleys.

The size of the planning area is 61 hectares. Total investment costs (land acquisition[2] excluded) are approximately 2 300 million SFr.; the share of ABB is about 1 billion SFr. More than 50 per cent of the work is already completed or in progress.

1.2. Innovation with regard to parking in Area D

For many decades, parking regulations in Switzerland had been based on fixing a minimum number of parking lots per unit of floor area for living, work, shopping purposes, etc., to be created in new buildings. This encouraged house-owners to look for parking spaces in their own compound instead of depending on car parking on the roadside.

Local governments have also tried, for many years now, to fix maximum levels of parking. The maximum is defined in relation to the local conditions, such as accessibility by public transport. The reasoning behind this is environmental (to keep the number of car trips as low as possible) and functional (to relate the amount of parking facilities to the carrying capacity of the surrounding road network). Parking policy has thus become a tool of traffic demand management.

In the view of landowners and developers, these regulations are difficult to accept, not only due to the impact they may have on the attractiveness of a site, but also due to possible partiality towards certain landowners. Today it may well be that a firm traditionally located in the city centre has more parking allowance per square metre of floor area than a firm established ten years ago in a more peripheral location, closer to a highway; and the latter firm may have more parking allowance than one in a newly-constructed building.

Another peculiarity of parking regulations to emerge in Switzerland is that demand for parking lots is defined in relation to each type of project function (residential, business, industrial use, etc). What should be done, however, in an area that has, *a priori*, a multifunctional scope, whereby certain land uses require day-time parking and others require evening or night time parking?

For Area D in Zurich North, ABB Real Estate Ltd. has conceived an innovative concept for dealing with such a situation, the so-called *Fahrtenbegrenzungs-Modell* (access contingent model)[3]. Area D measures roughly 24 hectares and is located directly beside the important railway interchange of Zurich Oerlikon.

ABB is the largest landowner in the ZZN area. Instead of providing parking facilities to each of the buildings to be erected, ABB will act as the overall operator for parking provided in Area D, in a total of nine well-situated car parks. But instead of letting parking space permanently to those settling down in Area D, ABB attributes parking space "user rights". A user right fixes the number of car-rides in and out of the area and the time-frame in which these trips can be made. Tenants and visitors obtain these rights in the form of badges, whereas shoppers pay as usual with short-term parking fees.

The badges have to be renewed every year. The tariffs relate to the intensity of parking space use.

ABB also operates a parking guidance scheme which leads car drivers as closely as possible to their destination. The nine car parks are organised in a parking network. In this way, a maximum of handling capacity is achieved and search traffic is reduced to a minimum.

1.3. The policy behind it - and the details

With a few exceptions, tenants do not have a personal parking space, nor do they have it for an unlimited time-span. Almost all parking lots are thus "public" and the same parking lot may be used for various purposes (multifunctional use). In an ecological and traffic-planning perspective, the question is thus no more one of determining the number of parking lots but the number of incoming and outgoing cars/day. At the same time, the capacity of the surrounding road network is taken into account.

ABB has developed this model together with the Traffic Planning Agency of the Municipality of Zurich. The model was also approved by the bureau responsible for the environment. According to the contract, once all the buildings are constructed, a total of 9 800 car-rides per 24 hours into and out of the nine car parks of Area D will be allowed, with a total of 2 000 parking lots available.

The number of parking lots corresponds to the number that would have been possible without applying the new solution. No growth clause is adopted, as the number of cars admissible is directly related to the number of parking lots. On this basis and considering the pattern of tenants who will occupy Area D, the number and timely distribution of car-rides in and out during 24 hours was calculated with a simulation model. During the day, business employees' parking predominates, followed by shoppers'. Towards the evening, the situation starts to change and at night both residential parking and parking for entertainment (cinema, casino, etc.) prevail.

The final number of admissible car-rides in and out has been negotiated between ABB and the municipality. The original request of ABB was some 20-25 per cent above the level that the municipality was willing to accept. Monitoring of car-rides is carried out continually, but the

measuring results are only consolidated every six months. The limit for this period is thus 1.8 million car-rides.

What happens if the number of car-rides is higher than the limit? If the given limit of the accounting period is exceeded, ABB - as the general operator - has to pay to the municipality an initial penalty of 3.50 SFr. for each trip that is beyond the fixed total per semester. The minimum charge is, however, 50 000 SFr. This latter penalty becomes active independently from the amount of the limit excess. In case the excess is repeated later, the sum of the penalty is increased. Yet if the operator can keep to the limit, he will gradually obtain a bonus out of the sum paid as a penalty.

As the operator is responsible for keeping to the limits, he will have an eye on the single landowners and tenants. He will also organise a service of mobility management to the firms that settle down in Zurich North, with a view to the careful handling of mobility needs.

The contract for applying the model has been signed by ABB, all other landowners and the municipality. As the model is of a new kind, an initial trial period is foreseen in which the limit for the number of car-rides in and out is 10 per cent higher; and for the first two years of operation, there will be no penalty for exceeding the limit.

Further details of the parking management scheme in Zurich North are shown in Figure 1 in annex.

1.4. Organisation

The scheme is organised in the following way:

- ABB Real Estate Ltd. acts as "general tenant of parking space" in Zurich North, for a maximum of ten years. Its main task is to make sure the contract regarding the access contingent scheme is fulfilled and that rents for admissible car-rides in and out are paid;
- A special management organisation fixes the tariffs and the distribution of user rights to landowners and tenants;
- The bureau for parking guidance informs car-drivers on the road about free parking space, and it exercises control over the number of car-rides.

Not all of the projects to be realised in Zurich North will have parking lots. But all landowners in the real estate register will have access to parking lots in Zurich North.

