ASSESSING THE IMPACT OF UNITED KINGDOM FUEL PRICE PROTEST ACTIONS IN THE CITY OF YORK, UNITED KINGDOM

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ABSTRACT

In early September 2000 protests about high levels of taxation on fuel took place in Europe. In the United Kingdom these protests took the form of blockades of fuel refineries that lead, in turn, to a national shortage of petrol. This paper describes the effects of these protests on the city of York (population 100k) in the north of England. Flow counts and licence plate observations took place to monitor a planned bridge closure that happened to coincide with the fuel protest. The data set provides a unique snapshot of an event where reduced vehicle flows were combined with a significant change to the network. Analysis of the event shows that at the height of the protest, vehicle flows were down by 12% during the morning peak as a whole, by 19% for the evening peak and 21% for the twelve hour period from 7:00am to 7:00pm. Figures show a similar decline in the usage of the city's park and ride system for the duration of the protest. The bicycle is an important mode of transport in the city and usage increased by more than 50% on some of the worst hit days. Despite an increase in travel time caused by the bridge closure, congestion in the city was severely reduced. The paper analyses the traffic system in detail and fits a logit model to explain the route choice decisions made.

INTRODUCTION

In the autumn of 2000, an unprecedented level of dissatisfaction amongst the haulier and farming communities in Europe over the price of fuel was shown by demonstrations and blockades of oil refineries. Although the action was mainly instigated by these two groups, it was felt that they enjoyed a great deal of public support, especially in the early stages of the demonstrations. The speed at which these demonstrations impacted upon the travelling public was a shock to politicians and commentators.

The public reaction to this situation included a trip by trip consideration of the use of their car for journeys and a willingness to spend free and working time queuing outside petrol stations to obtain fuel. The first reaction is very much what many local and national authorities desire to achieve, admittedly by other means. The second reaction is undesirable since it wastes individuals' time, contributes to pollution and creates congestion hotspots in the vicinity of petrol stations.

An assessment of the magnitude of the traffic impacts of the autumn demonstrations has been made by many authorities, usually using readily available aggregate measures such as traffic flow, accidents and air quality. This paper will present a disaggregate assessment using individual vehicle movements within the centre of the City of York, United Kingdom. This data will allow us to assess whether individuals did adapt their behaviour as a result of the perceived availability of fuel.

BACKGROUND

It was perhaps the oil crisis in the early 1970's, when the middle eastern oil producing countries sharply reduced the production of oil, which first alerted society to its immediate dependence upon petroleum. For the first occasion in peace time, an informal method of petrol rationing took place in many developed western nations. One long term effect of this crisis was that motor manufacturers did take onboard some of the lessons of the crisis and started to produce more fuel efficient vehicles, but this reduction was often offset by enhancements to vehicles such as bigger engines and chassis. There were renewed concerns about oil prices during the late 70's, another period of instability in the Middle East. At this stage many Government and Academic institutions began to examine how the dependency on petroleum products could be managed. A series of volumes by the Transportation Research Board (*1*,*2* and *3*) reflect this concern and interest. More recently, the growing environmental awareness of individuals has kept oil production and consumption near the top of the political agenda.

Not withstanding these later effects, the price of oil has tended to reduce over time, although there has always been some local volatility in the price (see (*4*) for an interesting discussion of the impacts of a Government induced fuel price rise in a developing country). Many governments have taken this as an opportunity to increase the taxation associated with petrol. There are two main reasons for this, firstly it provides an inelastic source of revenue and secondly reductions in fuel use help to meet environmental objectives. Rising prosperity in the developing countries tended to mask this trend, until recently.

Trends in data

The increased dependence of the developed nations on the private car is described in (*5*). The percentage of passenger kilometres travelled by car in the United States has remained constant over a 20 year span, at a level of 97% of passenger kms. For European nations over the same period, the share of passenger transport by car has steadily increased and is now at a level just below that of the US (88% of passenger kms for the UK). Additionally, over the past 20 years fuel efficiency in the typical UK vehicle has increased, with a reduction of approximately 20% in fuel required to travel 100km. The price of the fuel, however, has increased. Figure *1* shows the inflationadjusted price of a litre of unleaded petrol, disaggregated into raw costs and two types of taxation, general Value Added Tax and petrol specific duty. This graph shows a gradual increase in the real price of petrol over the decade, with the percentage of the price taken in taxation increasing from 60% in 1990 to 82% in 1999, although the percentage drops to 76% in 2000.

The Fuel Protest Timeline

Demonstrations by transport hauliers over the costs they were expected to pay for fuel began in August 2000 in France but quickly spread to the United Kingdom and the rest of continental Europe. The schedule shown below provides a description of the fuel protests as they happened in York. It is reconstructed from news reports in the local newspaper "The Yorkshire Evening Press" (*6*). Locally, the impact of the fuel protest was felt extremely heavily on the Tuesday, Wednesday and Thursday.

Date	**Event**
Fri 8th Sept	Farmers and hauliers blockade nearby oil refineries
Mon 11th Sept	First day of fuel protest as local petrol stations begin to run out of supplies. By lunchtime almost all local stations out of unleaded petrol. Long queues of cars form outside garages which still have stocks of petrol.
Tue 12th Sept	Queues outside all remaining garages with petrol drivers to expect a half an hour wait to get petrol. Local bus companies express concern about lack of supplies.
Wed 13th Sept	6am a delivery to a BP petrol station causes queues which block the city's outer ring road. These supplies are soon used up. No unleaded fuel available within York except for emergency service vehicles. Some council services are suspended. Panic buying of bread empties shelves in some supermarkets.
Thu 14th Sept	Refinery blockades end and fuel is allowed out – initially only for emergency services.
Fri 15th Sept	Fuel reaches pumps and supplies to return to normal. Queuing outside all garages with fuel but fuel is available for those willing to queue.

TRANSPORT IMPACTS

A national UK perspective on the protests is given in (*7*). This note show that there was a between 9% and 39% reduction in car traffic during the main phase of the protest (12th to 15th September) followed by more modest reductions of the order of 7% in the following ten days. The reduction on motorways was greatest, perhaps reflecting unwillingness by drivers to make long car journeys during the period of the dispute. The reduction for goods traffic was less pronounced than that for car traffic. A more considered examination of the economic and behavioural aspects of fuel price protests on an national and international level is in preparation and when published should provide further insight into the impacts of fuel shortages and maybe what longer term lessons can be learnt (*8*).

