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Potential User Response to Road User Charging in Dublin, Ireland

by

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ABSTRACT

POTENTIAL USER RESPONSE TO ROAD USE CHARGING IN DUBLIN, IRELAND

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Transport strategies in Dublin before 1990 were primarily road based with particular emphasis on increasing road space within the city for the car. In the early 1990s, however, the Dublin Transportation Initiative recommended a more innovative strategy, the core of which centred on public transport. Implementation of the strategy is currently underway but increased economic activity, with associated increases in car ownership and usage, has undermined the potential to address the imbalance between transport demand and supply, particularly in the shorter term. As a result, feasible and reliable public transport alternatives do not currently exist for car users on some radial corridors. The ongoing implementation of bus lanes and an increase in the number of buses should go some way to improving the reliability of the service.

It is against this background that road use pricing is considered here. The potential user response to road user charging is examined by means of a pilot-action project to investigate if further evaluation of the measure would be justified on a larger sample. The distance and time based pricing, time differentiated method used in the pilot-action induced a significant decrease of 22% in car trips and a 23% reduction in distance travelled during the peak period reflecting the relatively high road use charges applied in that period. The total distance travelled decreased by 13%. The road user charge reflects the marginal external costs of car travel in the peak period in Dublin.

Key Words: Road user charging, external costs, private transport

INTRODUCTION

An unfortunate impact of Ireland's recent economic growth on its capital, Dublin, is the rapidly increasing levels of traffic congestion now prevalent in the city. Although a comprehensive and well-focused transportation plan has been in place for some time now (1), the recommendations of which are currently being implemented, the car traffic forecast levels, on which the plan is based, have now been exceeded. Public transport options for car users are now the centre of attention for operators and local authorities, the main emphasis of which is on quality bus corridors. The aim is to provide 'bus only and taxi lanes' and to reduce the road space allocated to private transport. Another key element of the strategy is parking restraint measures where long-term, on-street parking has been reduced in favour of short-term parking with severe monetary penalties for overstaying.

It is in the context of the above that road use charging is examined for Dublin as part of a pilot-action project, entitled EUROPRICE (2), funded by the EU SAVE II Programme. The emphasis of the research is on user response to the measure and particularly the impact on traffic levels. Another primary objective of the project was to evaluate the resulting implications on fuel usage if road user charging were to be implemented in Dublin but the results of this part of the project are presented elsewhere (3).

The pilot-action involved participation of twenty-three individuals in a road user charging experiment lasting two months. One of the more notable aspects of the pilot-action was the fact that it involved distance and time based pricing in preference to the point based charging methods that have been evaluated elsewhere. Distance and time based pricing is capable of internalising the marginal external costs of transport more closely than point based methods

and was therefore considered worthy of investigation. A heavier weighting was attached to the distance proportion of the road user charge to eliminate the potential dangers of unsafe driving associated with time based pricing, suggested by Bonsall and Palmer (4).

Price differentiation by period was also a factor where the charge in the peak period reflected the larger marginal external costs associated with that period. The rates applied were selected so that the charge per vehicle trip was equivalent to the marginal external costs of car travel in Dublin calculated in another EU funded R&D project (5). The individuals were given real money budgets to be used in either of two ways; to pay the road use pricing charges if they chose to use their car or to save the money if they found alternative (cheaper) modes of transport. Although there are difficulties in translating such an approach to real life behaviour where the individual pays the road user charge from their own income, a real money incentive is considered important to observe the potential responses of individuals to road use pricing.

METHOD

The in-car unit (ICU) used to apply the distance and time based charge was developed specifically for the purpose (2). In summary, the ICU logged the time and distance travelled and performed the cost calculation by applying the charges allocated per time and minute for each individual. The ICU logged the date, start and end time of each trip, the distance travelled, the number of idling stops en route and the cost of each trip, calculated using the road use pricing charges.

In order to observe the baseline travel behaviour against which to measure the responses to road user charging, an ICU was installed in each car and baseline travel behaviour was logged for three weeks. No information was presented on the ICU to the driver during this first phase. After completion of this phase, the road user charging phase was initiated by the researcher. During this phase, the LCD on the unit displayed the weekly budget balance (i.e. how much of the budget was remaining at any particular time), the cost and distance travelled since the start of the trip, the time, date, and the charge rates per unit of distance and of time. Road use charging was applied for a three-week period after which the data was downloaded from the units and the individuals were interviewed to obtain qualitative information for integration with the quantitative data collected by the units.

