ESTIMATING THE INFLUENCE OF PUBLIC POLICY ON ROAD TRAFFIC LEVELS IN GREATER LONDON

By David Lewis*

Over the past two years fares and petrol prices in London have risen by more than 100 per cent in money terms, and owing to staff shortages public transport services have been operating some 15 per cent to 18 per cent short of scheduled mileage. The recent consultative document on *Transport Policy* (H.M.S.O., 1976) foreshadows further radical changes as a result of the progressive withdrawal of transport subsidies in London and the South East.

This article describes a model which has been developed for the purpose of forecasting short to medium term changes in the level of road traffic in Greater London. The study examines the substitution between private and public means of travel following changes in public transport fare and service levels, petrol prices, and demographic and macro-economic activity.

TIME-SERIES DATA

Traffic Data

Most urban transport authorities today use automatic traffic counter equipment for one reason or another. The Greater London Council operates counters which continually record hourly vehicle flows on several main roads throughout the Greater London area. Tabulations on these data, adjusted for public holidays and faulty records, are published monthly. For modelling purposes we have employed data for the period January 1972 to December 1975, from 10 selected counter sites in inner London (see Table 1). In order to control for variations in the level of traffic due to factors that vary with time of day and day of week, e.g. trip purpose and traffic composition, the data have been divided into five sets;

(i) Monday—Friday 0700—1000 (morning peak)
(ii) Monday—Friday 24 hours
(iii) Saturday 24 hours
(iv) Sunday 24 hours
(v) Monday—Sunday 24 hours.

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TABLE 1

Automatic Traffic Counter Sites

Road Number	*Road Name*
A20	Loampit Vale, Lewisham
A24	Mordon Road, Merton
A217	Wandsworth Bridge, Wandsworth
A23	Westminster Bridge, Lambeth
A40	Western Avenue, Ealing
A412	Greenford Road, Ealing
A41	Park Road, Westminster
A406	North Cirular Road, Barnet
A105	Green Lanes, Hackney
A11	Stratford High Street, Newham

Data on traffic composition to calibrate the automatic counter outputs are collected manually every two or three years. The proportion of non-car traffic—mainly trucks and buses—on a week-day varies between 20 per cent and 35 per cent, according to the location. The heterogeneity of traffic causes some problems, and it is assumed by necessity that there is no variation in the non-car flows which is not due to variables in the model. In order to generalise from the counter results to all traffic in Greater London, it is also necessary to assume that the volume and composition of traffic at the counter sites are representative of traffic generally and that changes are adequately representative of London as a whole. This may not be true where congestion forces traffic growth away from major roads on to minor roads, but it has not been possible to estimate the magnitude of this effect. However, care has been taken in the choice of counter locations used in this study to ensure that the data are not distorted by changes in local traffic conditions (e.g. infrastructure improvements).

Data on petrol prices refers to the retail price per gallon of 4-star petrol, provided by the Institute of Petroleum. All public transport fare and service level data have been made available by London Transport. The fare level is measured by receipts per passenger-mile for bus and Underground services, and the service level is measured by bus and Underground vehicle miles operated. All prices are deflated to constant January 1974 levels by the General Index of Retail Prices. Real personal disposable income is obtained from the series published by the National Institute for Economic and Social Research, and population estimates are obtained from published Registrar General sources.

MODEL FORMULATION AND ESTIMATION

Choice of variables

The most general specification of the model treats the level of road traffic as a function of the price of petrol in real terms, the real fare level and quality of service on alternative public transport modes, real personal disposable income, and the population of driving age resident in the metropolitan area. Thus,

$$V_{qt}^{a} = f\{G_t, F_{tk}, S_{qtk}^{a}, Y_t^{a}, P_t\} \tag{1}$$

where

V_{qt}^{a} = seasonally adjusted traffic volume during period of day/day of week q at time t[1];

G_t = price per gallon of petrol at time t in real terms;

F_{tk} = fare level (receipts per passenger mile) at time t on public transport mode k in real terms;

S_{qtk}^{a} = vehicle mileage operated during period of day/day of week q at time t on public transport mode k—seasonally adjusted;

Y_t^{a} = real personal disposable income at time t—seasonally adjusted;

P_t = Metropolitan population of driving age at time t.

