Effectiveness of Pricing in Restraining City Traffic

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Parking charges are at present the only pricing measure used widely in Canadian cities to restrain city traffic. Most interest in modifying prices is focused on their use to discourage CBD-oriented trips during the peak periods. However, the majority of such trips do not use all-day parking. Evidence on whether other trips are sensitive to parking is limited, but generally supports the hypothesis that, for work trips, the demand for automobile usage as a function of parking charges is inelastic. This agrees with studies made of parking charges in U.S. cities. Gillen's analysis, which gives elasticities of about -0.3 in Toronto, explains these low estimates by the reaction of many drivers faced with a higher charge: relocating rather than switching modes. Nevertheless, different pricing policies for private parking in Ottawa and Toronto appear to have a significant effect on commuters' choice of mode, and parking rates may be a useful instrument when used with other measures.

In recent years, some interest has appeared in Canada in measures to discourage the use of automobiles, especially in urban areas. The interest has been stimulated by concerns over energy consumption, the negative impacts of the private automobile on the urban environment, and the need to improve the overall efficiency of urban transportation systems. Measures using pricing to meet these concerns have several advantages: They retain individual freedom of choice, can often be applied through existing taxing mechanisms, and generate revenues that may be used to cover the social costs of private vehicle usage.

A large number of measures might be used to restrain traffic, as has been excellently summarized by Thomson (1). The principal pricing measures he considers are parking charges, area licenses, tolls, road pricing, and gasoline taxes.

Of these measures, only parking charges have been used systematically in Canadian cities with the effect of restraining traffic, and most proposals to discourage the use of automobiles in urban areas rely heavily on this measure. The city of Toronto, in a recent unsuccessful application to the Ontario government to control all parking within the city, proposed that parking rates be set solely on an hourly basis and that the preference given to commuters through the present lower all-day maximums be removed (2). In Vancouver, proposals are being formulated to freeze the number of parking spaces available and then to let the market ration the available supply through higher rates. The federal government recently introduced charges for parking permits so that parking costs for many federal employees working in central urban areas increased considerably.

In general, these schemes discourage all-day parking to reduce the numbers commuting by automobile into the CBD. Given this objective, parking charges appear one of the most applicable forms of fiscal restraint. It is popularly argued that increases will be borne most heavily by vehicles traveling in the urban core during peak periods and that they are an effective way of diverting commuters to transit. They are attractive to municipal governments because they can be a revenue source that is easy to

implement and administer.

APPROPRIATENESS OF PARKING CHARGES AS A MEASURE OF TRAFFIC RESTRAINT

Nevertheless, there are limitations to the ability of parking charges to meet this and other objectives of traffic-restraint policies. Within downtown areas their impact is reduced by through traffic or vehicles parked illegally. Control and parking facilities in and around the urban core are limited because of the large proportion of commercial and private parking, and the resistance to greater municipal control is substantial on grounds of social inequity, impact on downtown retail trade, and alleged inadequacy of transit facilities.

EFFECTIVENESS OF PARKING CHARGES IN DISCOURAGING DOWNTOWN COMMUTING BY AUTOMOBILE

Even disregarding these problems, considerable doubt has been expressed as to whether parking charges do in fact have much effect in reducing automobile usage. More formally, it is suggested that the price elasticity of demand as a function of parking charges is rather low. This was the conclusion of Kulash in a review of the effects of parking charges in several U.S. cities (3). His general finding was that the short-run price elasticity of demand for automobile usage into urban core areas is about -0.3 and that even major increases in parking charges would only reduce automobile usage sufficiently to offset 1 or 2 years of normal growth in traffic. For instance, a doubling of parking costs would only result in a 22 percent decline in automobile trips terminating in the parking restraint area, and this effect would be diluted to under 10 percent of the volumes on major arteries by the presence of other traffic.

That parking charges should have such little effect in large cities with ample alternative transportation services may seem rather surprising. It is generally accepted that the price elasticity of demand for transit is low (estimates of approximately -0.3 are the norm), but this can be largely ascribed to the relatively small part of the transit fare in the modal-choice decision. However, in large North American cities, where parking fees are typically around $2.00 per day, one would expect parking charges to have much more impact. Although a 50 percent change in transit fares would typically modify total return trip costs by only $0.30 or thereabouts, a 50 percent rise in parking costs involves an increase of $1.00. One would expect the impact of this on modal choice to be much greater and the elasticity of demand for automobile trips to be correspondingly higher. Figure 1 shows how an estimate may be derived from a modal-split model. Assume that the transit fare is $0.30 so that a return trip costs $0.60, that the modal split is 50-50 between transit and automobile, and that a 50 percent transit-fare reduction will increase the modal share to 60 percent. The price elasticity of demand for transit is -0.27. If a model is used in which modal choice is dependent on the money-cost difference between modes, so that a 50 percent decrease in transit fare is equivalent to a $0.30 cost increase in the parking charge, then an increase in the parking price from $2.00 to $2.30 will also lead to a 40 percent modal share for the automobile. The elasticity computed from these demand and price changes is -1.59, nearly 6 times as high as the elasticity of demand for transit.