SAMPLE

A general call for volunteers was initiated amongst university staff at Trinity College Dublin. Individuals who had a reasonable alternative public transport option to their car for their work trips (< 10 minutes walk from terminus or bus stop) were selected from this volunteer base. The fact that instrumentation was required to be installed in the car of the individual limited the scope for sample selection.

The salary range of the sample ranged from 10,000 euro/year to about 70,000 euro/year. Most of the sample started their work trip between 7.30 and 8.45 and all except two had free parking at their place of work although parking spaces are in high demand. Most of the sample had fixed working hours from 9.00 – 17.00 although a few had flexitime schedules. The majority of the sample were in the age groups 21-25, 36-45 and 51-55 although there was some

representation in the sample from all age groups. The occupations of the sample included secretarial, research, administration officer, lecturer, technician, engineer and insurance clerks.

RESULTS

The variables selected for investigation from the downloaded trip data were:

- number of trips made
- distance travelled and
- amount spent on road user charges each week.

Each of the three variables was disaggregated further to estimate differences between peak and off peak periods. The total number of trips made by each individual are presented in Figure 1 for the baseline case and for the road use pricing case. The total reduction in trips for the whole sample is 6% although no particular trend is obvious from the Figure. The data were tested statistically using a paired t-test and the results suggest that road use pricing does not influence this variable significantly.

Baseline and road use pricing data for the number of peak period trips made are presented in Figure 2. Similar sets of data are presented for off peak period trips in Figure 3. In Figure 2, there appears to be a reduction in the number of peak period trips made by many of the drivers during the road use pricing phase. The significance of this trend was confirmed by a paired t-test which indicated that one could be more than 99.5% confident that road use pricing is influencing this reduction. The total average reduction in this variable is 22%. When one examines the data in Figure 3, there appears to be a general increase in the number of trips made during the off peak period. The overall average increase was found to be 6% but the

statistical test suggested there was not enough evidence to support the hypothesis that road use pricing influenced the increase in trips significantly.

The total distance travelled each week by the individuals during the baseline and road use pricing phases is presented in Figure 4 followed by the distance travelled each week during peak periods in Figure 5. The general trend observed is a reduction in total distance travelled during the road use pricing phase. This overall average reduction of almost 13% is indeed influenced by road use pricing (95% confidence). The apparent greater influence on total distance travelled than on total number of trips made may be related to the pricing method where the predominant cost element is distance.

In examining Figure 5, one may observe that once again there is a reduction of 23% during the road use pricing phase (99.5% confidence). The reduction in distance travelled in off-peak periods during this phase was about 1% which is no doubt related to the relatively low charges applied in off peak periods i.e. 0.13 euro per mile and 0.02 euro per minute. The 1% reduction in distance is an interesting finding given that the number of trips made during this period was found to have increased by 6%.

The total amount spent on road use pricing is compared with what individuals would have paid if their baseline trips were priced at the same rate as those trips made during the road use pricing phase. The total amount spent each week is presented for the two phases in Figure 6. As one may expect from the data presented already, the general trend is a reduction during the road use pricing phase where the total reduction is about 17% (95% confidence). Similar data are presented for the peak period in Figure 7. Individuals, when faced with having to pay for

car travel in the peak period, reduced their expenditure by 22% (compared with what they would have paid if priced for their baseline peak period trips).

In summary, the relatively high price levels applied in the peak period appear to have influenced the individuals in reducing their peak period demand for car use. However, when one examines the off peak period travel of the individuals, there does not appear to be a significant transfer (although there is some) of peak period trips to the off peak period. This issue was addressed with the individuals in interviews after the trial. Many agreed that they had made a conscious effort to reduce car travel during peak periods. Four of the sample indicated that they tried to complete their trip to work either before the peak period in the morning (7.30 – 9.30) and after the peak period in the evening (17.00 – 19.00). As shown above, this trend by a few of the sample did not reflect greatly when the data from the sample was examined as a whole. Others used public transport a few times each week for their journey to work or tried to reduce the distance they travelled by car during the peak periods. Another identified an attractive public transport option during the trial, that she did not previously know about, and after completion of her involvement in the trial has continued to use this public transport option. Another peak period alternative for two of the sample was cycling.