The correlation matrix of all the explanatory variables (in the form in which they appear in the main model) is shown in Table 3. It is immediately apparent from this table that a high degree of correlation exists between the bus and Underground fares series and the bus and Underground service series. It was therefore decided to combine the series into single average fare and average service variables. The subsequent correlation matrix is given in Table 4. The partially-aggregated matrix indicates a relatively high correlation between petrol price and fares, which might still have proved to be a barrier to precise estimation; but no estimation problems were encountered, and other tests (see later) suggest that multicollinearity has not impaired attempts to disentangle the relative influence on traffic of the explanatory variables in this form.

Model form

The best fitting statistical model which was also consistent with economic and transport theory was that which implied constant point elasticities for all variables except public transport service levels, for which the point elasticity was found to vary according to service quality. The model, written in the form used for Ordinary Least Squares (OLS) estimation, is:

$$\begin{aligned}\text{Ln } V_{qt}^{a} = {} & \alpha_0 + \eta_{(v_q,g)} \text{ Ln } G_t + \eta_{(v_q,f)} \text{ Ln } F_{t-1} + \alpha_{1q} \frac{1}{S_{q,t-1}} \\ & + \eta_{(v_q,y)} \text{ Ln } Y_t^{aG} + \eta_{(v_q,p)} \text{ Ln } P_t + \epsilon_{qt}\end{aligned} \tag{2}$$

[1] Throughout, superscript a denotes that the variable has been seasonally adjusted. All seasonal adjustments and adjustments for special events such as petrol shortages are carried out before estimating the main model. The procedure for doing so is described in [16] and [11]. The seasonal coefficients for the traffic series and the estimated effects of the petrol shortage are given in Table 2.

TABLE 2

Seasonal Coefficients and Estimated Influence of the 1973-1974 Petrol Shortage

TABLE 2A

Estimated Monthly Deviation in Traffic Levels from Overall Average Level (%)

Month	*Peak 0700—1000*	*Monday-Friday 24 hour*	*Saturday 24 hour*	*Sunday 24 hour*	*Monday-Sunday 24 hour*
January	−2.97	−4.03	−6.95	−8.47	−5.01
February	−0.05	−2.28	−3.10	−4.43	−2.78
March	1.54	1.35	−1.55	−2.23	−1.34
April	−0.28	0.14	−0.71	−1.18	0.27
May	2.69	2.69	0.83	−2.22	2.04
June	1.79	1.56	0.81	1.34	1.72
July	0.97	2.56	3.44	5.91	3.16
August	−3.34	−0.87	0.04	2.11	−0.40
September	−1.78	−0.93	0.06	2.17	−0.32
October	0.31	1.02	2.06	2.24	1.45
November	1.41	1.30	2.81	3.00	1.51
December	−0.28	0.18	2.23	1.84	−0.25
F value	7.0	3.5	0.77	1.9	4.7

TABLE 2B

Estimated Monthly Deviation in Traffic Levels from Average Level due to Shortage of Petrol in December 1973 and January 1974 (%)

Month	*Peak (0700—1000)*	*Monday-Friday (24 hour)*	*Saturday (24 hour)*	*Sunday (24 hour)*	*Monday-Sunday (24 hour)*
December 1973	−4.50	−12.20	−13.0	−9.05	−12.2
January 1974	−1.70	−4.0	0	−5.4	−5.0

(where $\eta_{(v,x)}$ = the elasticity or cross-elasticity of V with respect to variable X and ε = error term of mean zero and constant variance). The public transport service elasticity is:

$$\eta_{(v_q,s)} = -\frac{\alpha_{1q}}{S_{qt}} \tag{3}$$

Average waiting time can be expected to be roughly inversely proportional to vehicle miles operated. This formulation is intuitively reasonable, as it suggests that travellers will respond proportionately more to a percentage change in service levels

TABLE 3

Correlation matrix between all explanatory variables specified

	Log (real) petrol price	Log (real) bus fare level	Log (real) Underground fare level	Inverse bus miles operated	Inverse Underground (car) miles operated	Log (real) personal disposable income	Log population of driving age
Log (real) petrol price	1.0	−0.88	−0.82	0.40	0.56	0.44	−0.06
Log (real) bus fare level		1.0	0.89	−0.63	−0.74	−0.69	0.12
Log (real) Underground fare level			1.0	−0.51	−0.68	−0.55	0.10
Inverse bus miles operated				1.0	0.82	0.57	−0.04
Inverse Underground (car) miles operated					1.0	0.63	−0.06
Log (real) personal disposable income						1.0	0.34
Log population of driving age							1.0