A report produced by the Highways department of Leeds (pop 727k) City Council (*9*) looked at the wider impacts of the fuel protest over a two week period, starting on 11th September. In this urban context the reduction in morning peak traffic flows was 16% and for the evening peak, the reduction was still greater at 21%. Over the whole day the reduction was 24%. There were corresponding increases in bus (6%) and rail (20%) patronage, suggesting individuals had changed their mode of travel. The usage of the city centre car parks operated by the Council showed a 40% reduction, far in excess of the traffic flow reductions reported - an effect attributed to the nature of public transport provision, which makes journeys to the City Centre easier to accomplish using an alternative mode. Accident data collected for the whole of the West Yorkshire region (pop 2.1m), including Leeds, shows that fatal and serious accidents fell by 58% to 25 such accidents, whilst all injury accidents fell by 45% to 203. The final consideration was air quality, where there were 31% and 27% reductions in NO_x levels and 17% and 34% reductions in PM_{10} levels over the affected week at two sites, one urban and one sub-urban. The department concludes in its report that this exercise shows what safety and environmental benefits can be achieved if successful demand management measures are implemented.

Impacts in York

The City of York Council has made available information on traffic flows which begin to show the impact of the fuel protest on York. Tables 2, 3 and 4 show data from automatic traffic counters for the city. The 12 hour data is the cumulative flow from (7:00am-7:00pm). The weekly data is presented as average daily flow over a week on various roads. When examining the tables, it should be bourn in mind that any analysis based largely on flow counts takes place against a background of dynamic changes on a daily, weekly and monthly and yearly level.

The morning peak ATC flow over all comparable sites was reduced from 48,045 in the week before to 42,135 in the week of the fuel protest – a reduction of 12.3%. The evening peak was reduced from 52,727 to 42,449 (19.5%) and the 12 hour count was reduced from 494,357 to 388,537 (21.4%). We can therefore conclude that traveller numbers in the morning peak were less affected by the lack of fuel than those in the evening peak and numbers travelling in off peak hours were affected most. This is, of course, consistent with the hypothesis that less discretionary journeys are made in peak hours and therefore we would certainly expect morning peak journeys (usually assumed to be largely commuter and school run journeys) to be harder to reduce. There may also be an effect from there being less congestion on the network, enabling some vehicles which would not have reached ATC points until the off peak being recorded in the peak instead. Looking at the daily effects (table 3) we can see on the Monday the effects of news of the protest spreading and the protest worsening. The Monday am peak actually shows a greater number of trips compared to the week before. The 12 hour count shows a 6% reduction on the previous week average and the pm peak shows a 9% reduction. This can be thought of as the protest worsening throughout the first day as fuel began to run out and also the effects of the news spreading. The Tuesday, Wednesday and Thursday figures show the greatest reduction in total flows.

Automatic bicycle counters are shown in table 4 which gives weekly figures around the fuel protest and daily figures for the actual fuel protest week. Averaged over the whole week, the usage for the fuel protest week was up 35% for the morning peak hour, 23% for the evening peak and 25% for the 12 hour count. This is again consistent with the hypothesis that the morning peak contains journeys which are harder to suppress and those travellers who could no longer make the journey by car made the journey by bicycle instead. York is proud of its reputation as a cycle friendly city (*10*) and has an unusually high modal share by bicycle for a UK city (19% of journeys to work are made by cycle in the city). Therefore it is extremely interesting to notice that the day with the greatest switch to cycling had a 61% increase in morning rush hour cycling, a 33% increase in evening peak cycling and a 43% increase in cycling over the 12 hours. An interesting feature is that the figure for Friday is reduced below that even for an average day on the previous week. Inspection of local weather records (*11*) shows that this was the only rainy day that week. It is clear from analysis of the fuel protest that even in a city which is considered "Britain's most cycle friendly city" (*10* – page 9), there is considerable scope for more cycling to take place.

York also has three park and ride sites where motorists can leave their cars and take a bus into the city centre. These are heavily used with the Askham bar site taking 25% of the peak hour travellers on the main south western route into the city and 3% of commuting journeys being made by park and ride. The figures for drivers parking to use these sites are shown in tables 3 and 4 in the rows labelled P&R. It was not clear a priori whether the fuel protest would reduce or increase park and ride usage – it could be argued that drivers would be making fewer of their journey by car and therefore a greater percentage would choose to use park and ride. The typical park and ride user, however, is making a longer journey (since the park and ride sites are all on the outskirts of the city) and other figures show that long journeys were more likely to be cancelled during the fuel protest. The evidence from these counts supports this latter hypothesis since, if anything, the reduction on the Park and Ride sites was greater than the reduction on the roads in general. The morning peak weekly reductions at Askham, Grimston and Rawcliffe Bar Park and Ride were 13.9%, 10.0% and 13.4% compared with 12.3% in general traffic. The twelve hour count showed 23.7%, 27.9% and 28.6% reductions compared with 21.4% to general traffic and the evening peak hour traffic showed 25.9%, 21.8% and 25.8% reductions compared with 19.5% to general traffic.

Considering the after flows for two weeks after the bridge closure we see that they are higher than the flows before the closure. It is a hard matter to say whether or not the fuel protest had any effect on flows in its second week. We can see from tables 3 and 4 that flows 1 week after are less than those four weeks after and they are greater than those one week before. From this data it is impossible to conclude whether or not there were any trip suppression effects in the second week.

THE YORK SURVEY

A major survey of road traffic in York was conducted before and during the period of the fuel protests. This survey was taking place independently as part of a project to study driver route choice behaviour resulting from a bridge closure. A schematic diagram of the area being studied is shown in figure 2. Lendal Bridge was closed to general traffic on 11th September 2001 for engineering work and was to stay closed for several weeks (pedestrian, cycle and public transport access was uninterrupted). As the bridge is part of the city's inner ring road it was expected that the closure would cause severe disruption to traffic patterns and an extensive survey had been set up to monitor this closure. The survey sites are shown in the figure (sites K, L and M are actually off the sketch map shown):

Before closure: 27th June, 28th June, 6th Sept, 7th Sept, 8th Sept.
During closure: 11th Sept, 13th Sept, 27th Sept, 18th October.