Road use pricing appeared to have little effect on the high-income participants who live within a few miles from their work place. A couple of the sample did not have feasible public transport options and no change in their travel patterns was observed. However, they suggested that if they had an attractive alternative to using their car for their work trips they would use it, particularly if the alternative was rail based.

CONCLUSIONS

The road user charging pilot-action proved useful in addressing its main objective i.e. to examine whether road user charging as a traffic demand measure for Dublin should be evaluated further. Allowing for the fact that the pricing levels were higher than would likely to be considered acceptable, either at political or public level, the influence on peak period car travel was significant and sizeable (22% reduction in number of peak period trips). One interesting and surprising finding was the lack of evidence to suggest that the reduction in peak period car travel demand was transferred to the off peak period. It appears that suppression of demand is more likely to be the case.

Results from a small pilot-action, such as this one, can only be usefully interpreted as indications of likely user behaviour. A larger sample would be required to estimate more accurately potential user response. Distance and time-based pricing proved to be a useful means of evaluating road user charging in the pilot-action and is recommended as a means of conducting further experiments of this nature in Dublin and elsewhere.

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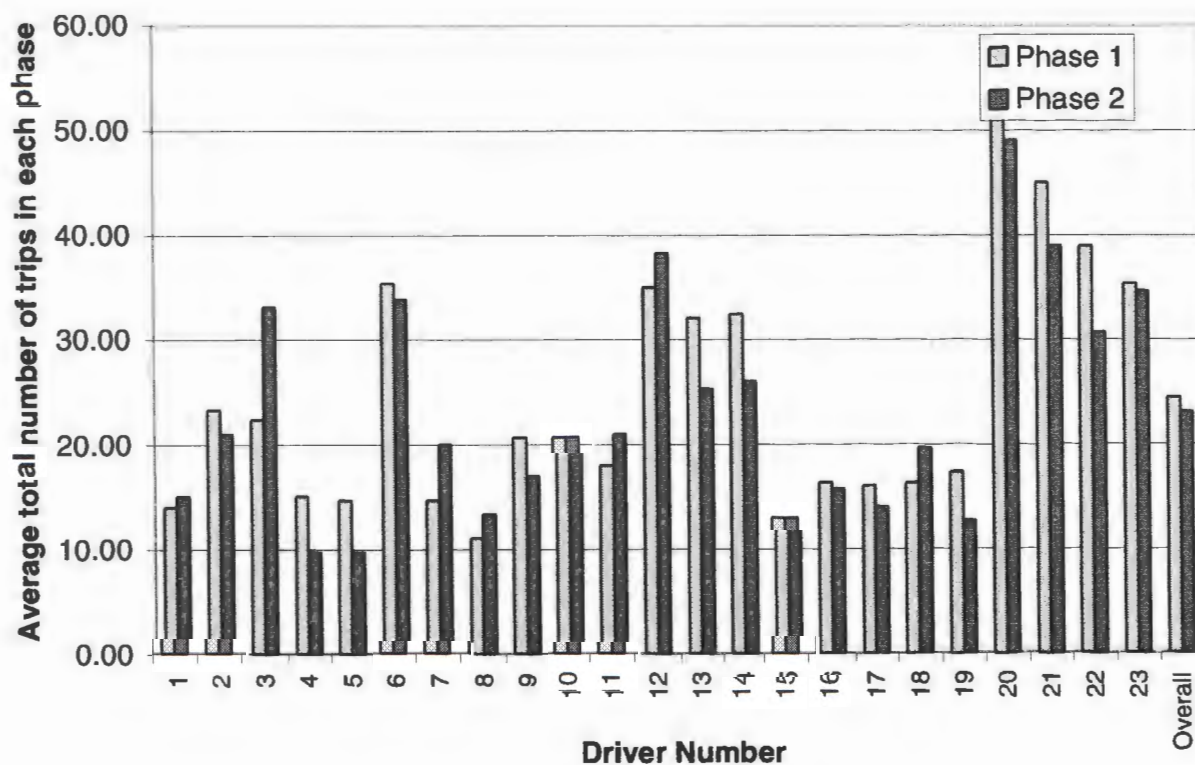


Figure 1. Average total number of trips made in Phases 1 and 2.