1.5. Overall assessment: A win-win model

The development of parking policy for Zurich North - including the access contingent model (*Fahrtenbegrenzungs-Modell*) - has evoked a great many reactions from the municipality, ABB and other landowners. But today, all partners are of the view that the model meets the needs of the landowners, investors and customers best. There is much flexibility with regard to the expected types of land use and tenants and in the use of available parking space. Investors obtain the best possible returns on their investment in parking space, as this space is used in an optimal way. After the first few years, the contracting parties will reconsider the feasibility of the regulation.

The municipality has been able to implement its environmental policy in one of the large development areas of the city. The number of car-rides in and out is a better key to combating nuisances than the mere number of parking lots.

In the eyes of ABB Real Estate Ltd., this model is tailormade. It cannot simply be transferred to other sites. Its main characteristic is that it is particularly suited to multifunctional areas and thereby areas with good accessibility by public transport for commuters.

2. SIEMENS AREA ZUG

2.1. The development project for the Siemens area

Zug is a relatively small city (25 000 inhabitants) at the edge of the metropolitan area of Zurich. The city has a beautiful lakeside position on the sill to the pre-Alps. Its attractiveness for habitation and business is also strongly determined by the exceptionally low tax levels. Many notable international firms have taken their seat in Zug.

Directly adjacent to the railway station of Zug, we find a former industrial area of some 20 ha. in size, which belonged to the Landis & Gyr electronic devices company. A few years ago, the firm, including its real estate, was taken over by Siemens Building Technologies.

Siemens Building Technologies (SBT) has recently sold the smaller northern part of its land to another large real estate developer, who will realise a considerable share of housing, whereas Siemens will concentrate primarily on the conversion of the industrial site to land use by offices and other tertiary services. Only a few months ago, SBT thought of developing more housing due to a slowing in demand for business floor space. The fact that there is a great deal of business development in the new development areas of Zurich is a major cause of the decline in Zug's growth.

Larger shopping facilities are not foreseen in the Siemens area. The city of Zug already has a very impressive shopping mall in its centre, only five minutes' walking distance on the other side of the railway station.

The Siemens area is very well positioned on the transnational North-South (Gotthard) railway line, only 20 minutes' distance from Zurich and with a direct rail connection to Zurich airport. In addition, the area will soon profit from the newly-agreed Light Rail to serve the whole lowland area of the Canton of Zug. Furthermore, in a few years' time, the Siemens area will have direct access to the highway system by means of a new, two-kilometre-long, high-capacity feeder road. The new road will become the main accessway to the city of Zug, the actual access road serving increasingly for local and bus traffic.

In December 1999, the municipal and cantonal governments of Zug and the landowners of the former industrial area west of the railway station signed an agreement with regard to the development of the site. The scheme is described in a development plan (*Entwicklungsplan*). The plan shows the

main lines of land-use development and infrastructure financing, and it defines a detailed action programme for the development process as such.

An important element of this action programme is the drafting and implementation of a promising way of handling parking in the development area. The present report deals with this issue.

By the end of 2001 (at the time of writing), a first series of new office buildings, roads and urban parks have been realised. The coming development phase may well involve a larger share of residential functions.

2.2. The integrated parking and access policy

Today, while major parts of the development plan are not yet implemented, we find some 1 200 parking lots on the site. This figure must be seen in relation to 110 000 square metres of floor area. The ratio corresponds roughly to the municipal parking regulations established in 1983 (actually in review).

For the year 2020, the development plan foresees an increase of some 280 000 sqm. of floor area, of which 105 000 sqm for residential purposes. The rest will be dedicated to office and service functions. No shopping facilities for large numbers of clients are planned.

The consultant to the landowners, Ernst Basker & Partner, Zurich, first calculated the number of parking lots that would correspond to the increase in floor space, based on the norms of the Association of Swiss Road Experts (*Vereinigung Schweizerischer Strassenfachleute*, VSS) and backed by the Federal Office for Roads. For the whole of the old industrial area this would have brought the number of necessary parking lots to 3 900 – 5 200 (including the 1 200 already existing), depending on the land-use mix.

The mutually-agreed development plan of 1999, however, fixed the maximum number of parking lots at 3 000. This maximum was defined with regard to environmental considerations and the capacity of the adjacent urban road network. The plan thus meant some 25 per cent to 40 per cent less parking lots than the VSS norms.

In Spring 2001, the municipal and cantonal governments and the landowners met in intensive discussion to find a way out of the renewed intense dispute. An independent consultant[4] was brought in to co-ordinate and moderate the process.

The parties involved came to the compromise of a maximum of 3 700 parking lots. The underlying conditions were:

- that parking facilities would be submitted to charges;
- that some of the private parking lots would be opened to the public in the evening and on weekends for recreational purposes (nearby stadium and exhibition site); and
- that access to the main road network would be modulated so to avoid heavy congestion in peak hours.

At the same time, parking guidance should allow for easy access to the large mass of parking lots that were – although on private property – not attributed to single tenants or persons.

So far, the concept resembles that of Zurich North. The difference is, however, that the Zug concept does not force the landowner or overall owner/manager of the parking facilities to provide for numerical car access control nor to keep to a level defined with the urban government.

In the case of Zug, the landowners stated that they did not wish to be the only ones in the whole Zug area (including some remote greenbelt sites) to have to undergo car access control. A solution was therefore found whereby the urban and cantonal traffic police would develop a citywide traffic management system, based on traffic needs calculated in a homogeneous way for all larger sites. Main-road access would thus be attributed by means of a sophisticated connection of traffic lights to each larger area.