when existing headways are relatively wide than to an equal percentage change to existing services associated with relatively narrow headways. Making a bad service worse invites a bigger response than making a good service worse by the same *percentage* amount. This is the same general pattern of behaviour as that predicted by generalised cost theory; the larger a base component of generalised cost becomes, the more important it will be in determining mode choice [5]. Generalised cost theory of course predicts the same pattern for all base components. Unfortunately, however, our data does not sustain the hypothesis (in the statistical sense) for fare levels, although in updating the model it would be possible to test for a more internally consistent specification.[2]

It can be seen from equation (2) that a rather simple lag structure was assumed,

[2] That is, while on the basis of t-tests and other statistical criteria we have been unable to specify a model with variable point elasticities for travel costs other than service quality (i.e. fares and petrol prices), this result is not necessarily inconsistent with the theory of generalised cost and may have occurred simply because the variation in the fare and petrol elasticities over the period of estimation was too small to measure statistically. Re-estimation over a longer time period and further cost changes could well result in modifications to the existing model.

TABLE 4

Correlation matrix between partially-aggregated explanatory variables

	Log (real) petrol price	Log (real) public transport fare level	Inverse public transport vehicle miles operated	Log (real) personal disposable income	Log population of driving age
Log (real) petrol price	1.0	−0.86	−0.56	0.44	−0.06
Log (real) public transport fare level		1.0	−0.74	−0.61	0.10
Inverse public transport vehicle miles operated			1.0	0.69	0.06
Log (real) personal disposable income				1.0	0.34
Log population of driving age					1.0

with private traffic taking about one month to respond to public transport fare and service level changes and then responding in full in the following month. This is not to say that a more complicated lag structure does not exist, but rather that we have been unable to determine one from our data. It seems quite plausible, however, that the bulk of mode substitution in response to a fare or service level change takes place in the six to ten weeks following the change.

Estimation

OLS estimates for equation 2 are given in Table 5 and the associated elasticities, with statistical confidence limits, are given in Table 6. Goodness of fit and other statistical results for the two week-day and one 7-day equations are all broadly similar.

The peak equation explains 79 per cent of the variance in peak traffic levels, and R^2 itself is highly significant as measured by the F-ratio. The Durbin-Watson test for first order serial correlation indicates the possibility of some slight auto-correlation in the residuals (i.e., if we forecast on the high side in one month there is the possiblility that we shall forecast on the high side again in the following month), although probably not enough to raise serious doubts about the results.

The 5-day and 7-day equations each explain roundly 90 per cent of the variance in traffic levels. A lower level of explanation is given by the weekend equations,

TABLE 5

Ordinary Least Squares Regression Estimates, January 1972-December 1975

Independent Variable	*Dependent Variable*				
	Log V^a Peak (0700-1000)	*Log V^a Monday-Friday (24 hour)*	*Log V Saturday (24 hour)*	*Log V Sunday (24 hour)*	*Log V^a Monday-Sunday (24 hour)*
Constant	2.200	2.030	1.780	2.630	2.280
Log G_t	−0.039	−0.086	−0.347	−0.359	0.082
	(−2.48)	(−4.51)	(−3.57)	(−3.40)	(−4.96)
Log F_{t-1}	0.057	0.030	0.054	0.201	0.050
	(2.17)	(0.93)	(0.256)	(0.877)	(1.80)
$\frac{1}{S_{t-1}}$ (peak/5 day)	2960.000	1913.000		—	—
	(3.61)	(1.70)			
$\frac{1}{S_{t-1}}$ (Sat./Sun.)	—	—	454.900	81.600	—
			(0.38)	(1.45)	
$\frac{1}{S_{t-1}}$ (Mon./Sun.)	—	—	—	—	2389.000
					(1.95)
Log Y_t	0.087	0.071	0.360	0.469	0.118
	(1.86)	(1.22)	(1.48)	(1.80)	(2.46)
Log P_t	0.165	0.403	0.278	0.045	0.326
	(3.09)	(6.19)	(0.745)	(0.113)	(5.86)
Statistical Measures					
R^2	0.787	0.870	0.559	0.561	0.894
F value	31.0	56.17	10.63	10.75	70.77
Durbin-Watson	1.54	1.50	0.81	1.07	1.68

F_{t-1} = (total bus + Underground receipts) divided by (total bus + Underground passenger miles travelled) lagged one month.

