36

THE COMPANY CAR SECIOR FROM AN ENERGY CONSERVATION PERSPECTIVE

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ABSTRACT: This paper reports on a study of the characteristics of company cars in Australia, and the impacts of possible energy conservation policies on company car fleets. The fundamental proposition is that the company car sector offers a considerable potential for energy conservation through changes to smaller more fuel-efficient cars. Company cars constitute a very important share of the new car market, and they tend to be larger less fuel-efficient types of cars, travel longer distances and be of more recent vintage than private cars. Responses of companies to a range of policy scenarios indicate that the policies considered would have negligible impacts on the overall demand for company cars, but that the shift to smaller cars would be substantial. The characteristics of companies and fleets were found to have very significant effects on the policy responses.

THE IMPORTANCE OF COMPANY CARS

Company cars constitute a very important share of the car market in Australia. Yet, the company car sector has been virtually overlooked by research, and its energy conservation potential has not previously been explored. This paper reports on a study of the characteristics of company cars[1] in Australia, and the impacts of possible energy conservation policies on the size and composition of fleets.

Evidence from the literature on energy conservation in transport suggests that a change towards smaller more fuel-efficient cars represents the most promising option for the conservation of petroleum energy in the medium term (Schou 1979a, 1979b).

The fundamental proposition of this study is that the company car sector offers a considerable potential for energy conservation via changes to smaller more fuel-efficient cars. Company cars account for about 35 per cent of the new car market in Australia, and as much as 44 per cent of new car registrations in the state of New South Wales[2]. In Britain the importance of the company car sector is even more pronounced with at least half of all new cars being bought by companies (Cooke 1978). The very large share of company cars in the new car market can be expected to have an important influence on the types of cars produced by the local automobile manufacturers as well as some influence on imports, particularly of luxury cars.

It is hypothesized that company cars tend to be larger less fuel-efficient types of cars, travel longer distances, and be replaced more frequently than other cars. These characteristics in turn would imply that the energy conservation potential of company cars is even greater than that suggested by their market shares.

POLICIES AND RESPONSES

Four specific energy conservation policies were selected for detailed study of their likely impacts on company car fleets.

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1. The study defines company cars as sedans and stationwagons registered by companies. Vans, utilities (pick-up trucks) and trucks were excluded on the grounds that their usage characteristics differ fundamentally from those of sedans and stationwagons.

2. Based on information provided in private communication with Ford Sales Company of Australia and the New South Wales Department of Motor Transport.

The policies were:

i. Increasing the price of petrol by 25%, 50% or 100%

ii. Imposing petrol rationing of 60, 40 or 20 litres per week per car.

iii. Imposing an inefficiency tax of $50, $100 or $200 per year on each car which does not meet a fuel economy standard of 10 kilometres per litre(1). This expense would not be tax deductible.

iv. Reducing the level of tax deductibility to 75%, 50% or nil for company cars which do not meet the fuel economy standard of 10 kilometres per litre

These policies are representative of the types of policies which could be applied to encourage companies to change towards smaller more fuel-efficient cars.

The approach adopted to assessing the likely impacts of the selected policies, involved the application of experimental design methods to the systematic construction of policy scenarios. The scenarios described possible future situations in terms of combinations of the policies at various levels The experimental design approach and its application in the current context is discussed in Schou (1981 and 1982a).

The responses of companies to a range of policy scenarios were sought in terms of the numbers of small, medium and large cars which companies would keep in their fleets if circumstances were as described in the scenarios. (A time horizon of about five years was considered, and the assumption of business activity remaining constant was imposed.)

The car size categories were defined according to a set of criteria specifying weight, engine size, number of cylinders, and fuel economy as follows:

Small: weight less than 1000 kilograms or engine size less than 1.8 litres, four cylinders, and fuel economy exceeding 10 kilometres per litre.

Medium: weight of 1000 to 1200 kilograms or engine size 1.8 to 2.5 litres, usually four cylinders, and fuel economy in the range of 8 to 10 kilometres per litre.

Large: weight above 1200 kilograms or engine size above 2.5 litres, 6 or more cylinders, and fuel economy below 8 kilometres per litre.

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1. 10 kilometres per litre = 28.2 miles per gallon.