2.3. The allocation of number of parking lots, combined with pricing

The development plan is based on a step-by-step implementation of the various landowners' areas. By 2003, a large business park will be finished, followed by low-rise housing segments which do not require special permission procedures. Until recently, in the areas open for residential purposes, the housing share was expected to be between 50 and 70 per cent, the rest being foreseen for offices. Today, the expectations point rather in the direction of larger housing shares.

For the calculation of the number of required parking lots, according to the above-mentioned VSS norms, the first consideration is the planned amount of floor area for each type of use. The required number of parking lots per 1 000 sqm of floor area also depends on accessibility to the area by public transport, mainly defined as the distance to the nearest railway station. In the case of the Siemens Site in Zug, a large part of the area is best qualified in terms of this criterion.

In addition to accessibility by public transport, the VSS parking norms also require consideration of the surrounding road network and environmental aspects.

According to the agreement of Spring 2001 between the landowners and the municipal and cantonal governments, the maximum number of parking lots allowed over the whole area is 3 700. This corresponds to:

- One parking lot per 100 sqm of floor area for inhabitants, in residential zones;
- One parking lot per 100 sqm of floor area for employees, in zones of mixed land use;
- One parking lot per 140 sqm of floor area for employees, in zones reserved for work places;
- One parking lot per 1 000–1 400 sqm of floor area, for visitors;
- One parking lot per 100 railway passengers/day, for Park & Ride.

With regard to parking control and charges, several alternatives have been studied. The alternatives relate to the way in which different elements of the parking policy are combined among each other. These elements are:

- Pooling all 3 700 parking lots under one management system, or individual handling by each enterprise. In the case of Siemens Zug, all solutions belonged to the first type: pooling;
- Access control, allowing identification of the different groups of users of the available parking facilities;
- Pricing in relation to the time during which a parking lot is used;
- Pricing in accordance with the time of entrance (peak hour, off-peak);

- Pricing in accordance with the time of exit (peak hour, off-peak).

For the evaluation of the various alternatives, the following criteria were applied:

- How far does an alternative guarantee the functioning of the main road system around the development area?;
- Are the operational system and the organisation of parking management efficient and do they allow for flexibility if there is a need for adoption of new conditions?;
- Are the available parking facilities used efficiently?;
- Does the system have a positive impact on the modal split, in the sense of inviting employees and residents to make more use of public transport?

The three partners in policymaking (cantonal government, municipal government, landowners) applied different weights to these criteria. The evaluation process therefore led to a certain spectrum of preferences.

Before we discuss the results of the evaluation, we should mention that, on the one hand, all alternatives to parking management itself included a new, dynamic parking guidance system which should be extended over the whole city. On the other hand, parking management could be combined in various ways with a model of area access management. Here, the limitation of car access to the area could either be fixed on a daily basis or for the peak hours only; or the access control could be handled in a more dynamic way, by relating the entry or exit allowance to traffic loads on the main road network.

The final winning scheme had the following characteristic: pooling (i.e. overall management) of parking facilities. Parking allowances differed in the following ways:

a) Short-term parking for visitors, with a basic price related to duration and an additional price related to the entrance time (peak-hour surplus);
b) Long-term parking for employees, based on multiple parking permits ("*abonnement*", two, three, four or five times per week). An additional price was to be paid for entries over the *abonnement* allowance and for entries during peak hours. Employees making use of long-term parking, however, were not attributed a personal parking lot;
c) Long-term parking for VIPs, with the same pricing rules as for the employees, but with a personal parking lot;
d) Permanent parking permit on fixed lots for residents, charged at a monthly flat rate. Certain parking lots may be sold to other residents, where the household requires a double parking lot;
e) Park & Ride for railway passengers.

This scheme has become part of the special building regulations proposed to the parliaments of the Canton and the Municipality of Zug.

2.4. Management of traffic and main road access

Area access management is a novelty in recent parking policy for large, privately-owned development sites.

As discussed above, the task of controlling incoming and outgoing traffic on the basis of an agreement between municipal government and landowners falls – in the case of Zurich North – to the latter.

In the case of Siemens Zug, the solution presently proposed is more differentiated.

On the one hand, the traffic control instruments are different in the morning and in the evening peak hours. Outside the peak hours, access is only limited by the available parking space, in contrast to Zurich North, where there is a limit on whole-day parking. In the Siemens area in Zug, the control of in-flowing traffic is foreseen through pricing, and control on out-flowing traffic is foreseen by means of traffic lights.

The reason for differentiating between morning and evening traffic management is that, in the morning peak hour, traffic must be made to flow away from the nearby highway. The policy is thus to influence the amount of car traffic by the parking pricing system.

In the evening peak hour, access to the nearby highway is already (before full development of the Siemens area) mostly congested. The scheme developed by the municipal and cantonal governments thus takes into account the wish of the Siemens area developer not to be the only one who has to dose access to the main road network by means of traffic lights. The traffic management system using traffic lights over the whole city should therefore be guided by a policy which holds back traffic from the starting points (large traffic generators) in order to obtain a traffic flow which is no greater than that allowed by the highway capacity.

Obviously, such dynamic handling of traffic - be it by means of pricing or an overall system of traffic lights - requires a relatively sophisticated technology. Siemens itself is interested in this type of differentiated traffic management becoming the norm.

2.5. Mobility management

The landowners in the Siemens area of Zug are aware of the fact that firms which will settle down in this area will have to discuss with their employees a transport policy that relates to the above-mentioned principles. The key to pertinent understanding from the side of the employees is “mobility management”.