Such an approach is a logical extension of most modal-split models. It assumes, in effect, that a fixed amount of parking must be purchased for an automobile trip. This fails to recognize that the automobile user is not constrained to a single parking space, but has the option of relocating his or her parking in response to a change in price. Parking is a separate commodity and its demand, while complementary to that for automobile usage, is not completely dependent on it.

GILLEN'S APPROACH

The implications have been furthest explored by Gillen (4), who developed modal-split models of work trips into downtown Toronto. He hypothesized that the influence of parking cost on modal choice would differ from that of other automobile costs and that an increase in parking charges would be followed by (a) a reduction in demand for parking services through a relocation of drivers to less expensive, less convenient parking spaces and (b) a shift from the automobile to other modes. Because of the larger number of options available to drivers, he expected that the elasticity of demand for automobile trips as a function of parking charges would not be high.

He tested this hypothesis with data obtained in the Metropolitan Toronto and Regional Transportation Study of 1964. In alternative models he developed, the parking charge was considered as a part of total automobile costs and as a separate variable. In the second model, the coefficients of the cost variable were significantly different from each other and from the cost coefficient in the first model. Moreover the index of good fit, a surrogate correlation coefficient, was higher for the second model.

The elasticity of demand computed from the second model was -0.31, coinciding with one of Kulash's estimates for San Francisco. As might be expected, a stratification of the model by income groups showed that the elasticity was much lower for high-income than for low-income individuals.

OTTAWA EXPERIENCE

However, the data used by Gillen are more than 10 years old and, in many cases, are derivations of data collected in the original survey. Recent data are just becoming available from work under way on monitoring the effects of a sharp increase in parking charges in Ottawa.

The federal government has 35,000 employees working in the urban core of Ottawa and Hull and controls 7,000 parking spaces, i.e., 1 space per 5 employees. Until recently these spaces were provided free. Because the supply did not meet demand, demand was rationed according to criteria such as seniority and need. On April 1, 1975, charges for the spaces were introduced, ranging from $20 to $24 per month, about 70 percent of the average rates in the area.

Details of the impacts of these charges are only just becoming available. The percentage of employees applying for parking was as follows:

Year	Percentage
1974	35
1975	
Old applicants	18
New applicants	1

The modal-split percentage was as follows:

Mode	1974	1975
Automobile driver	35	27
Automobile passenger	11	11
Bus passenger	41	48
Other	13	13

Since applications in 1975 almost equaled the spaces available, there was no need to

ration demand except through the price mechanism. When charges were imposed, 17 out of 35 percent of the 1974 market for free applications withdrew. However, the effect on the modal split is not exactly equivalent, for employees always had the option of using uncontrolled commercial parking in either 1974 or 1975. In fact, the modal share of automobile fell from 46 to 38 percent between the summers of 1974 and 1975.

As usual, several notes of caution are necessary before one generalizes from these results. First, during the interval between the 2 observations, several important improvements in transit were made that have been increasing its share by 2 percent per year during the last 6 years. Second, the charges affected a particular population: federal employees with specific socioeconomic characteristics and, possibly, attitudes. The average income of permit applicants in 1974 was 20 percent above the sample mean. Third, the effect of the charge is somewhat obscured by the existence of commercial parking, which is an attractive alternative for individuals who are unable to get convenient space or who use their automobiles only 2 or 3 days a week. This commercial space has a significantly different price structure from that of the federal parking. Finally, the analysis is not complete and major causes of bias may appear at a later date.

TORONTO CROSS-SECTIONAL DATA

High parking charges are often accompanied by inconvenient parking locations and higher search times, and the combinations of these factors may lead to significant differences in automobile usage. These factors may explain some interesting findings by Berger in his work for the city of Toronto (2), which permits a cross-sectional analysis of parking behavior. Downtown and midtown Toronto are both major employment centers separated by more than a mile, and both are excellently served by transit services. However, the midtown area has much higher availability of parking space and generally lower charges partly because of preferential rates for private parking in the area.