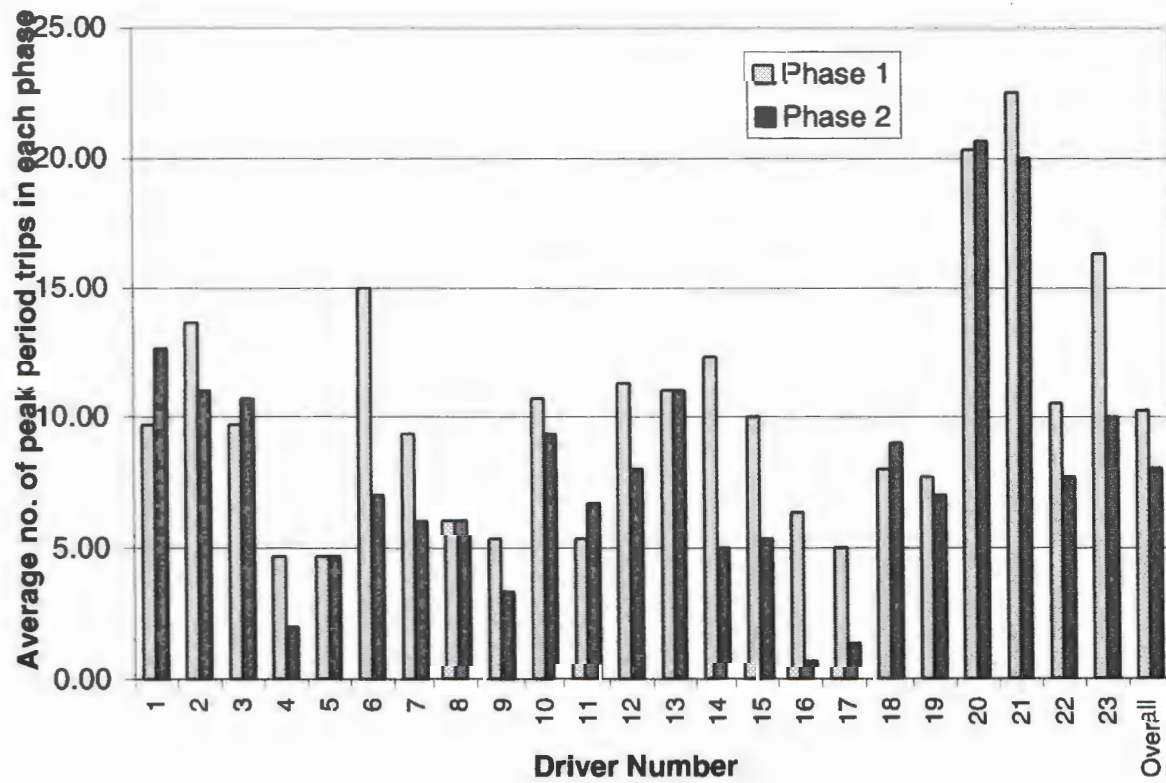


Figure 2. Average number of peak period trips made in Phases 1 and 2

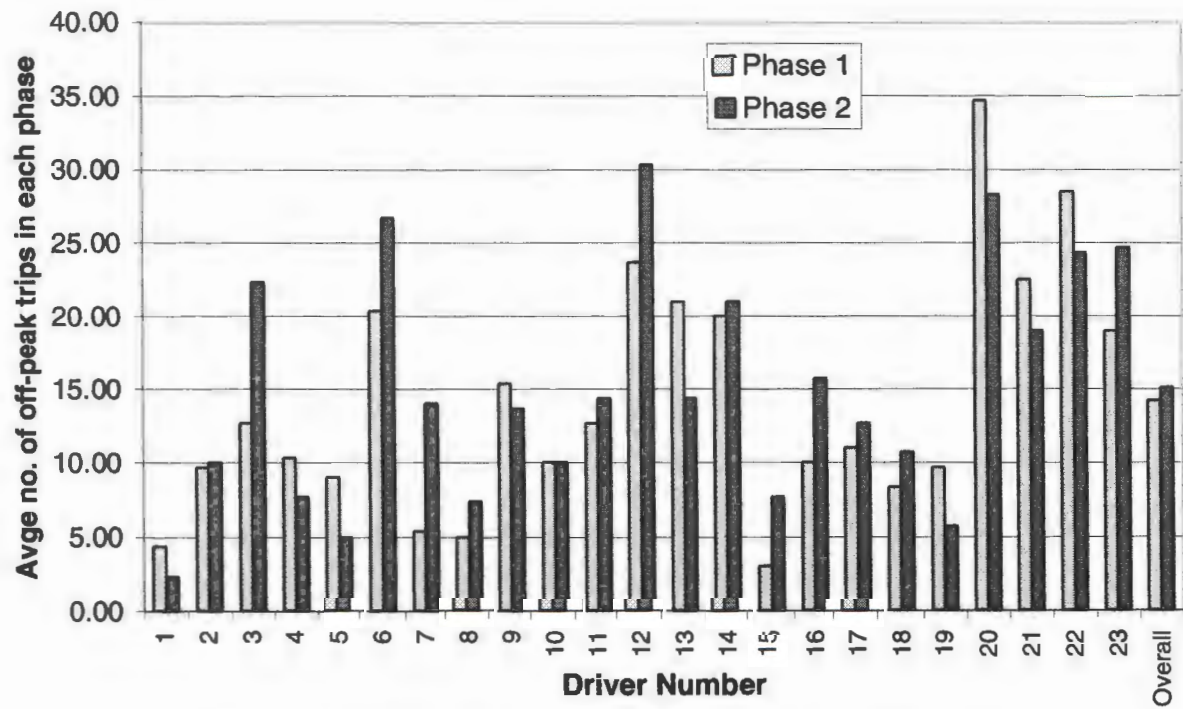