Zug is, among Swiss cities, already quite advanced with regard to this approach to traffic problems. The cantonal government, the transport operators and private businesses each have their role in smoothing the conditions for commuters and shoppers to use public transport or bicycles. The Canton provides relevant consultancy to the private firms, and the transport operator provides tailor-made services to them. The firms themselves reach favourable agreements with their employees if the latter renounce excessive use of the car.

CONCLUSIONS

The parking policy for Zurich North presented above represents a novelty in Switzerland. The landowners have taken a heavy burden on themselves in implementing such a sophisticated scheme of parking and access management. The coming months will show how the approach is functioning in reality. The merit lies with Zurich North for having made a start.

The scheme for the Siemens area in Zug has not yet been realised, but it has undergone a phase of intensive collaboration between local and cantonal government and the landowners and is thus the result of public-private-partnership. As such, it may obtain the approval of both parliaments in 2002.

Such schemes, which combine both parking and area access policy, are intended:

- to fulfil the requirements of efficiency;
- to provide a clear division of tasks between the private sector and public authorities;
- to balance the interests and concerns of a variety of private sector actors and residents;
- to respect the capacities of the road network;
- to bring demand to the newly-increased offer of public transport; and thus
- to respond to the requirements of environmental policy.

Obviously, once there is more experience with such solutions, the public authorities and the landowners will make use of the space for manoeuvre for still more innovation.

NOTES

1. *Source*: ABB Real Estate Ltd., Zentrum Zürich Nord, March 2000.

2. Land acquisition of some 700 million SFr.

3. *Source*: Interview with and documents provided by Mr. A. Beck, ABB Real Estate Ltd., Promotion and project development.

4. The author of the present contribution.

Figure 1

Parking management of single car parks Traditional	**Central parking management of several car parks** in process of construction in Zurich North Development Area

Steering instruments

Long-term parking Parking lots for tenants Parking lots allocated to specific individuals	**Parking Guidance System**		**Long-term parking** Renting a specific parking lot. Allocation of a parking lot to specific individuals.	**Housing** Proprietors Tenants **Tertiary sector activities** Tenants	Red badges
		User requirements	**Long-term parking** General access to all parking lots without time restriction.	**Housing** Tenants **Tertiary sector activities** Tenants	Blue badges
			Long-term parking Restricted access to certain parking lots without time restriction.	**Housing** Tenants **Tertiary sector activities** Tenants	Semi-blue badges
			Long-term parking General access to all parking lots, with time restriction (8 a.m. to 6 p.m.).	**Tertiary sector activities** Employees	Green badges
			Long-term parking Restricted access to certain parking lots, with time restriction.	**Tertiary sector activities** Employees	Semi-green badges
Short-term parking Ticket Parking lots not allocated Time-progressive tariff			**Short-term parking** Ticket. General access to all designated parking lots. Progressive fees.	**Visitors** **Customers** Short-term parking	Ticket

SUMMARY OF DISCUSSIONS

SUMMARY

1. CAR PARKING FOR COMMUTERS -- A STRATEGIC VARIABLE

1.1 Cash-out incentive schemes

The rest of the world is gradually catching up with the United States in terms of car ownership. The trend worldwide is towards ever greater numbers of private cars and it would be fair to say that the current situation in the United States provides a foretaste of what many regions around the globe can expect to see in the future.

In the United States, for example, over 90 per cent of commuters travel to work by car and as a general rule free parking facilities are provided for them at the workplace by employers; in contrast, no benefits are given to employees who do not travel to work by car. In a situation such as this, free car parking paid for by employers would seem to be an irresistible tide that cannot easily be turned back; it offers a powerful incentive to employees to travel by car. Employees who use their car to travel to work receive more benefits from their employer. On the other hand, it has been proven that, as a general rule, higher parking charges encourage greater use of alternative modes of transport.

The idea which dominated discussions at the Round Table was that, with regard to parking and in the particular context of the United States, employees should be offered a choice between free parking or an equivalent cash benefit. Such a system would make car use no more advantageous than buying a season ticket for use of the public transport system. The payment of a cash equivalent to an employee who chooses not to make use of a free parking space would seem to be a measure that is simple to put in place and manage; in addition to which, such a provision would be fair in that everyone would be treated in the same way. The provision of free parking spaces, on the other hand, lessens the impact of one of the largest single components of the cost of car use, namely, parking charges.

In terms of fairness, offering free parking gives preference to high-income members of the car-owning population, which in the United States corresponds to white males. Paying a benefit for foregoing use of a parking space is therefore a means of ensuring a certain degree of fairness. Moreover, if such a benefit were to be taxable, it would in addition generate tax revenues that could be used to develop the supply of public transport. This would therefore be a means of creating tax resources through a measure that reintroduces fair treatment.

Parking is currently both free and tax-exempt in the United States. This advantage could be maintained if it were made conditional upon payment of an equivalent cash sum to those not using a car to travel to work, that is to say, through introduction of “cash out”. The expenditure by firms on payments to reward non-utilisation of a parking space would be covered by the savings afforded by reduced size of car parking facilities which are needed by firms and which in many cases are extremely expensive to rent. This is the main thrust of the changes to the legislation currently under consideration in the United States and already implemented in California.

The introduction of cash-out incentives, i.e. payment of a financial benefit for non-use of a free parking space, makes the opportunistic cost of parking visible. This cannot but raise the awareness of employees. Furthermore, the market, when it is undirected, creates discrimination in that free parking

without any compensatory measures gives preference to certain categories of the population over others. Free car parking is extremely generous and tantamount to rewarding those who do not share the same environmental concerns and who already have certain advantages in terms of income.

Cash-out incentive schemes can mark the turning point for employees with regard to the use of environmentally-friendly modes of transport, even though some employees will clearly prefer to use their car regardless. Over 20 per cent of car users have nonetheless opted for cash rather than free parking spaces in areas in the United States where cash-out schemes have been introduced. What is important is to offer a choice.