Obtaining the policy responses in terms of the absolute numbers of cars that would be kept in each size category, allowed for the investigation of the likely changes in the overall demand for company cars as well as changes in the market shares of different size groups of cars.

Based on data from a sample of 216 companies in the State of New South Wales[1] statistical analysis was undertaken of the characteristics of company cars and of the impacts of the energy conservation policies.

THE CHARACTERISTICS OF COMPANY CARS

The sample of company car fleets comprised a total of 12,031 cars, representing just under ten per cent of all cars registered by companies in New South Wales.

The sizes of the fleets ranged from 1 car to 1050 cars, with a mean of about 56. As expected the distribution of fleet sizes is heavily skewed, with a large number of relatively small fleets and only a small number of very large fleets. The 216 companies represented a wide range of industry types and company sizes.

The Size and Fuel Efficiency of Company Cars

The characteristics analysis provided strong support for the proposition that company cars are predominantly larger and less fuel-efficient types of cars. Of the 12,031 cars as many as 70 per cent were classified as large, about 22 per cent as medium and only 8 per cent as small. The dominance of large cars in company fleets is further illustrated by 63 per cent of the fleets containing no small cars at all, while only 10 per cent of fleets contained no large cars

The fuel economy data complements the results with respect to car sizes. The average fuel economy reported for the fleets ranged from 4 to 16 kilometres per litre with an overall average of 7.1. This is about 15 per cent less than the average for all Australian cars, which is in the order of 8.3 kilometres per litre (National Energy Advisory Committee 1978).

A breakdown of the company cars into 'management cars' and 'field cars' (e.g. sales representatives' cars) showed that the former are generally larger and less fuel-efficient than the latter. Thus the ratio of 'management cars' to 'field cars' may be expected to have some influence on the propensity of a company to shift to smaller cars.

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1. The data were obtained in a mail questionnaire survey of 1000 companies registered in New South Wales (and employing 10 or more people). The survey, which was carried out in July 1979, collected information on a variety of company and fleet characteristics, as well as on the likely responses to the policy scenarios.

Distances Travelled

It was confirmed that company cars do indeed travel greater distances than other cars. The average annual distances driven by the company fleets ranged from 10,000 to 80,000 kilometres. The mean distance for management cars was 20,510 kilometres, while the mean distance for field cars was considerably greater at 33,838 kilometres per year.

It is revealing to compare these distances with those for all Australian cars. The average annual distance travelled by the total national fleet of cars and stationwagons is in the order of 15,100 kilometres (Australian Bureau of Statistics 1980). Thus about 70 per cent of management cars and no less than 95 per cent of field cars were driven distances in excess of the national average. The longer distances travelled by company cars clearly contribute to their greater total fuel consumption, and accentuate their energy conservation potential.

Replacement Cycles

The average time between replacement of company cars was found to be just over three years, implying an average age of about one and a half years. The average age of all Australian cars is considerably older than this, and has been estimated at five and a half years (Hamilton 1978).

This dramatic disparity in the average age of company cars and other cars explain why company cars account for a much greater share of the new car market than of the total number of cars registered. In New South Wales company cars account for less than ten per cent of total car registrations, but yet as much as 44 per cent of the new car registrations.

The dominance of company cars in the new car market implies that new energy saving technologies can be introduced more quickly in this sector than in the rest of the market.

Sketch of Some Other Characteristics

A number of other characteristics of company cars and of fleet management were investigated. These are summarised briefly below.

The majority (74 per cent) of the company cars were purchased by the user company, 25 per cent were leased, and only one per cent were acquired through hire-purchase. The usage of fuels other than petrol was very limited. Less than one per cent of the cars were operated on LPG (liquid petroleum gas), and only about half of one per cent on diesel.

The average price which the companies paid for petrol was ten per cent below the retail price, and nearly 90 per cent of the companies paid less than the retail price. This indicates that most companies obtain special discount arrangements from the petrol suppliers. The majority of companies (about 80 per cent) paid all the fuel expenses incurred by

the cars in their fleets. Decision making in respect of company cars generally takes place at a very high level in the company, usually involving the managing director and the general manager.

