"UNNECESSARY AND WASTEFUL" COMPETITION IN BUS TRANSPORT

By Ian P. Savage*

Many commentators, for example Gwilliam (1964), report that a common reason for regulating local bus services has been that competition was regarded as "unnecessary and wasteful". By this it is implied that the competitive benefits to consumers on the competed route – from reduced fares and waiting times and the consequent generated traffic – are outweighed by the additional resource costs involved in competition. The purpose of this note is to investigate the conditions under which the argument holds. A simulation model of a bus route, based on a standard social welfare approach, has been developed to do this.

COSTS AND BENEFITS IN THE MODEL

The demand for bus travel is influenced not only by the total monetary amount a consumer has to pay (that is, the fare) but also by the value of the time taken on the journey (Mohring, 1972). This time element consists of two parts: first, the in-transit time – or time actually on the bus – and secondly, the time spent waiting at the stop. Whether passengers are assumed to arrive randomly at bus stops (giving an average waiting time of half the headway) or not (for example, by the waiting time function of Seddon and Day, 1974) does not materially affect the results of the analysis. However, some relationship is assumed between frequencies and average waiting time. In addition, as load factors increase the generalised costs of travel will increase, because journey times are extended (as more people alight) and there is a greater chance of not being able to board the first bus because it is full. This has not been initially included in the model, though (particularly with respect to boarding and alighting times) it easily can be. It is assumed, as has been empirically shown many times in the developed world, that there is a negative relationship between patronage and generalised cost.

The benefit of bus travel, to the passenger, is measured by the area under the demand curve but above the generalised cost of travel. Therefore a Marshallian

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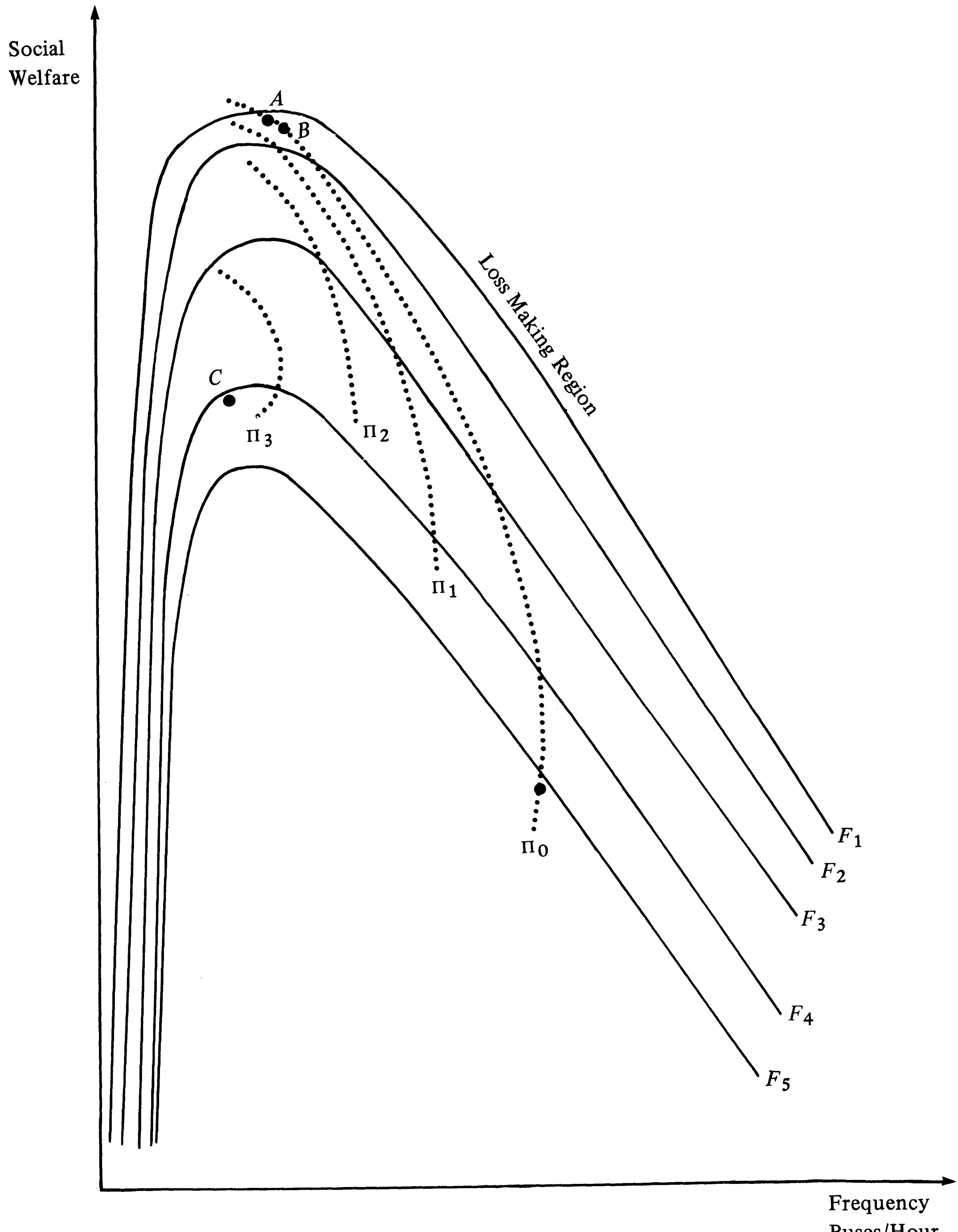
Social
Welfare
A
B
C
Loss Making Region
Π3
Π2
Π1
Π0
F1
F2
F3
F4
F5
Frequency
Buses/Hour