Cash-out schemes can be particularly appropriate in the event of changes in an employee's personal circumstances (new house, job, etc.). In such cases employees can make allowance in their travel plans for the fact that foregoing the use of their car will be rewarded by a cash benefit, and choose their place of residence or work accordingly.

Admittedly, one remaining obstacle to cash-out schemes is that firms are unaware of the cost of providing free parking spaces because it is buried in the overheads and they therefore cannot assess the exact cost of free car parking in cases where the latter is provided. However, what matters is to gain an idea of the market prices for parking spaces in the area in question and in this respect firms do have access to reliable sources of information.

1.2 Prerequisites for cash-out schemes

A number of prerequisites must be met if a cash-out policy is to work. Since changes must be made to current legislation and tax procedures, both firms and individuals need to be familiar with the latter. Furthermore, to ensure that everyone is indeed treated fairly, these measures must be applied uniformly, irrespective of the level and position reached by employees within the company. There can be no question either of people taking the cash payment and continuing to use their car, simply paying for alternative car parking space elsewhere. Hence the need for employees to sign a declaration to the effect that they will no longer use their car to travel to work. In addition, measures must be discussed within the company, since the success of a cash-out scheme depends upon the way in which it is perceived by employees. Staff must be encouraged to think carefully about what they are doing. Lastly, physical support measures also need to be taken, such as the possible provision of bicycle parking areas.

If cash-out is to be viable, then the provision of free car-parking spaces, which are expensive for firms, must be made redundant. To enhance its effectiveness, a cash-out scheme must apply not only to parking spaces rented by firms but also to those owned outright by firms. What will happen to such spaces?

- In the short term, parking spaces will be made available for others. They could be used either for leisure activities or for shopping. The fact that there are fewer people commuting by car will reduce traffic levels during rush hours, which will improve conditions for other users during off-peak times. In areas where parking charges are levied, this will generate revenue for firms or local authorities.

- In the long term, land-use plans will provide for smaller numbers of parking spaces, which will automatically reduce the number of workers commuting by car and which will also allow firms to make financial savings.

It is essential that the regulations and change of tax framework on which cash-out schemes are based work towards the same goals in order to generate synergies and counter adverse impacts on the environment. Such a system cannot in fact be introduced incrementally by individual firms; it must be based on modification of the regulatory and fiscal framework.

1.3 Constructing a parking policy on the basis of cash-out schemes

Consideration should be given to extending the use of cash-out incentive schemes. The provision of parking spaces at the workplace is merely one element in an overall parking policy that should apply to all parking facilities. It would therefore be highly desirable for municipal authorities to introduce standard parking charges in all areas equal to the market value of the parking spaces in question. For example:

- Parking spaces around shopping centres should reflect the market value of street parking spaces, and the use of public transport should be encouraged by offering some form of incentive to users, such as reimbursement of public transport tickets. This used to be common practice in the 1950s but has since been abandoned in favour of the current practice of reimbursing the cost of a parking space;
- Commuters travelling to work by bicycle should be subsidised by an amount at least equivalent to the cost of travelling by car. This would be a far-reaching change that would dramatically alter commuter perceptions.

Parking at the workplace comes at a very high cost which cannot be reflected by the market unless a sum of money is forfeited in exchange for the possibility of free parking, that is to say, a cash-out policy. Parking spaces have greatest value in densely-populated areas. However, it is in these very areas that high-quality public transport is usually available. This suggests that cash-out schemes will result in changes in behaviour in those areas where they are most needed, i.e. in areas experiencing difficulties in terms of both transport and the environment.

There nonetheless remain doubts over the effectiveness of such measures if powerful messages encouraging the use of private cars continue to be sent to users. These messages may consist in failure to cover environmental costs, poor-quality public transport and the resultant time losses, lack of safety on public transport or massive investment in road and motorway infrastructure. It is clear, from this standpoint, that benefiting from a cash incentive alone will not be sufficient to achieve lasting changes in behaviour. On the other hand, cash-out schemes can be seen as one measure among the array of instruments available to public authorities. They reveal the hidden cost of private car use and are a step in the right direction that brings us nearer to the ultimate objective. There is no need either for massive investment in public transport to encourage the use of such schemes since, in many cases, employees who accept a cash incentive opt for car-sharing as much as they do for public transport.

The simplest change would be to introduce parking charges or taxes; however, such a solution would not offer an employee a fair market price in exchange for using another mode of transport. This would negate the strong perceived incentive in a cash-out scheme in cases where employees are asked to forgo use of a free and tax-exempt parking space. The difference is subtle, but nonetheless profound. In addition, making employees pay for use of a parking space would be hard to justify in political terms and, in this respect, cash-out schemes are merely a palliative for the widespread dysfunctions arising from the provision of free parking spaces, although this particular palliative does have the advantage of being politically acceptable.

It would therefore be fair to say that cash benefits in return for an agreement to forgo use of a free and tax-exempt parking space, as in the case of a cash-out scheme, can be incorporated into transport policy and are capable of changing perceptions even though they would be insufficient if used in isolation. While, doubtless, merely a very small step forward, cash-out schemes have the advantage of being universally acceptable. Consideration should nonetheless be given to optimising measures relating to company parking policy introduced by different firms at the regional level, in order to ensure that measures adopted by one firm are not cancelled out by those introduced by other firms. The success of such optimisation would depend upon the organisational ability of firms within a given area of activity (which includes schools, hospitals, government administrations, etc.) to ensure that, even if parking is not the sole instrument used, it is nonetheless integrated into an overall strategy.