Figure 3. Average number of off-peak period trips made in Phases 1 and 2

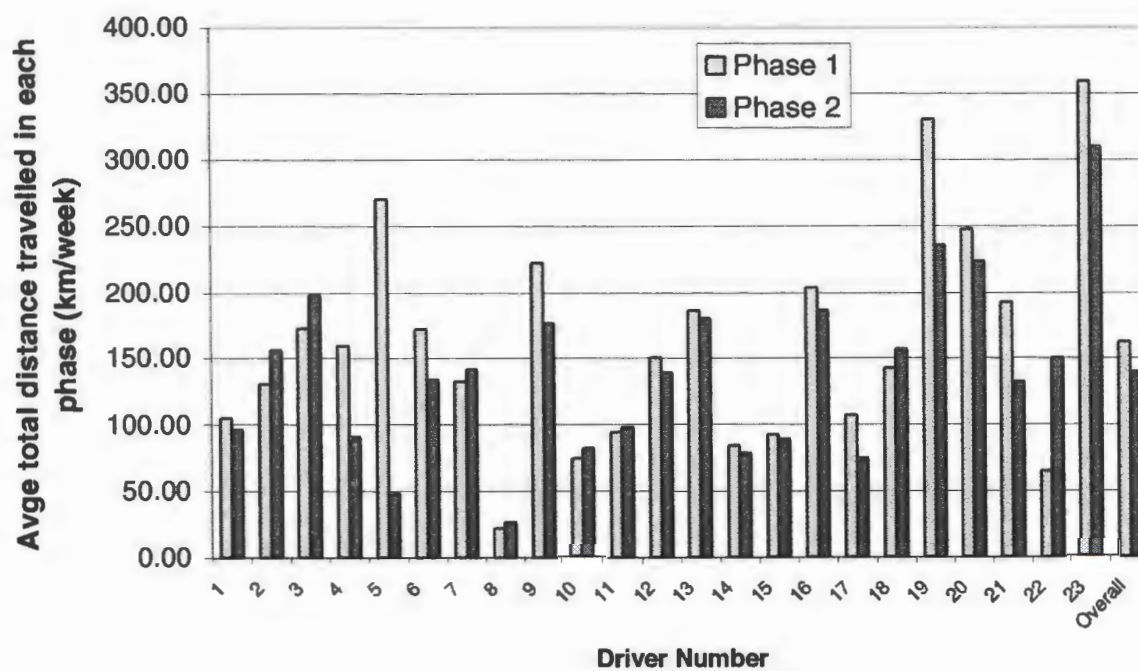


Figure 4. Average total distance travelled in Phases 1 and 2 (km/week)