S_{t-1} = total bus vehicle mileage operated (seasonally adjusted) + total Underground vehicle mileage operated (which was not found to be seasonal) lagged one month.

t— ratios are given in parenthesis. Note that the t— ratios are corrected for losses in degrees of freedom due to prior seasonal adjustment by multiplying the estimated standard errors by

$$\sqrt{\frac{N-K}{N-K-d}}$$

where N is the number of observations, K is the number of explanatory variables and d is the number of dummy variables used in accounting for seasonality and special events (see Table 2). Actual estimated t-ratios are 1.205 times greater than those given in Table 5 (see Lovell [11].

with R^2 of about 55 per cent. However, the estimated weekend coefficients do appear to be consistent with the coefficients in the other equations. In fact, in all equations the signs of the estimated coefficients accord with broad economic expectations and are consistent with those predicted by transport theory.

TABLE 6
Summary of Results
Estimated elasticities and 95 per cent confidence limits

Model estimate of: / *Period*	*Peak* (0700-1000)	*Monday-Friday* (24 hr.)	*Saturday* (24 hr.)	*Sunday* (24 hr.)	*Monday-Sunday* (24 hr.)
Petrol price elasticity	−0.04 (±0.03)	−0.09 (±0.04)	−0.35 (±0.19)	−0.36 (±0.21)	−0.08 (±0.03)
Cross-elasticity with respect to fares	0.06 (±0.05)	0.03 (±0.06)	0.05 (±0.41)	0.20 (±0.45)	0.05 (±0.05)
Cross-elasticity with respect to service level*	−0.12 (±0.07)	−0.08 (±0.15)	−0.07 (±0.36)	−0.30 (±0.41)	−0.08 (±0.08)
Income elasticity	0.09 (±0.09)	0.07 (±0.11)	0.36 (±0.48)	0.47 (±0.51)	0.12 (±0.09)
Population elasticity	0.17 (±0.10)	0.40 (±0.13)	0.28 (±0.73)	0.05 (±0.78)	0.33 (±0.12)

Source: Equations; Table 5
*At mean service level, January 1972—December 1975.

The public transport service data have been divided into peak 5-day, weekend and 7-day for the purpose of estimating the model. These variables are not given separately in the correlation matrices, but all follow, broadly, the same pattern as the 7-day series.

Saturday and Sunday traffic flows were not found to be significantly seasonal (see Table 2). Hence the dependent variable in the weekend equations is not seasonally adjusted.

INTERPRETATION OF RESULTS

The estimated real petrol price elasticities are all highly significant, varying from −0.04 during the morning peak period to −0.09 over the 24 hour period and rising to −0.35 and −0.36 on Saturdays and Sundays respectively. Clearly, the work journey is far less sensitive to changes in car running costs than off-peak journeys, the 95 per cent confidence limit indicating that the peak elasticity could be as low as −0.01 (note in Table 5 that the peak and week-end petrol elasticity 95 per cent probability ranges do not overlap, indicating that they are statistically different from each other).

There are no other similar U.K. studies with which to compare these results, but they are consistent with several North American studies, including one which employed European data. For example, Houthakker, Verlaga and Sheehan [8] found a short-run elasticity of -0.075, using the same double logarithmic specification as that applied above, and in a single equation model Wildhorn *et al.* [17] determined short-run petrol price elasticities ranging from -0.10 to -0.18. McGillivray [12] found petrol elasticities on the order of -0.20. This consistency suggests that the collinearity between the petrol and fare level series is not seriously biasing the standard errors. It is interesting to note that the standard approach to multicollinearity used by Domencich and Kraft [4], using prior statistical estimates of one or more of the coefficients as inequality constraints in estimating the model, would yield virtually identical coefficients to those in Table 5 if the evidence on petrol elasticities from the above studies were used in setting the constraints.