Perceived Importance of Purposes and Features of Company Cars

The perceived importance of a range of purposes and features of company cars was measured on a five point scale ranging from not important to very important, for management cars and field cars respectively

It was found that company cars are seen to be essential for conducting company business, this is particularly so in the case of field cars. Management cars are also to a large extent considered important as fringe benefits, parts of remuneration packages, and as means of providing transport of suitable standard. The companies tended to state as not important the purposes of projecting the company image, being signs of corporate success, status symbols, or gaining tax savings. These purposes are no doubt important in some types of companies, however there may have been some reluctance on the part of the respondents to admit this.

Features perceived as the most important for company cars were reliability, comfort, performance, and safety. Fuel economy was considered more important for field cars than for management cars, which is not surprising given the much greater distances travelled by field cars. It is notable that size of car per se was seen to be relatively unimportant. Variables such as new car price, resale value, and maintenance and insurance costs were considered fairly important for all cars, but slightly more important for field cars

A factor analysis was performed to summarise the data on the perceived importance of the purposes and features of company cars. This analysis reduced all the purposes and features variables (forty in total) to three factors, and revealed some interesting relationships. All the purposes and features of field cars load mainly onto the first factor. However the variables indicating remuneration, fringe benefit and status as purposes of field cars also load fairly highly onto the second factor, which contains the main loadings of the corresponding variables for management cars. The purposes and features of management cars separate between the second and third factor. The second factor comprises the status and perk oriented variables, while the third factor consists of what may be described as operation and cost oriented variables.

These results indicate that decision makers tend to perceive the purposes and features of field cars quite differently from those of management cars, and that in the latter case a distinction is made between status and perk type variables, on the one hand, and operation and cost type variables, on the other

The characteristics of companies and fleets were hypothesized to have significant effects on the responses of companies to the energy conservation policies under study. In this context the characteristics analysis served to provide an understanding of variables which constituted very important inputs into the central policy impact analysis.

POLICY IMPACTS ON COMPANY CAR FLEETS

The policy impact analysis generated results in respect of the likely impacts of the energy conservation policies on the size and composition of company car fleets, and the effects of the characteristics of companies and fleets on the policy responses. Analysis of variance was applied in a preliminary examination of the responses to the policy scenarios, while multiple regression analysis was employed in the comprehensive analysis of policy impacts and characteristics effects. The detailed results of this analysis are provided in Appendix.

It was found that the energy conservation policies under study would have virtually no impact on the size of company car fleets, and thus on the overall demand for company cars. However the impacts on the composition of fleets would be substantial. The number of large cars in the fleets would be reduced considerably, and the number of small (and to a lesser extent medium sized) cars would be increased correspondingly. The total number of fleet cars would stay remarkably stable even under the most severe of the policy scenarios.

This invariance of the size of fleets complements the finding that company cars are generally considered as essential for conducting company business. Thus companies will respond to energy constraints and conservation policies by changing to smaller more fuel-efficient cars, rather than by reducing the total number of cars in their fleets.

Of the four specific policies under study petrol rationing was found to have a much greater impact than any of the price and tax policies, at the levels of imposition considered(1). The imposition of rationing would result in very substantial shifts away from large cars and (at the most severe levels) also some move out of the medium size category. For example the introduction of rationing at the level of 60 litres per week per car would be likely to decrease the fleet share of large cars from the present of 70 per cent to less than 50 per cent. The same policy would result in an increase in the percentage fleet share of small cars from 8 per cent to almost 30 per cent(2).

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1. The changes in the fleet shares likely to result from the policies were computed from the regression results (shown in Appendix) including the relevant quadratic and interaction effects. For technical details of these computations see (Schou 1981a).

2. The rationing impacts were calculated from the base of the actual average petrol consumption of 80 litres per week for the company cars in the sample.

Increases in the price of petrol would result mainly in shifts from large cars to medium sized ones, although some change to small cars would also occur. Thus for example a 50 per cent increase in the price of petrol is predicted to reduce the share of large cars from 70 to about 61 per cent, implying an arc elasticity (of the fleet-share of large cars with respect to price) of about .26. The same price change would increase the share of medium sized cars from 22 to 28 per cent and the share of small cars from 8 to 11 per cent, implying arc elasticities of .54 and .75 respectively(1).