2. POLICIES PURSUED BY FIRMS

2.1 Scope for change

An examination of the employees' behaviour with regard to journey-to-work trips usually reveals a 60/20/20 split:

- 60 per cent of employees are prepared to modify their behaviour and are receptive to ecological arguments, but remain unsure how to proceed. They are in favour of bicycle paths and better public transport services. It would be fair to say that their attitude differs substantially from that of politicians in that, unlike the latter, they are amenable to change;
- 20 per cent of employees already use environmentally-friendly means of transport; the aim here is therefore to increase this percentage;
- 20 per cent enjoy using their car and are not prepared to change their mode of transport.

It must be borne in mind that perceptions of transport are based on individual opinions regarding the relative quality of and advantages to each mode of transport. The aim must be to change these deeply-entrenched patterns of behaviour which are both rational and irrational, conscious and unconscious. Beliefs and learning have an essential role to play in this respect, as does participatory democracy.

Consequently, the ECMT could act as an educator by spreading the message that most people are prepared to modify their forms of mobility and that politicians are often mistaken about people's expectations in this respect.

2.2 Company travel plans

The travel plans and schemes put in place by firms are a practical means of examining problems democratically and of considering solutions in no less a democratic manner. The starting point for the travel plans drawn up by firms is the observation that employees are demotivated by difficult travel conditions in which they waste time in traffic jams and in looking for parking spaces or must contend with shortcomings in the supply of public transport. Under such circumstances, a firm that wishes to expand must closely examine the issue of employees' journey-to-work requirements. Travel plans are

even more essential in cases where a firm's premises are located at a distance from public transport communication hubs, but the very remoteness of the firm's location makes it difficult to draw up such plans. A sustained effort in such a context can ultimately reap rewards by raising the awareness of decisionmakers with regard to transport when choices have to be made about location.

One of the major agents of change consists in the factors that govern employees' choice of transport mode, information being one example. Other factors include decisions regarding the company's vehicle fleet, management of business travel, quality of public transport links, etc. In some cases, firms have introduced car share schemes, cycle paths and, in collaboration with local authorities, better public transport facilities. Most of the travel plans introduced by firms remain basic, however, and are limited simply to informing employees about the supply of alternative modes of transport and to promoting car sharing. Such plans usually reduce the number of kilometres travelled by private car by 5 per cent. By combining different incentive measures, such as reduced season tickets for public transport with deterrent measures such as parking fees for private cars, firms can reduce the number of kilometres travelled by private car by 15 per cent.

The successful implementation of such an array of measures cannot be left to chance. On the contrary, it can only ensue from in-depth discussions and collaboration between staff, staff representatives such as the unions and mobility managers specialised in transport issues. Consideration must be given to appointing transport experts, that is to say, mobility managers, who are either recruited directly by firms or put in place by government to advise firms. Their task is to help firms draw up travel plans and oversee their design. The travel-plan drafting process initiated by mobility managers must be democratic, i.e. it must set out to evaluate employees' needs and find solutions. As pointed out earlier, these mobility plans are cost-free to firms in that, by reducing private car use, they allow the firm to make substantial savings on the supply of free parking spaces while, at the same time, enhancing the image of the firm by portraying it as a social actor that is fully aware of its impact on the environment. This enables the firm both to attract and to retain high-quality staff while continuing to motivate staff already in place.

At all events, success will depend upon the democratic nature of the process and the involvement, in this respect, of all levels of employee within the company. It is particularly important to secure the support of the trade unions, which often try to obtain free car parking for all employees. At another level, management must give transport planners a free hand and, in addition, must not be left out of the schemes proposed. Rigorous and sustained monitoring of the implementation of travel plans is also essential.

There is no "miracle" travel plan universally applicable to all firms. It is simply not possible to establish a travel plan for a given firm until the requirements of firm's employees can be analysed in depth. Every firm has its own particular context which, to a large extent, is determined by the type of work it performs. A hospital cannot be readily compared to a plant manufacturing industrial goods, for example. Travel plans exhibit a wide degree of diversity, even though there may be similarities between plans established within a same given area where shared or interdependent solutions need to be sought. This is precisely the role of mobility co-ordinators who, in addition to the input provided by mobility managers within firms, optimise moves and changes of location of firms within a zone or region. The efforts of mobility managers must therefore be enhanced by such mobility co-ordinators, who in practice can play a crucial role in creating synergies between different regional aspirations and thereby ensure that the decisions taken by firms are not mutually contradictory.

When encouraging firms to adopt travel plans, it is advisable to emphasize the potential financial gains. For example, account needs to be taken of the positive impact on the productivity of employees who see a solution offered to their transport problem, or of the positive image which this democratic

process, that takes account of the environment, brings to the firm. It is possible that not all firms are interested in seeking to reduce CO_2 emissions. However, mobility co-ordinators, whose remit is to serve the public good, can help such firms in making substantial financial savings in units where mobility plans are introduced.

It is, doubtless, necessary to employ several instruments to discourage private car use and the image of social success that it conveys. The success of road lanes reserved for car-sharing is one example of the fact that it is also possible to work from within the road mode. However, in order to change patterns of behaviour, it is necessary to radically change mind-sets, even if that requires strong measures. In Switzerland, for example, rules apply to the maximum area within which staff can travel by car and if that threshold is exceeded firms are fined. Another possibility is to make the criteria for awarding parking spaces contingent upon the capacity of the infrastructure in the vicinity of firms' premises.