The 11th and 13th September studies were the first and third days of the fuel protest and, obviously, traffic flow was affected by this. A planned study on the effects of the bridge reopening was abandoned when the city flooded at the end of October. The data from the surveys is publicly available from the project website (*12*) and researchers are encouraged to download and use this data set (and the other data sets on the web site) to investigate route choice problems.

Survey Analysis (Flows)

Table 2 shows the peak hour flows for vehicles passing survey points shown in figure *2* during the rush hour (8:00 am – 9:00 am). The data is shown both as absolute number of vehicles and also as a percentage of the average flow observed on that route on days excluding the fuel protest days (11th and 13th September). It should also be kept in mind that the days from the 11th onwards are after the closure of Lendal Bridge (site H on figure 2). The first and most obvious conclusion from the flows on our survey sites is that the bridge closure is the dominant effect at a number of sites. Taking the 13th of September as the most severe day of the fuel protest surveyed, the sites with the greatest reductions on that day were (in order of greatest reduction in traffic) F, I and A. These sites, however, also show substantial reduction in the non-fuel protest days during the bridge closure (27th Sept and 18th Oct). In a way, this should not be surprising since the survey sites are not an unbiased selection, they were specifically chosen to be those most crucial to the bridge closure, which was the original object of the study.

It is difficult to disentangle the flow effects of the bridge closure from fuel effects. Cairns et al (*13*) show that road capacity reduction can have the effect of reducing the number of vehicles entering a city overall. We should also remember that the total number of peak hour users of Lendal bridge was only 488 in the west-east direction. (The flow in the other direction is certainly comparable in magnitude). The majority of these drivers would almost certainly find other car routes in the city.

Survey Analysis (Journey Times)

Table 6 shows travel times between commonly used pairs of survey sites on the surveyed days. Travel times are calculated by matching licence plates between sites. Missing data means that travel times are not available for some pairs on some days. The totals shown are the totals only for those pairs where complete information is available to avoid the bias caused by totalling different numbers of sites. The total travel time can be seen as a measure of the ease with which a hypothetical car can travel about the city as it represents the time that this imaginary car would take to travel between all the different site pairs being examined. As we can see by comparing the totals for the 6th, 7th and 8th September, the variability in travel times between days is large in any case (a sample variance of 18.3 minutes compared with a mean of 33.1 minutes).

On the first day of the fuel protest, the total travel time over all sites is much higher. This is almost certainly a bridge closure effect since the survey point pairs in table 5 are, obviously, those which would be most affected by the closure. As has already pointed out, the absolute level of vehicle flows for the morning peak were largely unaffected by the protest. It is also clear that there was a substantial shift in the city's traffic patterns as a result of the closure. It is interesting then that the total travel time on the Wednesday is reduced by 13.6% compared with the average of all the other days (for comparison the total flows on the Wednesday on the sites involved in these matches was reduced by 10.0% on the average total flow of all other survey days as shown in table *5*).

Survey Analysis (Routes)

An inspection of figure *2* shows that there are a number of alternate routes through the City centre road network. If we confine ourselves to routes involving at least three points and starting and finishing at a recognized origin and destination, these routes are given below, with routes that are unavailable during the Lendal bridge closure given in **bold**:

ACEG; ICEG; BCEG;
AHG; **AHF**; AJE; ACE;
IHG; **IHF**; IJE; ICE;
BHG; **BHF**; BJE; BCE;
DHG; **DHF**; DEG;

Clearly, these routes present alternatives - with some being plausible alternatives (AJE vs ACE) whilst others less so (IHG vs ICEG).

A further piece of analysis is to investigate whether individuals were more likely to switch routes during the period when fuel was less available. This switch may be triggered by a perception that, due to reduced traffic flows and congestion, an alternative route to the one they usually use is quicker. A cross "tabulation" matrix may be established which shows the number of people who travel on route i during day 1 and route j during day 2. This matrix will provide information on how individuals reacted to the closure of Lendal bridge, in that a cross tabulation between a bridge open and a bridge closed day will identify to which routes vehicles switched as a result of the closure.

More interestingly for this study, the sum of the diagonals on this matrix are those who have chosen to use the same route on both days, whilst the off-diagonal are those who have changed route between the two days. Even under normal conditions there will be a degree of route switching as individual's itineraries change, route characteristics change and in the longer term, origins and destinations. Thus if days 1 and 2 are a time apart, the percentage of journeys on the diagonal will reduce. As an example, the percentage of drivers travelling on the 27th June who travelled on the same route on 28th June is 51.7%, whilst for the 27th June and 8th September the same percentage is only 21.6%.

Table 6 shows the percentage of travellers who remained on the same route for the two immediate before bridge closure days and three after days. To ensure a correct comparison, before routes which use Lendal bridge have been ignored. The other surveyed days were neglected due to isolated problems with missing data. Between the first and second fuel protest day (two days apart), 44.3% of vehicles use the same route on both days, whilst the expectation, for one day apart surveys, is closer to 55%. The similarity of the percentages on the same route for 11th to 13th and 27th September and 13th to 27th September are remarkably similar at around 43%, in spite of a fourteen day gap between the 13th and 27th. It is difficult to disentangle the compounded effects of the fuel protest and the bridge closure impacts here, it is possible that the stability observed is a reflection of the reduced number of available routes in the network.

Survey Analysis (Modelling Route Choice)

As mentioned above, in a number of cases drivers have a choice of routes to travel. If we restrict ourselves to a subset of the routes within the network which have the same origin and destination and are not primarily affected by the Lendal bridge closure, we have the following three origin-destinations and their binary alternatives: `AJE` or `ACE`; `IJE` or `ICE` and `BJE` or `BCE`. In this section we present a logit model which provides an interpretation of drivers' perceptions of various route attributes before, and during the bridge closure. In the latter case, an impact solely due to the fuel affected days is also investigated.