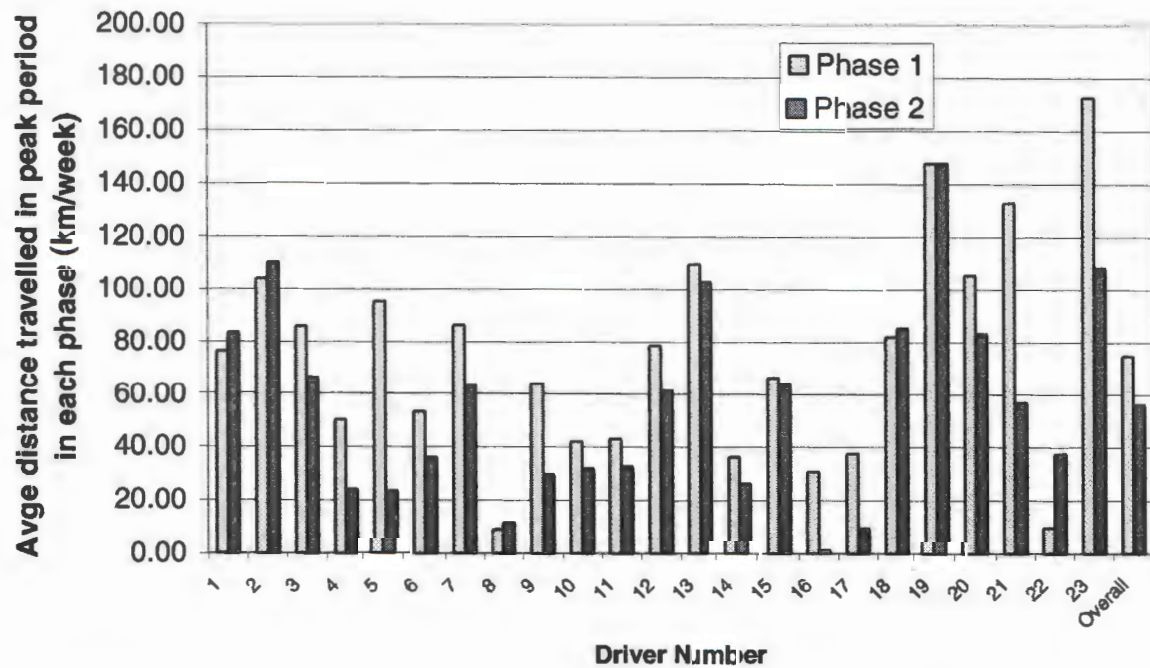


Figure 5. Average distance travelled in peak periods during Phases 1 and 2

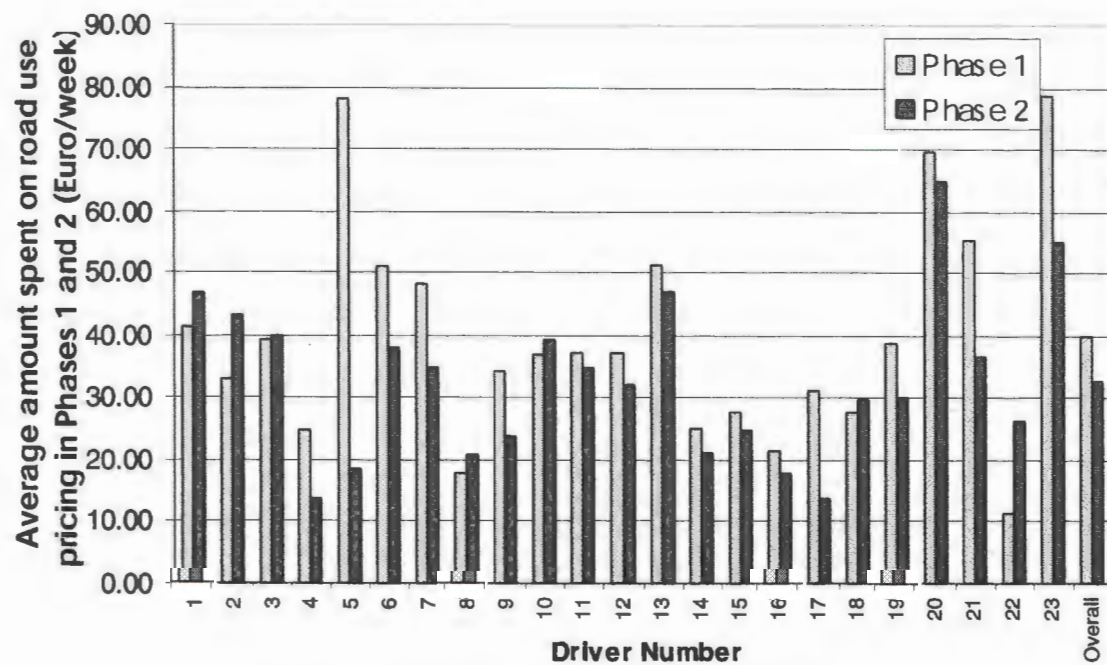