The inefficiency tax would induce a greater shift from large to small company cars than would any of the other policies except for rationing. Increases in the fleet-share of small cars would correspond almost exactly to the decreases in the share of large ones, and thus the share of medium sized cars would remain virtually unchanged. This is presumably because very few of the cars classified as medium size would meet the fuel economy standard (10 kilometres per litre) required to avoid the tax. The likely impact of, for example, an inefficiency tax of $200 per year per car would be to decrease the fleet-share of large cars to 45 per cent (from 70), while increasing the share of small ones to about 33 per cent (from 8).

It appears that companies are more sensitive to a direct lump sum annual tax than to an indirect tax via petrol price increases. Thus while the effective cost attributable to a 50 per cent increase in petrol price is, on average, somewhat more than $200 per year per car (2), the response to the direct inefficiency tax is likely to be greater. This type of disparity in responses to direct versus indirect taxes is not uncommon, it has been previously observed, for example, in the context of parking charges (Gillen 1977).

The final policy examined involved reductions in the tax deductibility for company cars which do not meet the fuel economy standard of 10 kilometres per litre. This policy would induce some changes from large to small and medium size cars, however it would be much less effective than the inefficiency tax

EFFECTS OF COMPANY AND FLEET CHARACTERISTICS ON POLICY RESPONSES.

It was confirmed that the characteristics of companies and fleets do indeed have very significant effects on the responses of companies to the energy conservation policies. (The numerical results with respect to all the characteristics effects are shown in Appendix)

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1. The petrol price increases were from the base of the average price of 26.9 cents per litre actually paid by the companies at the time for the survey.

2 The effective cost of a 50% increase in petrol price as calculated for the average fleet car would have been about $255. Note that petrol expenses are tax deductible while the inefficiency tax would not be.

Effects of Industry Type and Company Size

Industry type and company size have highly significant effects on the propensity of companies to change to smaller cars. Thus companies in some sectors such as manufacturing, business and professional services, and community services are more likely to move to small cars than companies in rural and mining, finance and property, transport and communications, and building and construction. Companies in wholesale and retail are likely to change to medium size cars but not to small ones. Very large companies are the most inclined to change to small fleet cars, while medium size companies (of 50 to 99 employees) are the least inclined to do so.

Effects of Present Fleet Composition and Fuel Efficiency

The existing composition of company car fleets has highly significant effects on the composition which companies would adopt in response to the policy scenarios. The greater the present share of a particular car size category in a fleet, the greater would be the share of that size category under the scenario circumstances. Thus companies which already have experience with smaller fleet cars have a higher propensity to adopt yet more of these. On the other hand companies which have very high present fleet shares of large cars are more likely to retain these types of cars.

These results are reinforced by the evidence on fuel economy effects, which shows that the better the present average fuel economy, the more likely are shifts to small fuel-efficient cars.

The fleet composition in terms of management cars and field cars was confirmed to have a significant effect on the policy responses. Thus the higher the ratio of management cars to field cars in a given fleet, the less would be the changes to small cars. This is understandable in view of the fact that management cars are generally larger and less fuel-efficient than field cars.

Effects of Distance Travelled and Replacement Cycle

The average annual distance travelled by fleet cars was found to have a negative effect on the likely fleet share of large cars. That is, the greater the distances travelled the more likely are shifts away from large (fuel guzzling) cars.

In respect of the replacement cycle and method of acquisition it was found that the propensity to change to smaller cars was greater the shorter the replacement cycle, and the higher the proportion of fleet cars being purchased rather than leased.

Other Characteristics Effects

The extent to which companies pay the fuel costs incurred by their fleet cars has a significant effect on the policy responsiveness. Thus in cases where the company pays all the fuel costs (for business as well as private travel) it is more inclined to move to small fuel-efficient cars. To the contrary the usage of alternative fuels (LPG or diesel) appears to increase the propensity to retain large cars.

The three factors summarising the purposes and features of company cars have some important effects on the policy responses. Companies rating the purposes and features of field cars highly important would be more inclined to change to small cars, than would companies which consider the status and perk oriented attributes to be very important. Finally companies which perceive the operation and cost oriented attributes of management cars as highly important are likely to move to medium size cars but not right down to small ones.