In (*14*) a logit model was fitted to binary choice data which related route choice to the following attributes : time; distance and number of : giveways; roundabouts; traffic signals; pelican crossings; zebra crossings; opposed turns and other turns, on each route. For the three origin-destinations above, the same statistics were collected for each route. A slight complication occurred with the journey time attribute since there is no direct information on how the driver perceived the journey time on each alternative at the decision point in their journey. Instead, the actual journey time on the chosen route is used and an "imputed" journey time on the unselected route. The imputed journey time was calculated by averaging the journey times of all other drivers who were "seen" at the same origin within ±5 minutes of the driver under consideration and did take the alternative route. Where there are no alternative drivers, the observation from the driver is not included in the dataset for estimation. The adoption of this method means that when there are insufficient drivers taking the alternative route, few imputed journey times are available and data is lost. This is especially so for the pair `BJE` or `BCE,` where few drivers take the `BJE` alternative. The model formulated to represent the proportion choosing the each route is given by:

$$\log\left(\frac{P_1}{1-P_1}\right) = ASC + \beta_1\ TIME_1 + \beta_2\ DISTANCE_1 + \sum_{i=3}^{9} \beta_i I_{1,i} + \beta_{10}\ LENDAL + \beta_{11}\ FUEL$$

$$\log\left(\frac{P_2}{1-P_2}\right) = \quad + \beta_1\ TIME_2 + \beta_2\ DISTANCE_2 + \sum_{i=3}^{9} \beta_i I_{2,i} + \beta_{10}\ LENDAL + \beta_{11}\ FUEL$$

Where P_1 is the probability of choosing the Ouse bridge route;
P_2 is the probability of choosing the Skeldergate bridge route;
ASC is an alternative specific constant;
$TIME_i$ is the journey time (actual or imputed) on route i;
$DISTANCE_i$ is the distance of route i;
I_{nm} are integer indicator variables for each of the seven route infrastructure attributes;
LENDAL is a dummy variable set to the route distance when the bridge is close and 0 otherwise; and
FUEL is a dummy variable set to the route distance when the fuel protest are in effect and 0 otherwise.

The latter two variables are designed to pick-up any difference in the perception of the route distance (and hence fuel use) during the bridge closure period. The dataset on which the model is estimated consists of 1,266 observations, 588 (46%) of whom chose the Ouse bridge route. The final model estimated using the ALOGIT package (*15*) is as follows (standard errors in brackets):

ASC:	0.539 (0.104)
TIME:	-0.076 (0.023)
DISTANCE:	-2.174 (0.357)
TRAFFIC LIGHTS:	-0.488 (0.145)
FUEL AFFECTED (DISTANCE):	-0.534 (0.326)
LENDAL BRIDGE CLOSURE (DISTANCE):	0.781 (0.375)
ρ^2 wrt Constants:	31.56%

The ρ^2 value may appear low in the context of traditional regression type models, but in the context of logit models is acceptable (Hensher et al (*16*) suggest that values of ρ^2 in the range 0.2 to 0.4 are "indicative of extremely good model fits"). The positive ASC value suggests a preference for the Ouse bridge route, when all other things are equal. This result is clearly affected by the lack of journeys from BJE or BCE where Ouse bridge would not be the most attractive option. In this formulation, the DISTANCE measure is a base measure whilst FUEL and LENDAL are additional distance values which modify this base, depending upon the circumstances. Of the indicator variables only the number of traffic signaled junctions has a significant impact. Since there is a great deal of overlap in the routes for each origin-destination these other indicator variables were unable to provide much additional explanatory variation in the data. All the variables in the model have the anticipated sign, TIME, DISTANCE and TRAFFIC LIGHTS are seen as negatives in terms of the attractiveness of the routes. The LENDAL variable shows how the perception of distance changes during a bridge closure day. In this case, distance is less of an important factor, a reflection of the different perception of the network. The FUEL variable is a further addition, requiring the consideration of both DISTANCE, LENDAL (since all fuel affected days are Lendal bridge closure days) and FUEL together. Here there is evidence to suggest that during the fuel affected days the distance for each route recovers some of its magnitude, ie distance (and hence fuel use) is an important consideration. When interpreting these results it is necessary to issue the caveat that we are not using the preferred measure of perceived travel times here but actual and imputed travel times. Also the discrepancy between perceived and actual travel times may be greater during the initial period of the bridge closure.

CONCLUSIONS

It is clear from the data available that the fuel protest was a major influence on both flows and travel times in the city of York. On 13th September when the protest was at its height, morning peak hour flows were down by 15.5% in the city compared with the previous week average. For the twelve hour period from 7:00am to 7:00pm the flows were down by over 30%.

The effects of the fuel protest were slight on the morning of the first day (11th September) but increased throughout that day. No noticeable effect was detected in the flows on the following week. In the peak hour (where data was available) journey times across the network were reduced considerably. Longer journeys (those involving the city's outer ring road) were suppressed more than shorter journeys (national data showed that motorway flows were reduced more than other roads). Similarly, off peak journeys were suppressed more than peak hour journeys with morning peak journeys being the least likely to be suppressed by lack of fuel. This is most likely to be because the morning peak is largely commuter and school-run trips and less likely to be discretionary (shopping or leisure) trips.

Park and ride usage in the city was decreased, in fact it decreased more than the aggregated all-vehicle flows. This is possibly due to the fact that most park and ride users are making comparatively long commutes to get to the park and ride site. Cycling (a major mode in the city) was up by more than 50% on some days although one rainy day decreased the amount of cycling.

The effects of the fuel protest are hard to disentangle from the effects of the bridge closure which had a major effect on the city's traffic system. On the peak hour of the first day of the protest, travel times at the surveyed sites increased and flows were not reduced in the city as a whole. The increase in congestion seems likely to be a result of the bridge closure (which coincided exactly with the start of the fuel protest) since the survey sites were chosen to capture this effect.

Considering the large effects on the network due to both the fuel protest and the bridge closure, driver route choice remained relatively stable. This is possibly due to the reduced number of routes available on the network but also seems to indicate a reluctance on the part of drivers to shift routes even when conditions are obviously different. The data seems to be well fitted by a logit model that allows the bridge closure and the fuel protest as explanatory variables.

The data set used in this paper and other data sets which may be used to investigate driver route choice are available for download from the web site: http://gridlock.york.ac.uk/route/. Researchers are encouraged to download and investigate these data sets for themselves.