Figure 2 (2) shows these characteristics and the much higher usage of automobiles by commuters into the midtown area. Parking rates in midtown are a little more than half those of downtown, and automobile usage is more than double. If one assumes that this higher automobile usage into midtown is solely due to the lower parking rates, the elasticity of demand can be computed as -1.1. However, such an assumption ignores the unknown impact of the greater availability of parking space in midtown, which probably results in time savings to automobile users in terms of searching for space and walking from the space to their final destinations. One would surmise that these savings substantially reinforce the effects of the price differential so that a true price elasticity of demand might be much lower.

CONCLUSIONS

Policies of increased parking charges to drivers parking all day in the CBD will not have major effects on traffic volumes. Moreover, they are unlikely to have a significant impact on energy consumption so long as they apply only to core areas with a small proportion of trips. Even around and within the urban core, their impact will be limited by the large proportion of vehicles entering it that do not park and the fact that many drivers are not sensitive to parking charges. Although the available evidence is limited and considers only short-term effects, it fairly consistently suggests that elasticity is about -0.3. Thus, in Canada, as in the United States, parking charges can only be expected to reduce street traffic volumes by amounts less than 10 percent.

Parking charges can still make a valuable contribution to reducing automobile usage and increasing transit ridership. Their impact occurs at the point in urban transportation systems often considered the most critical. In Ottawa, the number of employees driving to and from work fell by about 2,000 during a 12-month interval. Their vehicles account for about 6 percent of traffic entering the urban core each day between 7 and 10 a.m. Such trips are disproportionate in their effect on the need for road facilities.

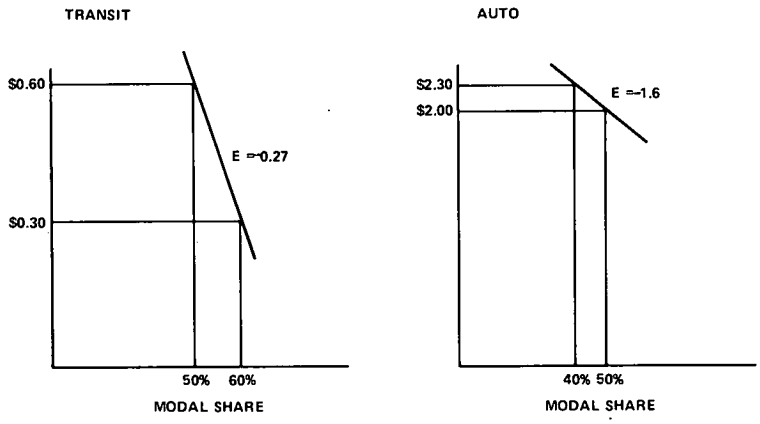

Figure 1. Costs and model choice: a basic model.

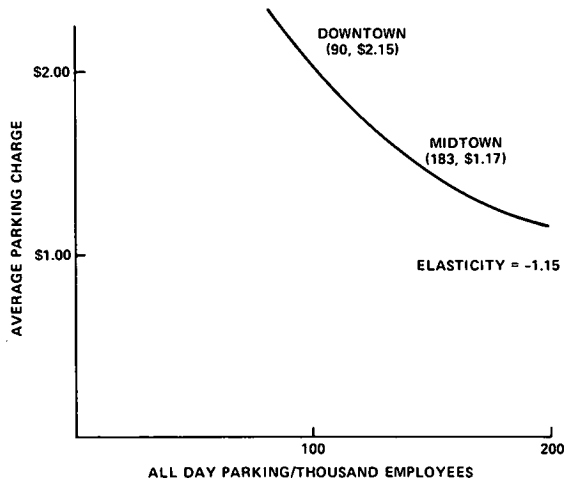

Figure 2. Parking facilities and travel behavior in Toronto.

Even a respite of 1 year's growth in traffic volume would save Canadian cities many millions of dollars, although this would be partly offset by needs for expanded transit facilities.

Parking charges also have a useful role in conjunction with other measures. The great differences between downtown and midtown Toronto suggest that the total parking situation—prices and availability—can be of major importance. Reducing the supply may be much more effective than pure pricing measures such as taxes.

The Toronto and Ottawa cases illustrate a major factor in parking in Canadian cities: the large proportion of private space reserved for employees and often provided at preferential rates. Greater leverage can probably be obtained from charges here than adjustments to commercial or municipal parking. Measures such as taxing of parking as an employee benefit or as a nondeductible expense may have greater impact.

This could be extended to cover parking facilities beyond the urban core, where large amounts of unpriced space are often provided. Parking controls could then be used as an important incentive to car pooling by employees. Only in this way could parking be used as an instrument that has a more general effect than reducing traffic entering the CBD and that makes a significant contribution to energy conservation.

REFERENCES

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