Figure 6. Amount spent on road use pricing in Phases 1 (notional) and 2.

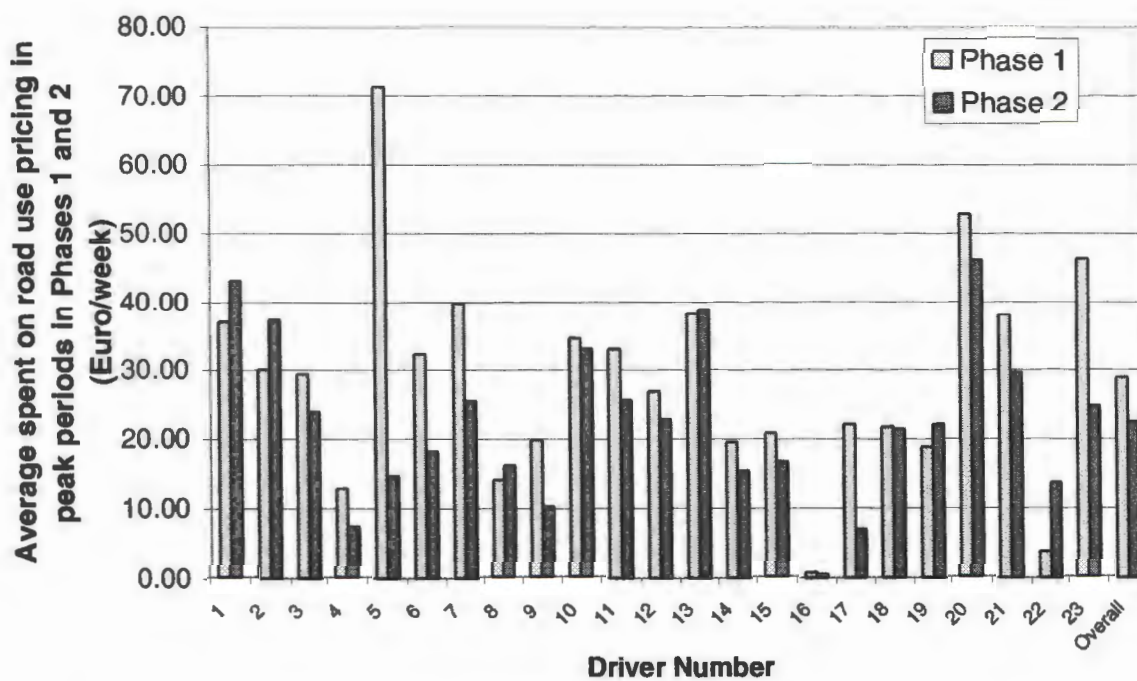


Figure 7. Amount spent on road use pricing in peak periods in Phases 1 and 2