Best estimates of the cross-elasticity of road traffic with respect to public transport fares are of the order of 0.05. However, only the Monday-Friday peak elasticity is statistically different from zero, lying within the 95 per cent probability range of 0.01-0.11. This suggests that the probability of substitution of private for public means of travel as a result of public transport fare increases may be higher during peak periods that at any other time of day, although this inference is inconclusive on statistical grounds.[3]

The best estimate of the cross-elasticity of road traffic levels with respect to public transport service quality changes is around -0.08, although once against only the peak elasticity (of -0.12) is statistically different from zero, the 95 per cent confidence limits being -0.05 to -0.19. It is also noteworthy that changes in public transport service quality are estimated to have a greater impact on private traffic levels than changes in public transport fare levels. During peak periods, when both effects are strongest, service level changes are calculated to be twice as important as fares in determining mode choice. This result is consistent with other evidence on the comparative influence of fares and service levels on public transport ridership, which suggests elasticities with respect to bus mileage about twice as great as elasticities with respect to fares [13], [15].

The regression results for both fare and service levels suggest that the influence of public transport fare and service levels on traffic is greatest during the peak. There are two primary reasons which might account for that pattern of behaviour. First, given the relatively more essential nature of peak journeys, there is a greater likelihood that, following an increase in the generalised cost of travel by public modes, journeys that are priced out will still be made by car. Secondly, the proportion of public transport passengers with a car available is greater during the peak than off-peak periods; thus the opportunity, as well as the inclination, to substitute private modes is greater for the journey to work.

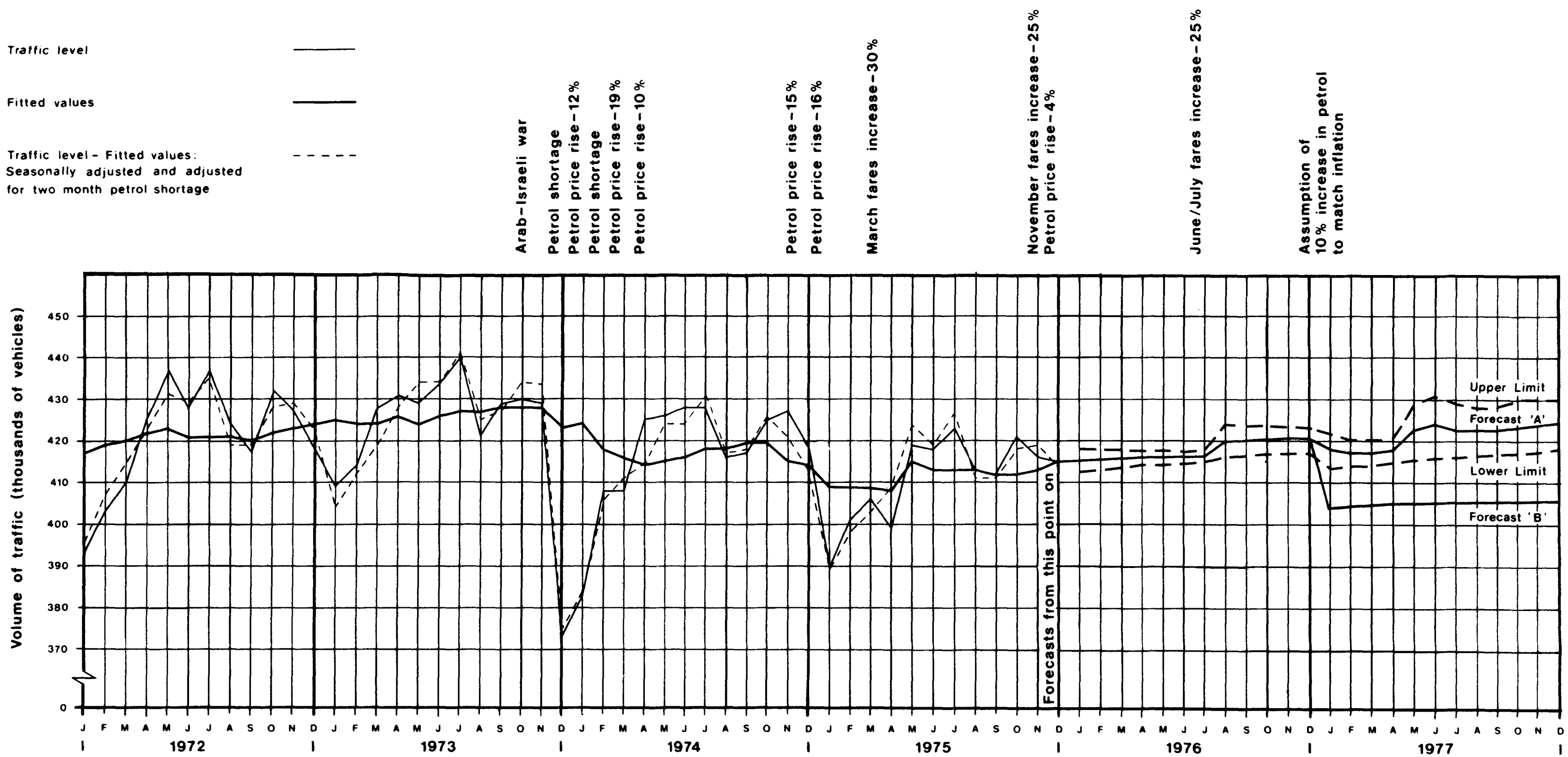
The estimated income elasticity over the entire week is 0.12; but, as with petrol price, week-end travel appears to be far more sensitive to income changes than week-day travel. Estimates other than the 7-day 24-hour elasticity are, however, of marginal statistical significance. This may well be due to the limited variation in the income series. Our estimates are broadly consistent, however, with the limited evidence available from other time-series travel studies (see Fairhurst [5], Fairhurst