IMPLICATIONS FOR POLICY

The results of this study are expected to be of interest to both government and corporate policy makers. From the point of view of energy conservation policy, the results imply that increasing petrol prices will encourage some moves towards smaller more fuel-efficient cars. However a direct tax on cars with poor fuel-efficiency would be likely to have a greater effect on fleet-shares. It would be most effective to implement such a tax on a sliding scale basis, such that the tax would be greater the lower the actual fuel economy, and possibly combined with subsidies for highly efficient cars. This would serve to encourage continuous adjustments towards higher fuel-efficiency, rather than merely adjustment to meet a set fuel economy standard. An annual ineffiency tax would be relatively easy to administer, for example through registration charges, and could readily be extended beyond company car fleets to apply to all inefficient cars.

Selective reductions in tax deductibility for inefficient cars would encourage some changes to smaller cars. However differential rates of tax deductibility are likely to be more difficult to administer than a direct annual inefficiency tax, and this policy would not be generally applicable beyond the company car sector.

The rationing policy would be the most effective in inducing shifts to smaller cars. However rationing would also involve serious disruptions to the operation of companies and the whole economy, and therefore such a policy is unlikely to be implemented except in situations of severe (and hopefully temporary) supply shortages.

In the area of corporate policy the study is of relevance to the efficient management of company car fleets under energy constraints, and it has important implications for the automobile industry faced with large potential shifts in the pattern of demand in a very important sector of the market.

APPENDIX

Policy Impacts and Characteristics Effects on the Composition of Company Car Fleets

Explanatory Variables [a]	PCSMALL coef.	PCSMALL t-ratio	PCMEDIUM coef.	PCMEDIUM t-ratio	PCLARGE coef	PCLARGE t-ratio
PPRICE	.067	2.650	.024	.944	-.091	-4.242
RATION	-.483	-12.308	.167	4.205	.316	9.468
INEFTAX	.026	2 064	002	.137	-.028	-2.590
TAXDUCT	-.064	-2.517	- 014	-.557	.078	3 625
QPPRICE	- 000	-.398	-.000	-.235	.000	.748
QRATION	- 014	-5 273	-.005	-1.691	.019	8.218
QINEFTAX	.000	141	-.000	-1.143	.000	1.196
QTAXDUCT	-.001	-.611	-.001	-1 334	.002	2.309
PP*IT	-.001	-2.432	-.000	-.570	.001	3.541
PP*TD	.000	989	001	1.537	-.001	-2.995
IT*TD	001	3.487	.000	.140	-.001	-4.270
RURAL	-17.040	-4.609	6.089	1 626	10 953	3 485
BUILD	-5.232	-1.603	.307	-.093	5 538	1.996
SALE	-6.636	-3.443	5.090	2.607	1.545	.943
TRNSPCOM	-6.192	-1.964	-.032	-.010	6.222	2.321
FINPROP	-8.531	-2.334	- 233	-.063	8.758	2.819
BUSIPROF	2.556	803	-4.931	-1 529	2.370	.876
COMSERV	12 044	1.215	1.679	167	-13 723	-1.629
SIZE35	- 296	-.107	-.965	-.343	1 261	.534
SIZE75	-5.153	-1.681	3.390	1.092	1.761	.676
SIZE300	5.181	2.089	3.628	1.444	-8.808	-4.179
SIZE750	25.847	7 392	-6 009	-1.696	-19.835	-6.673
SIZEGTM	25.040	5.405	-1.687	-.360	-23.348	-5.929
FLEETSIZ	- 023	-.779	.009	.031	.014	.370
PPSMALL	52.448	9.829	-45.001	8.227	-7 446	-1 642
PPLARGE	-20 443	-6 288	-40 667	3.643	61.110	22.114
RATIOMF	- 894	-2.756	-.017	-.052	.911	3.304
AVDIST	.125	1.266	.087	875	-.212	-2.532
AVKMPL	1.423	2.152	-.312	-.466	-1.111	-1.976
PLPG	-7 330	-1 343	1.817	1.920	5 513	3.090
PDIESEL	-4 625	-2.349	-1 223	-1 109	5.847	2.893
PFCOV	10.784	3.607	3.831	1 507	-14.616	-4.825
AVRPLCM	- 181	-2.067	.135	1.484	.046	.604
PLEASE	-1.167	-.612	6.410	3.317	-5.243	-3.233
FACTOR1	10.862	5.491	-1.135	-.567	-9.727	-5.785
FACTOR2	-2.221	-2.260	-.817	-.351	3.038	3.053
FACTOR3	-1.091	-1.056	3.897	2.661	-2.805	-2.997
R^2	.43		.22		.53	
F-ratio	27.48		10.25		40.60	
Constant	64 47		-4.12		-20.24	