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TABLE 1 Peak hour flows at each survey site in York (A= start of data file missing, B= one lane of traffic missing from count, C= end of data file missing). Flows are given in absolute terms and as a percentage of the average non-fuel protest day.

	27th Jun	28th Jun	6th Sep	7th Sep	8th Sep	11th Sep	13th Sep	27th Sep	18th Oct	Average Flow	Av. Normal Fuel Day
A	954	942	830	728	699	710	659	633	A 185	769.4	797.7
	19.60%	18.09%	4.05%	-8.73%	-12.37%	-10.99%	-17.38%	-20.64%			
B	390	No data	410	441	487	394	446	502	475	443.1	450.8
	-13.49%		-9.06%	-2.18%	8.02%	-12.61%	-1.07%	11.35%	5.36%		
C	906	876	No data	837	C 718	906	846	927	No data	883.0	886.5
	2.20%	-1.18%		-5.58%		2.20%	-4.57%	4.57%			
D	1490	1451	1312	1399	1430	1494	No data	1465	1438	1434.9	1426.4
	4.46%	1.72%	-8.02%	-1.92%	0.25%	4.74%		2.70%	0.81%		
E	B 572	B 631	1266	1207	1241	1296	1175	1335	C 639	1253.3	1262.3
			0.30%	-4.38%	-1.68%	2.67%	-6.91%	5.76%			
F	413	399	434	429	438	290	278	298	351	370.0	394.6
	4.67%	1.12%	9.99%	8.73%	11.01%	-26.50%	-29.54%	-24.48%	-11.04%		
G	419	381	364	395	341	399	345	393	432	385.4	389.3
	7.63%	-2.13%	-6.50%	1.47%	-12.40%	2.50%	-11.38%	0.95%	10.97%		
H	579	458	472	488	446	No data	No data	No data	No data	488.6	488.6
	18.50%	-6.26%	-3.40%	-0.12%	-8.72%						
I	344	449	491	479	533	461	361	416	420	439.3	447.4
	-23.12%	0.35%	9.74%	7.06%	19.13%	3.03%	-19.32%	-7.02%	-6.13%		
J	462	526	567	592	569	621	508	596	557	555.3	552.7
	-16.41%	-4.83%	2.58%	7.11%	2.95%	12.35%	-8.09%	7.83%	0.78%		
K	864	871	879	861	860	873	761	799	863	847.9	856.7
	0.85%	1.67%	2.60%	0.50%	0.38%	1.90%	-11.17%	-6.74%	0.73%		
L	1006	1068	840	836	822	851	755	855	868	877.9	899.3
	11.87%	18.76%	-6.59%	-7.04%	-8.59%	-5.37%	-16.04%	-4.92%	-3.48%		
M	A 726	1729	2156	2142	2076	2091	No data	2134	2255	2083.3	2082.0
		-16.95%	3.55%	2.88%	-0.29%	0.43%		2.50%	8.31%		
N	No data	No data	No data	No data	No data	488	No data	415	443	448.7	429.0
						13.75%		-3.26%	3.26%		

TABLE 2 Flows from Automatic Traffic Counter (ATC) sites in York.

Road Name	W/c 4th Sept (Week before fuel protest)			W/c 11th Sept (Fuel protest week)			W/c 18th Sept (1 Week after fuel protest)		
	0800-0900	1700-1800	12Hr	0800-0900	1700-1800	12Hr	0800-0900	1700-1800	12Hr
Hull Road	2152	2177	20147	1974	1851	17191	2191	2157	19886
Hull Road	1056	1348	13401	1012	1174	11378	1042	1300	12924
Field Lane	888	723	6241	823	616	5489	906	723	6458
University Road	804	804	6997	777	693	6229	860	901	7962
Murton Way	220	292	1942	204	186	1488	199	225	1738
Heslington Road	705	825	6919	694	716	6325	748	852	7321
Fulford Road	1131	1458	15279	1258	1189	12239	1328	1354	14251
Bishopthorpe Road	605	534	5074	546	462	4134	647	535	4903
Tadcaster Road	1423	1580	15044	1244	1209	11941	1312	1514	14209
Outer Ring Road	1902	2089	17872	1502	1565	13188	1963	2048	17667
Outer Ring Road	1685	1897	18448	1409	1502	13649	1704	1889	18156
Outer Ring Road	1890	2178	22549	1662	1868	17650	1915	2210	22522
Outer Ring Road	2030	2347	23496	1821	1956	18306	2158	2366	22884
Wetherby Road	866	830	6952	751	686	5657	854	814	6802
Wetherby Road	612	592	5452	547	505	4395	620	596	5266
Boroughbridge Road	1247	1338	13273	1059	1175	11502	1194	1305	12688
Harrogate Road	1333	1515	14310	1033	1134	10143	1319	1462	13563
Clifton Bridge	1929	1993	18000	1900	1889	17353	2044	2018	19432
Wigginton Road	1020	1110	10864	945	947	8231	909	1079	10052
Wigginton Road	1126	886	10305	1019	1017	8146	1160	1234	9729
Haxby Road	1062	886	9087	957	792	7475	1036	924	8995
Malton Road	995	1317	11254	885	1033	8888	1056	1326	11260
Foss Islands Road	1723	1776	19391	1742	1640	17535	1831	1823	20160
Bridlington Road	988	1105	9862	862	819	7206	986	1007	9109
Askham Bar (P&R)	273	282	1569	235	209	1198	283	259	1490
Grimston Bar(P&R)	220	206	1744	198	161	1257	234	194	1550
Fulford Road	1469	1836	16693	1244	1425	12557	1315	1804	16153
Stockton Lane	415	378	3437	400	324	2851	410	372	3288
Rawcliffe Bar (P&R)	142	178	1388	123	132	991	153	146	1265
Askham Lane	268	326	2535	266	303	2178	305	332	2589
Moor Lane	370	412	3441	368	371	2950	425	440	3675
Outer Ring Road	1987	2074	24528	1701	1843	18752	1951	2010	23837
Outer Ring Road	1420	1415	17515	1174	1189	13094	1404	1411	16910
Outer Ring Road	1480	2116	17637	1495	1732	16283	1821	2071	21217
Outer Ring Road	1403	1484	11390	1062	1127	10074	1435	1676	14240
Outer Ring Road	4092	4609	38432	3239	3122	26113	4125	4367	35967
Outer Ring Road	3354	3731	32142	2591	2462	21182	3411	3518	29583
Outer Ring Road	1760	2080	19747	1413	1425	13320	1746	1908	17507
Totals	**48045**	**52727**	**494357**	**42135**	**42449**	**388537**	**49000**	**52170**	**487209**
% change v week 1				**-12.3%**	**-19.5%**	**-21.4%**	**+2.0%**	**-1.1%**	**-1.4%**