[3] That is, while only the peak elasticity 95 per cent confidence limits exclude zero, the confidence intervals around the fare elasticities in all the equations do overlap to some extent. Hence it would be wrong to conclude that the fare coefficients are statistically different from each other.

FIGURE 1

7 – DAY 24 – HOUR TRAFFIC LEVELS IN INNER LONDON 1972 – 1975 AND FORECASTS TO 1977

FIGURE 1



and Morris [6]). The population data show, mostly, a downward trend. If this net out-migration from the city were made up of equal proportions of people travelling, on average, by public and private modes, the population elasticity would be 1.0. However, in each equation the elasticity is less than 1; this implies either that private car users are less likely to move out of the city than public transport users, or that not all private transport users who move out of the city stop driving into the city, or a combination of the two.

The first possibility is supported by evidence on the socio-economic characteristics of people moving out of London. Those appear to be predominantly young inner city residents, who are less likely than the average to own a car. The second possibility may be supported by the pattern of estimated elasticities over the day and week. The smaller peak traffic response to population decline may be due in part to people moving out of the city but still working in the city. This would have less effect at the week-end, thus explaining the higher elasticity in the week-end equations.

FORECASTING AND POLICY

Having established the predictive power of the model, we can consider a number of policy questions. These include the estimated influence of Government policy regarding petrol taxation and availability of resources for public transport, and the determination of the price increases necessary in private transport to offset the influence on road traffic levels of price increases in the competing public transport sector. On the effects of fuel tax and public transport fare changes, two forecasts to the end of 1977 are shown in Figure 1. Forecast A (shown with 95 per cent confidence limits) is intended to be a base forecast against which to compare tests of hypothetical policy decisions. The assumptions underlying this forecast were that petrol prices rise in line with inflation and that in July 1976 bus and Underground fares rise, in money terms, by 25 per cent. It is assumed that early in 1977 (April) another (hypothetical) 25 per cent bus and Underground fares increase is introduced, while bus and Underground services are assumed to remain broadly at their December 1975 levels. Inflation is assumed to fall to 10 per cent p.a. by September 1976 and 8 per cent by June 1978 (this is based loosely on Government forecasts). Real disposable income is assumed to fall by 2.8 per cent in 1976 compared with 1975, and to increase by 0.5 per cent in 1977 and 1978. Population is assumed to remain broadly constant.

From Figure 1 it can be seen that the level of road traffic was increasing at an annual rate of about 1.5 per cent until the end of 1973. After the petrol price increases and the general economic recession from December 1973 until May 1975, there was a reduction of roundly 1.5 per cent p.a. Since then, and up to the end of 1975, traffic levels appear to have stabilised (although they were roughly 5 per cent lower than they would have been if the pre-1974 trend had continued). The base forecast shows a gradual resumption of growth in road traffic (although at a lower rate than before 1974) and gives an indication that by the end of 1977 road traffic may have grown to the October 1973 level.

Forecast B examines the implications of substantially higher petrol prices, the revenue from which is employed to finance fare subsidies. This is an attractive option to test, as there will be no inflationary effect from the petrol price increase if it is matched £ for £ by fare reductions. It is also of interest because there will follow a two-pronged effect—a reduction in car use and increase in public transport use through switching from car, and more use of public transport due to the fare stability or reduction. The test carried out assumed exactly the same growth in income, population and service levels as in the base forecast. Petrol prices and fares are assumed to grow in 1976 as in the base forecast. In January 1977 petrol price is assumed to be increased to £1.25 per gallon of 4 star, and fares are assumed to remain at December 1976 money levels throughout the year.[4] Inflation is assumed to grow at the rate assumed in the base forecast.