a. All variables are defined in the accompanying list

APPENDIX

Definition of the Variables in the Policy Impact Models

Name	Definition
PCSMALL	Percentage of Small Cars in Company Fleets under Scenarios
PCMEDIUM	Percentage of Medium Size Cars in Company Fleets under Scenarios
PCLARGE	Percentage of Large Cars in Company Fleets under Scenarios
PPRICE	Petrol Price
RATION	Petrol Rationing
INEFTAX	Inefficiency Tax
TAXDUCT	Tax Deductibility
QPRICE	Quadratic Term for Petrol Price
QRATION	Quadratic Term for Petrol Rationing
QINEFTAX	Quadratic Term for Inefficiency Tax
QTAXDUCT	Quadratic Term for Tax Deductibility
PP*IT	Interaction of Petrol Price and Inefficiency Tax
PP*TD	Interaction of Petrol Price and Tax Deductibility
IT*TD	Interaction of Inefficiency Tax and Tax Deductibility
RURAL	Rural and Mining
BUILD	Building and Construction
SALE	Wholesale and Retail
TRNSPCOM	Transport and Communications
FINPROP	Finance and Property
BUSIPROF	Business and Professional Services
COMSERVE	Community Services
SIZE35	20-49 Employees
SIZE75	50-99 Employees
SIZE300	100-499 Employees
SIZE750	500-999 Employees
SIZEGTM	1000 or more employees
FLEETSIZ	Fleet Size
PPSMALL	Present Proportion of Small Cars in a Fleet
PPLARGE	Present Proportion of Large Cars in a Fleet
RATIOMF	Ratio of Management Cars to Field Cars
AVDIST	Average Annual Distance Travelled by Cars in a Fleet
AVKMPL	Average Fuel Economy of Cars in a Fleet
PLPG	Proportion of Cars run on Liquid Petroleum Gas
PDIESEL	Proportion of Cars run on Diesel
PFCOV	Proportion of Cars for which the Company Pays All Fuel Costs
AVRPLCM	Average Replacement Cycle for Cars in a Fleet
PLEASE	Proportion of Cars that are Leased
FACTOR1	"Field Car" Factor on Purposes and Features
FACTOR2	"Status and Perk" Factor
FACTOR3	"Operation and Cost" Factor for Management Cars

REFERENCES:

Australian Bureau of Statistics (1980) Survey of Motor Vehicle Usage, Australia. Ref. No. 9202.0.

Cooke P N C (1978) The Company Car, Gower Press

Gillen D W (1977) "Estimating the Value of Time: An Additional Misspecification Error" Transportation vol 6, no. 1, pp 85-89.

Hamilton R B (1978) "Mobility and the Individual" Paper presented to Society for Social Responsibility in Science, National Conference on Energy and People - Social Implications of Different Energy Futures, Canberra 7-9 Sept.

National Energy Advisory Committee (1978) Proposals for An Australian Conservation of Energy Program, NEAC Report No. 1, Australian Government Publishing Service, Canberra.

Schou, Kirsten (1979a) "Energy and Transport: Strategies for Energy Conservation in Urban Passenger Transport" Environment and Planning vol 11, no. 7, pp 767-780.

Schou, Kirsten (1979b) "Transport and Energy Issues: Evaluation of Conservation Measures" Fifth Australian Transport Research Forum, Sydney, April

Schou, Kirsten (1981) Energy Policies and Company Cars - An Application of Experimental Design Methods in Economic Research. Bureau of Transport Economics, Occasional Paper (forthcoming), Australian Government Publishing Service, Canberra.

Schou, Kirsten (1982a) "A Scenario Approach to Transport Policy Planning and Evaluation" Paper presented to the 7th Australian Transport Research Forum, Hobart, April

Schou, Kirsten (1982b) "Company cars: characteristics and energy conservation potential" Transport Policy and Decision Making (forthcoming).

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