In conclusion, what is needed in all cases at the level of the firm is to establish a precise objective which consists not only in improving transport conditions for employees but also, and above all, in reducing the environmental impact of employees' journey-to-work trips. Travel plans provide a basis for discussion within the firm by forcing people to talk about the issue of mobility. They can also influence individual behaviour patterns by making citizens aware of the pollution they personally generate. The onus is on the authorities to provide an appropriate framework for action.

3. POLICY FRAMEWORK

The Round Table opened discussions by considering the example of new ECMT Member countries. In countries from the former socialist bloc, the transport of employees had been organised by the industrial conglomerates which employed them. After transition, rising wage levels encouraged growth in car ownership and it became common practice for firms to provide cars for their managers, even those in middle management. During the same period, the international financial institutions recommended that public transport subsidies be abolished and tariffs aligned on costs. Because income failed to cover all the costs of public transport, prices rose substantially and patronage declined. The share of public transport in the urban modal split in some countries fell from 90 per cent to merely 50 per cent.

There are some special economic zones, however, where local government and transport managers organise bus services funded by public and private subsidies. A new policy of providing as many parking spaces as possible in the more important areas of cities is also starting to become apparent.

The conclusion that can be drawn from the example of the CEECs is that, as levels of car ownership rise, it is extremely difficult to organise mobility schemes for employees. This is a deep underlying trend that, if it is to be countered, requires several instruments of public policy to be brought into play.

3.1 Raising awareness

The facts are that there are relatively few demonstrable cases where travel plans for firms have been successfully implemented, in that private firms do not necessarily have the requisite travel planning skills to organise travel plans for their employees.

In view of the complexity of the problems to be solved, as well as the distinctive attributes of individual firms, the Round Table felt that it fell to the authorities to recommend the recruitment of mobility managers within firms, or the consulting of such specialists, and that it was also the responsibility of the authorities to provide guidelines on what to expect from carefully drafted travel plans.

This point illustrates the crucial role that mobility managers can play in taking action, either within firms or at the level of a given development area under the supervision of mobility co-ordinators. Government must set an example by creating similar posts of mobility co-ordinators within public administrations. To ensure that appropriate structures are put in place and achieve success at a regional level, it may be advisable to set up regional advisory centres, designed to inform and assist firms and to ensure the consistent implementation of national environmental and territorial development policies. It is essential to ensure that such policies are closely co-ordinated.

It is therefore clear that information plays an essential role and that it is the responsibility of the authorities to establish methodological guidelines and provide firms with access to managers in the public sector who are aware of all aspects of such issues.

Travel plans are needed not only for new but also for existing firms. This can be achieved by substantially increasing awareness of the central objective of travel plans, namely, lower levels of environmental nuisance. An overall approach needs to be set in motion, which can only be done by organising resources on the basis of practical objectives and through information campaigns. A soft approach that raises awareness can prompt firms to initiate actions themselves, provided that such actions are part of an overall strategy.

It is important to make clear that travel plans are financially viable for firms and can greatly help to reduce CO_2 emissions. This latter aspect can encourage local and national government to provide support, even though a major financial commitment is not needed from government. Nonetheless, certain financial instruments can still be used, for example, making access to subsidies conditional upon drawing up a travel plan, although the experts at the Round Table particularly stressed the fact that not enough was known about the greenhouse effects attributable to pollutant emissions in the transport sector, a shortcoming which would have to be remedied gradually but surely. The media had to play their role to the full in this respect. In the same vein, pilot schemes, informing the public about such schemes and teaching, based on information campaigns, are some of the essential basic instruments that government must employ.

3.2 Fostering synergies between local initiatives involving finance

The role that government can play is not limited solely to explaining what the objectives are. Government must also encourage the formation of partnerships, for example, with transport authorities in the region in question. A problem that frequently emerges at the regional level is that it can be difficult to increase the supply of public transport, such as bus services. This is the case when services are provided on a purely commercial basis and when the sole criterion followed by public transport operators is that of financial viability. Under such circumstances, a firm which wishes to benefit from

better services may have to provide substantial funding resources. However, in most cases, the public transport network is managed by local authorities and an informed dialogue with the latter can be enough to secure additional services or the introduction of a combined ticketing system for, say, trains and buses.

In drawing up comprehensive travel plans, care must be taken not to exclude employees residing in regions that are distant from the centre of the industrial site. Travel plans must also take account of rural areas. This may require discussions with the managers of rail services in these remote areas. The upshot is that any measure taken by the authorities to organise rail services on a regional basis already contains within itself the seeds of success for travel plans organised by firms.

It follows from this that, in the developments outlined above, the public authorities need to ensure the transparency of the channels through which public transport is funded so that firms can feel that it is within their ability to intervene in these channels and influence the structure of the services offered by public transport operators. Improving the services that ensue makes it possible to consider reducing private car use and therefore has implications with respect to parking.

3.3 Parking policy as a determining variable

While all buildings must have parking spaces, it is important to limit the number of spaces provided, at least in buildings with good access to public transport services. The physical structure must send the right signals to employees. The number and quality of trips that can be made by public transport should be inversely proportional to the number of parking spaces provided. In addition, common regional standards are needed to avoid cities competing against each other. This might undermine the decisions over location made by firms in that individual cities would attempt to attract as many firms as possible and would be less demanding with regard to measures designed to reduce the number of parking spaces.

Parking policy is determined by local authorities and, unless the latter can rely on support from national legislation, they will have great difficulty in imposing unpopular parking measures. Moreover, it should be recalled that municipal authorities are under pressure from firms which want to set up premises on their territory. A comprehensive framework for parking policy can therefore act as a bulwark against excessive demands by firms.

Due to the high levels of taxation in Europe, parking policy is a powerful means of government intervention and one that is, undoubtedly, more effective than it is in the United States. Much can therefore be achieved by taxing the parking spaces provided by firms or by ruling that, as in the United States, parking be subject to cash-out. It is precisely such change that requires the support of an appropriate tax framework.