TABLE 3 Daily flows during the fuel protest in York from ATC sites compared with week before average

Road Name	Mon 11th September			Tue 12th September			Wed 13th September			Thu 14th September			Fri 15th September			W/c 4th Sept (Week before)		
	0800-0900	1700-1800	12Hr	0800-0900	1700-1800	12Hr	0800-0900	1700-1800	12Hr	0800-0900	1700-1800	12Hr	0800-0900	1700-1800	12Hr	0800-0900	1700-1800	12Hr
Hull Road	2283	2001	20159	1893	1803	15962	1880	1768	15457	1880	1881	16347	1932	1804	18029	2152	2177	20147
Hull Road	1077	1211	12481	981	1164	10841	993	1121	10453	1004	1153	11108	1003	1219	12005	1056	1348	13401
Field Lane	901	673	6455	779	617	5058	762	587	4904	801	603	5034	872	599	5993	888	723	6241
University Road	826	806	6949	794	667	5960	758	675	5838	747	621	5818	761	696	6583	804	804	6997
Murton Way	218	201	1676	223	191	1512	202	189	1458	191	193	1450	189	153	1345	220	292	1942
Heslington Road	750	832	6920	701	695	6110	653	613	5631	631	677	5921	731	762	7044	705	825	6919
Fulford Road	885	861	7985	791	820	6595	808	813	6410	799	746	6374	827	729	7135	1131	1458	15279
Bishopthorpe Road	1422	1232	14270	1224	1282	12151	1204	1158	11029	1255	1021	10833	1183	1252	12912	605	534	5074
Tadcaster Road	606	498	4655	543	444	4110	529	397	3720	503	393	3590	547	577	4596	1423	1580	15044
Outer Ring Road	1902	1933	17000	1336	1478	12370	1483	1402	11722	1318	1337	11273	1468	1678	13576	1902	2089	17872
Outer Ring Road	1855	1857	17460	1093	1426	12305	1403	1389	12162	1322	1376	12283	1374	1462	14032	1685	1897	18448
Outer Ring Road	2004	2103	21996	1203	1763	15593	1753	1771	15229	1624	1776	16300	1727	1927	19136	1890	2178	22549
Outer Ring Road	2178	2227	22784	1325	1805	15999	1969	1890	16044	1767	1862	17105	1864	1999	19601	2030	2347	23496
Wetherby Road	923	825	6674	733	648	5492	731	683	5456	683	593	5279	681	683	5388	866	830	6952
Wetherby Road	640	620	5071	547	533	4513	534	481	4184	501	441	4037	514	452	4170	612	592	5452
Boroughbridge Road	1297	1361	13873	970	1133	10376	1023	1047	10995	956	1096	10194	1049	1238	12072	1247	1338	13273
Harrogate Road	1377	1439	13296	941	1103	9444	978	993	8763	870	965	8584	1001	1173	10626	1333	1515	14310
Clifton Bridge	2050	2064	18623	1925	1860	16872	1803	1768	17202	1808	1845	16012	1914	1908	18059	1929	1993	18000
Wigginton Road	1076	1041	9946	920	961	9286	893	487	5678	850	1360	7176	986	883	9071	1020	1110	10864
Wigginton Road	1198	1174	9453	904	972	7723	981	954	7507	972	972	7589	1039	1009	8462	1126	886	10305
Haxby Road	1047	828	8218	890	778	7199	957	784	7230	947	805	7020	943	764	7706	1062	886	9087
Malton Road	1106	1179	10718	815	938	8003	833	1000	7858	834	1009	8583	838	1036	9277	995	1317	11254
Foss Islands Road	1783	1728	18883	1710	1606	17284	1715	1583	16530	1772	1656	16726	1730	1627	18254	1723	1776	19391
Bridlington Road	1030	944	8668	830	783	6635	821	805	6603	790	768	6760	842	792	7363	988	1105	9862
Askham Bar (P&R)	257	222	1463	227	192	1179	231	219	1187	221	201	1037	127	211	1124	273	282	1569
Grimston Bar(P&R)	235	182	1514	204	161	1263	194	147	1157	181	162	1119	208	149	1235	220	206	1744
Fulford Road	1424	1567	15523	1191	1508	12142	1180	1402	11174	1274	1291	11338	1149	1356	12608	1469	1836	16693
Stockton Lane	452	361	3156	419	315	2792	391	301	2732	372	351	2799	366	292	2775	415	378	3437
Rawcliffe Bar (P&R)	138	161	1401	104	126	905	121	128	867	128	135	893	127	110	889	142	178	1388
Askham Lane	286	352	2578	275	300	2196	262	272	1975	239	275	1916	267	316	2227	268	326	2535
Moor Lane	429	430	3525	315	329	2666	396	348	2755	356	325	2666	345	421	3136	370	412	3441
Outer Ring Road	2010	1965	22456	1246	1685	16067	1740	1812	16801	1687	1787	17833	1823	1968	20602	1987	2074	24528
Outer Ring Road	1445	1285	15706	840	1066	11054	1154	1157	11841	1152	1159	12206	1278	1280	14662	1420	1415	17515
Outer Ring Road	1875	1885	19550	1069	1615	13654	1450	1697	14716	1482	1732	15604	1600	1729	17891	1480	2116	17637
Outer Ring Road	1371	1344	12681	814	1024	8470	976	1064	8860	1047	1061	9423	1102	1142	10935	1403	1484	11390
Outer Ring Road	4208	3738	34384	3099	3114	24327	3092	2871	22918	2801	2754	21979	2994	3132	26955	4092	4609	38432
Outer Ring Road	3440	3024	27877	2451	2376	19263	2468	2217	18394	2179	2200	18028	2415	2491	22348	3354	3731	32142
Outer Ring Road	1808	1651	17104	1256	1361	11810	1293	1257	11098	1369	1348	12098	1341	1507	14488	1760	2080	19747
Totals	**49812**	**47805**	**463131**	**37581**	**40642**	**355181**	**40614**	**39250**	**344538**	**39313**	**39930**	**350335**	**41157**	**42526**	**404310**	**48045**	**52727**	**494357**
% vs week before	**3.7%**	**-9.3%**	**-6.3%**	**-21.8%**	**-22.9%**	**-28.2%**	**-15.5%**	**-25.6%**	**-30.3%**	**-18.2%**	**-24.3%**	**-29.1%**	**-14.3%**	**-19.3%**	**-18.2%**			