The result is that traffic is forecast to be 4 per cent below the base December 1977 forecast level. We have not undertaken any detailed assessment of the implications of this result for congestion. However, it can be seen that this difference is broadly similar to the difference between average March and August London peak traffic levels, where measurable differences in travel time can be recorded.

Finally, it is possible to establish an estimate of the increase in real petrol price that would be required to offset the effects on road traffic levels of a given percentage increase in public transport fares, i.e., to maintain constant traffic levels. Applying the factor

$$\frac{\eta_{(v,f)}}{\eta_{(v,g)}} = Z \tag{3}$$

to the percentage increase in real fare yields the estimated percentage increase in real petrol price required to offset the effect on road traffic of the fare increase. For example, assuming petrol price cannot be raised only in peak periods, and taking the 7-day, 24-hour elasticities, we get a value for Z of

$$\frac{0.05}{0.09} = 0.56$$

Thus, to offset a 10 per cent real fare increase, real petrol price would have to rise by 5.6 per cent. It should be noted that, according to the pattern of elasticities and cross-elasticities established above, the petrol price increase will have its most substantial effect on week-end traffic (mostly shopping and leisure trips) and not necessarily on those individuals who transfer from public transport, most of whom will transfer at peak periods. Hence pursuing this pricing policy would be consistent with the objective of saving fuel, but not necessarily with that of maintaining stable peak traffic. In order to ensure the latter, Z should be determined from the peak

[4] It is estimated (by the Greater London Council) that a tax which increased the sale price of petrol by 25 per cent would yield a little less than £100m from London petrol sales. Taking (i) a broad estimate of the gap in 1977 between London Transport running costs and revenue from fares *at 1976 levels* to be £115m (current prices), and (ii) an assumption that petrol will be nearing £1.00 per gallon by December 1976: then an increase in petrol price to roundly £1.25 per gallon would yield the revenue necessary to finance fare levels through 1977 at their 1976 level. It is beyond the scope of our model to carry out similar tests for nation-wide schemes; nor have we considered the practical difficulties of administering this scheme within the confines of the Greater London area.

elasticities. Here Z is estimated to be roundly 1.4, implying that, for the 10 per cent fare increase above, petrol price would have to rise in real terms by 14 per cent in order to ensure stable peak flows. Over the entire day, traffic will, however, actually fall, and again the decline will be entirely in the off-peak, and mostly week-end, trips.

SUMMARY AND CONCLUSIONS

A number of different issues have been explored in this article. It was first shown that road traffic is sensitive to petrol price changes, the elasticity varying from -0.04 during peak periods to -0.36 on Sundays. The 7-day cross-elasticity of road traffic with respect to public transport fares was found to 0.05, but at its highest level and apparently of greatest statistical significance during peak periods. The same pattern was observed in response to service quality changes, and in addition service was shown to be twice as important, on average, as fare levels in determining mode substitution. However, the specific magnitude of the service quality cross-elasticity was found to depend upon the average waiting time of the services affected; i.e., changes to services where waiting times are already high have a greater influence on road traffic levels than changes to services where waiting times are already low.

Forecast changes in road traffic levels were produced under various assumptions. A two-year "base" forecast, based on likely policy and economic developments, indicated that the decline in traffic since October 1973 has stabilised and some resumption in growth is likely. When petrol was assumed to increase to £1.25 (money terms) through petrol taxation and the tax revenue used to subsidise fares, traffic was forecast to be 4 per cent below the "base" forecast level. Finally decision rules were estimated giving the petrol price percentage increase necessary to offset any extra petrol consumption and effects on road traffic from given percentage fare increases. It was shown that the petrol price increase necessary to just offset extra petrol consumption was inconsistent with the aim of offsetting extra peak period traffic, as the petrol savings would occur largely in the off-peak. It would be unwise to assume that the relationships we have established will remain stable in the face of further radical changes in policy, but we hope that we have at least demonstrated how up-to-date and updateable sources of data, available in most cities today, can be used to monitor developments in key transport policy areas.

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