3.4 Strategic role of taxation

At a general level, taxation plays a crucial role in that it lends a final touch which ensures the consistency of the messages sent to both firms and employees. For example, it is necessary that:

- the provision of free public transport tickets to employees is tax-exempt;
- no tax exemption should be granted for company cars;
- expenditure on travel by public transport be made tax-deductible;

- regulations in certain countries, setting a cap on the amount received for parking, be abolished;
- expenditure by employers on car parking facilities be made taxable;
- all tax deductions for expenditure on private cars used for work purposes be abolished.

In Europe, consideration must be given to introducing restrictive measures, in terms of the macroeconomic regulatory framework, as well as incentives at the microeconomic level. Taxation can be one component of such action but must be framed at a national level in that:

- treating each firm individually is a very lengthy and costly process. It is preferable to have a common and well-established fiscal framework;
- if there is a clear fiscal framework, it is easier to win over the staff of firms and administrations;
- the travel plans of all firms within a given area must be consistent with one another; introducing individual travel plans on a piecemeal basis would rapidly reveal mutual inconsistencies.

3.5 A comprehensive regulatory framework

The general view of the experts at the Round Table was that, instead of making the development of travel plans for the employees of firms mandatory, it would be better to put in place an appropriate regulatory framework. This comprehensive regulatory framework recapitulates the points outlined so far in this summary of discussions at the Round Table, namely:

- Changes to the legislation in order to encourage the introduction of travel plans;
- A levelling of the tax system with regard to mobility. The tax system must not give preference to private car use over that of public transport;
- Improved public transport services, facilities for cyclists and alternative modes of transport;
- A reduction in the number of parking spaces that firms are allowed to build when establishing their premises. The best solution is to set a maximum limit on the number of parking spaces.

The travel plans drawn up by firms must therefore be placed within a co-ordinated framework established by the authorities, so that all plans are directed towards meeting the same objectives. Government must clearly explain what these objectives are. The failure to achieve widespread use of travel plans in the United States may be attributed to the fact that they did not have clearly defined goals capable of arousing the interest of firms.

It is also important to place the freedom of each enterprise within a context of responsible behaviour in that, while firms must help to resolve the problems their activities have caused, any action they take must be placed within an overall framework to ensure that measures are neither contradictory nor implemented in isolation.

Government must set an example and, to this effect, it can require central and local administrations as well as airports, for example, to put in place travel plans.

The actions of the authorities should be directed towards providing incentives and seeking complementarity rather than towards imposing obligations, in the strict sense of the term. Some

fine-tuning of various aspects of the regulations may nevertheless prove necessary. The aim is to ensure the consistency of regulations concerning, for example, the regional organisation of transport services, transport subsidies, tariffs, ticketing, location of public buildings, highway construction and provision of parking spaces, with a view to removing all obstacles and impediments.

Amendments must therefore be made to regulations and, to ensure optimum effectiveness, must be accompanied by action to meet the imperative need, outlined above, to harmonize tax rules.

Some experts at the Round Table expressed doubt over the possibility of making marginal changes to a transport system which until now had given high priority to private car use and which, with regard to the latter, had not even managed, for example, to internalise environmental costs. It was suggested in reply, that it was very difficult to make changes to the macroeconomic framework in that this was an area where public hostility could ensure the failure of radical measures. It was probably best to seek synergies between different instruments that could be mutually enhancing and embrace the need for change in all their dimensions.

This would mean that at the local level, in addition to incentive schemes and co-ordination, all aspects of public decisionmaking, such as those taken by the ministries of the environment, transport, energy, territorial development, health, education, construction, industrial policy, etc., would be placed within the same given task unit.

In the final analysis, there is a need to put all the various instruments of public action properly into perspective. This need embraces areas ranging from taxation to the built environment, regional autonomy, territorial development, location of industrial sites, transport subsidies, tariffs, information, etc. It may therefore be necessary to ensure that all these instruments send signals that point in the same direction.

4. CONCLUSIONS

The rationale behind company mobility plans is that of environmental protection and the need to reduce greenhouse emissions. This is a central objective and one that needs to be brought to the fore. It also needs to be addressed directly by government, which must initiate a debate and foster awareness of the importance of safeguarding the environment at all levels wherever possible.

Creating incentives and motivating both firms and individuals provide the basis for the work that government must undertake. To ensure that these incentives do not become a dead letter, governments must amend regulations concerning transport to make them more effective with a view to the future adoption of mobility plans by firms and measures to protect the environment. It was felt that the tax framework required particular attention in this respect. All that currently encourages private car use must be fought against to encourage adoption of another form of mobility.

The cultural differences between countries are such that, while in the United States it might be sufficient to modify the tax framework applicable to parking, in Europe, parking is simply one element in an overall strategy.

All of the above is aimed at addressing the problem of how to make it more advantageous for employees to use public transport rather than their car. What is needed is a change in the way in which transport is perceived by the public and this will require action in the form of information campaigns. Information campaigns can be pursued at the level of individual firms through the recruitment or consultation of mobility specialists who would form a network of what might be termed mobility managers, whose remit would be to help reduce employees' dependence on their cars.

The experts at the Round Table felt that, under present circumstances, government must provide an overall and consistent framework of incentives through a series of actions, such as the publication of codes of good practice or revision of the tax framework, rather than seeking to introduce legislation immediately in order to make measures mandatory. In the final analysis, however, action urgently needs to be taken to promote other modes of transport rather than the private car, in order to avoid creating a climate of mobility comparable to that in the United States.

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