TABLE 4 Weekly and Daily cycle usage in York during the fuel protest

		Cinder Lane	Skelder-gate Bridge	Rown. Park	Terrys	Maple Gr.	Blue Bridge	Total	% vs before week
W/c 4th Sept (Week before fuel protest)	**0800-0900**	153	80	42	35	53	102	**465**	
	1700-1800	137	60	53	40	42	94	**426**	
	12Hr	925	716	331	260	330	601	**3163**	
W/c 11th Sept (fuel protest week)	**0800-0900**	195	108	52	52	84	137	**628**	**35.1%**
	1700-1800	161	87	72	47	54	103	**524**	**23.0%**
	12Hr	1068	945	426	359	436	735	**3969**	**25.5%**
W/c 18th Sept (1 week after fuel protest)	**0800-0900**	163	82	52	39	54	81	**471**	**1.3%**
	1700-1800	136	56	34	29	34	67	**356**	**-16.4%**
	12Hr	890	732	272	239	260	428	**2821**	**-10.8%**
Mon 11th Sept	**0800-0900**	193	85	44	46	75	129	**572**	**23.0%**
	1700-1800	167	76	80	56	52	99	**530**	**24.4%**
	12Hr	1072	859	431	388	449	767	**3966**	**25.4%**
Tue 12th Sept	**0800-0900**	215	110	47	62	91	143	**668**	**43.7%**
	1700-1800	189	121	83	53	60	118	**624**	**46.5%**
	12Hr	1176	1102	509	440	479	815	**4521**	**42.9%**
Wed 13th Sept	**0800-0900**	211	141	71	57	100	170	**750**	**61.3%**
	1700-1800	169	95	78	52	62	110	**566**	**32.9%**
	12Hr	1227	1040	502	417	497	847	**4530**	**43.2%**
Thu 14th Sept	**0800-0900**	203	129	45	64	101	143	**685**	**47.3%**
	1700-1800	174	100	82	51	68	126	**601**	**41.1%**
	12Hr	1102	1011	409	373	498	773	**4166**	**31.7%**
Fri 15th Sept	**0800-0900**	153	75	53	32	54	102	**469**	**0.9%**
	1700-1800	106	46	38	24	32	65	**311**	**-27.0%**
	12Hr	764	715	280	181	257	477	**2674**	**-15.5%**

TABLE 5 Travel times in minutes between the pairs of survey sites most commonly travelled between

	6th Sept	7th Sept	8th Sept	11th Sept	13th Sept	27th Sept
A->C	N/A	9.72	N/A	7.39	5.19	7.95
A->E	6.43	8.71	8.09	7.26	6.97	7.34
A->J	4.31	3.31	6.31	6.20	5.87	3.43
B->C	N/A	4.78	N/A	8.93	5.29	9.61
B->E	7.43	6.45	7.23	9.76	6.83	9.64
I->E	5.69	6.95	8.25	11.35	4.68	5.71
J->E	1.33	3.46	3.16	3.04	1.88	1.60
I->J	3.98	4.18	4.68	6.75	1.67	4.60
Total	**29.17**	**33.06**	**37.72**	**44.36**	**27.90**	**32.32**

TABLE 6 Percentage of vehicles which stay on the same route between days and (total vehicles) "seen" on both days

Day	7th Sept	8th Sept	11th Sept	13th Sept	27th Sept
7th Sept		56.9% (318)	44.2% (292)	53.7% (218)	37.4% (24.3)
8th Sept	56.9% (318)		50.8% (254)	47.3% (203)	37.5% (216)
11th Sept	44.2% (292)	50.8% (254)		44.2% (244)	43.4% (251)
13th Sept	53.7% (218)	47.3% (203)	44.2% (244)		42.9% (233)
27th Sept	37.4% (24.3)	37.5% (216)	43.4% (251)	42.9% (233)	

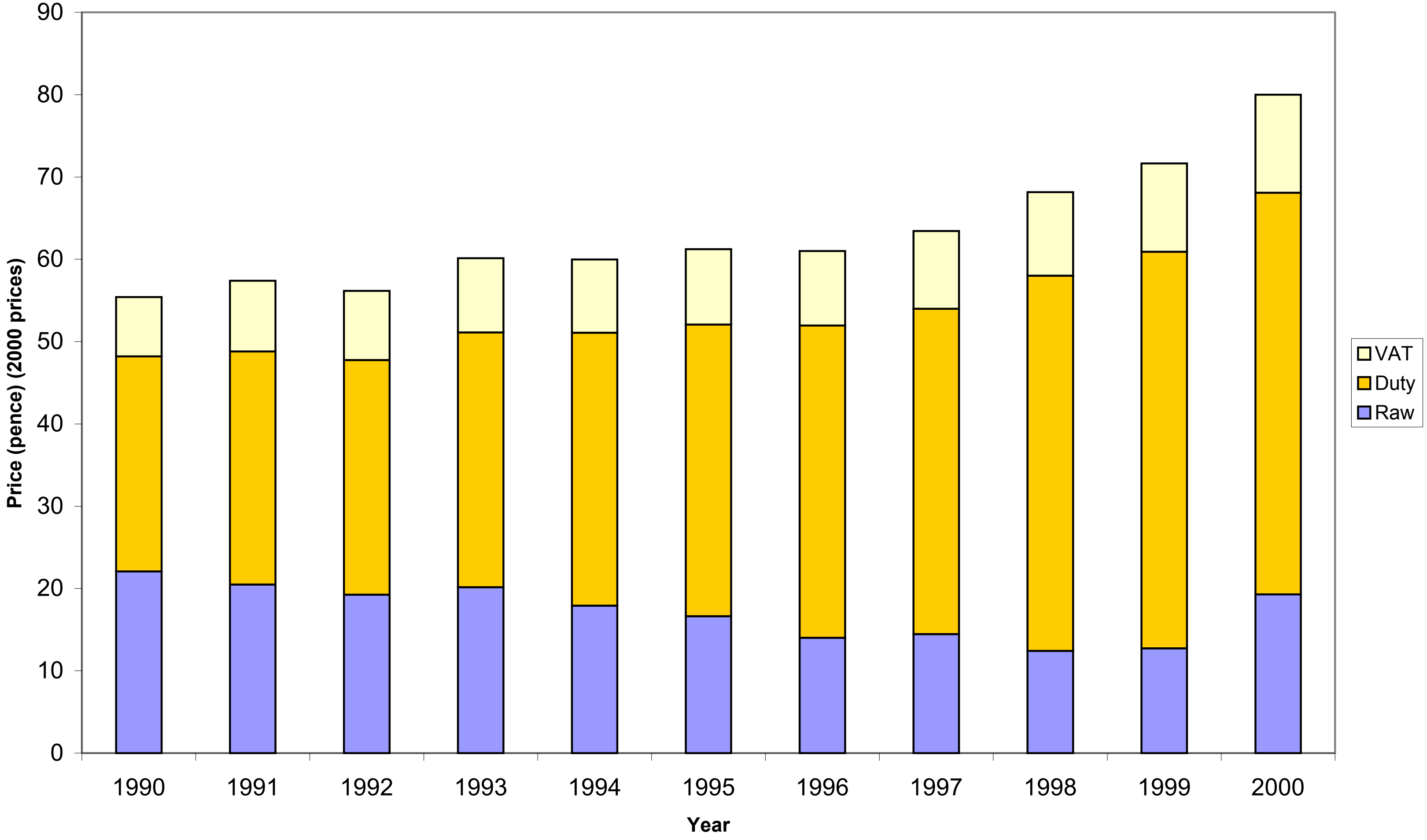

FIGURE 1 Trends in fuel taxation in the United Kingdom

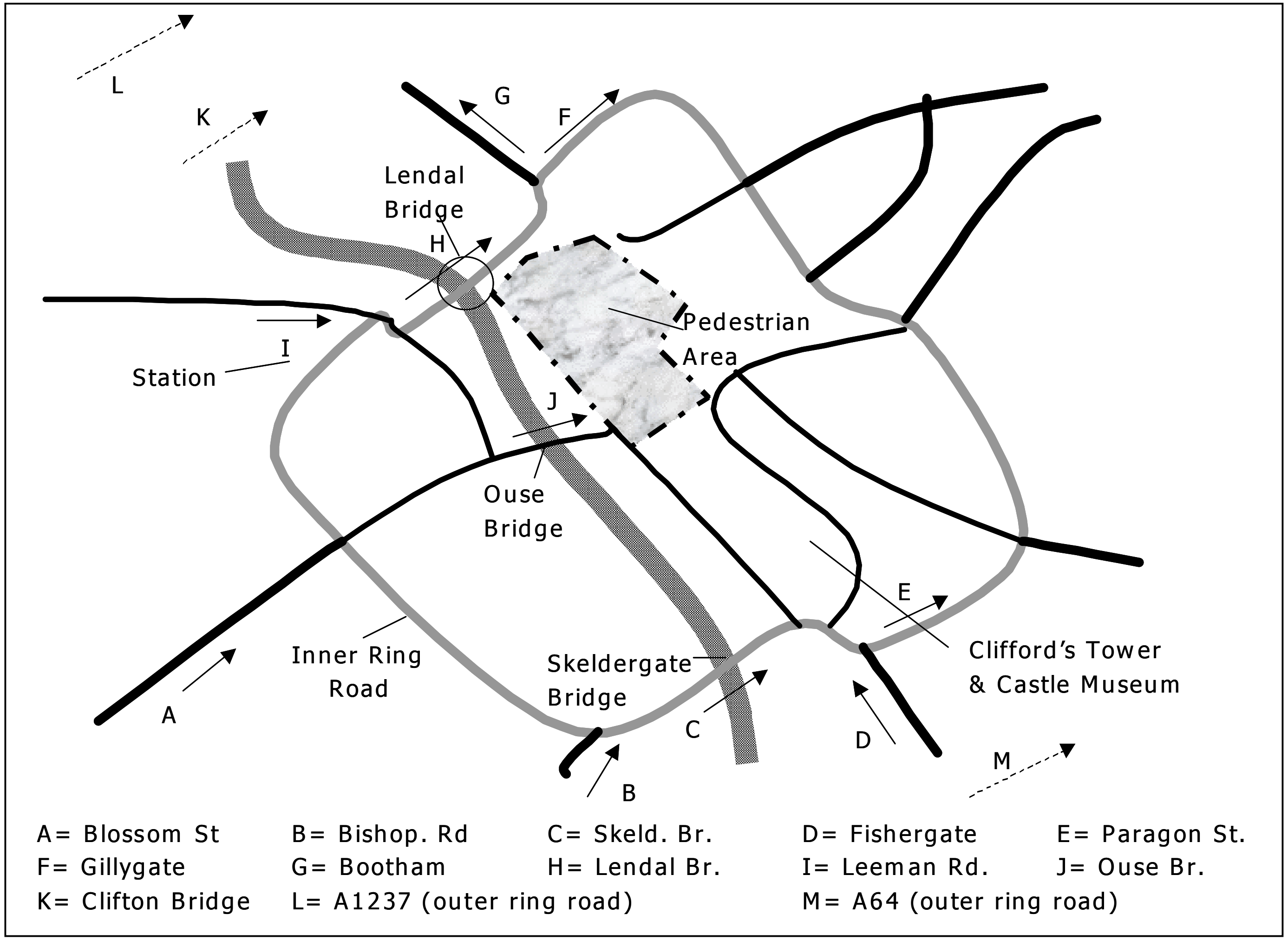

FIGURE 2 A schematic diagram of the surveyed network