FIGURE 1

measure of surplus is being used (for a justification see Willig, 1976). As in other work of this type, an assumption has to be made that the size of the surplus is comparable for all consumers. In addition to this benefit to consumers, a producers' surplus is incorporated. This is the divergence (positive or negative) of revenue from costs. Costs are assumed to be a function of the frequency offered by the bus company.

THE MODEL

It is now possible to construct a diagram showing the relationship between frequency (per unit of time) offered and the social welfare level resulting, for a given fare level. This is shown in Figure 1, in which fare level F_2 is greater than fare level F_1, and so on. It is observed that, for a given fare level, additional buses at low frequencies produce an increase in social welfare, as waiting times are significantly reduced and considerable traffic generated. An optimum level is then reached, and after that social welfare declines as additional buses are put on. This is because the benefits of reduced waiting times are now much smaller (and the amount of generated traffic is much less), and these benefits are outweighed by the additional resource costs of the additional capacity provided.

The level of producer surplus (or profit) can also be represented in the diagram. This is shown by the broken contours. The most important of these is labelled Π_0 and represents the breakeven position. All fare/frequency combinations to the "right" of this contour represent a loss on the bus route. If the fare/frequency pair on a route is on the breakeven contour (or, because of indivisibilities, up to one bus per unit of time inside it) it would not be possible to expand capacity without incurring a financial loss on the route. Unless it is taking predatory action, no bus company will be willing to move the route (and hence itself) into a loss- making position. In practice, in Britain, potential entrants to the stage bus industry have been motivated mainly by profit, and have sought it on the most favourable routes and timings. The favourable routes are often those generating a profit to be used to cross-subsidise other, unremunerative, services. Thus it can be expected that the routes on which competition is likely to occur are those on which the present fare/frequency combination is well within the breakeven contour.

COMPETITION

In the succeeding analysis the following initial assumptions have been made:

(a) Fare matching occurs. Since the licensing system was liberalised in Britain in 1980, a feature of the resulting competition has been the matching of fares.

(b) The competitors have similar costs.

(c) Except when buses are full, the greatest advantage to the consumer accrues when buses are inserted equally between existing departures.

Assumptions (b) and (c) will later be relaxed.

The possible fare/frequency combinations that might be observed on a bus

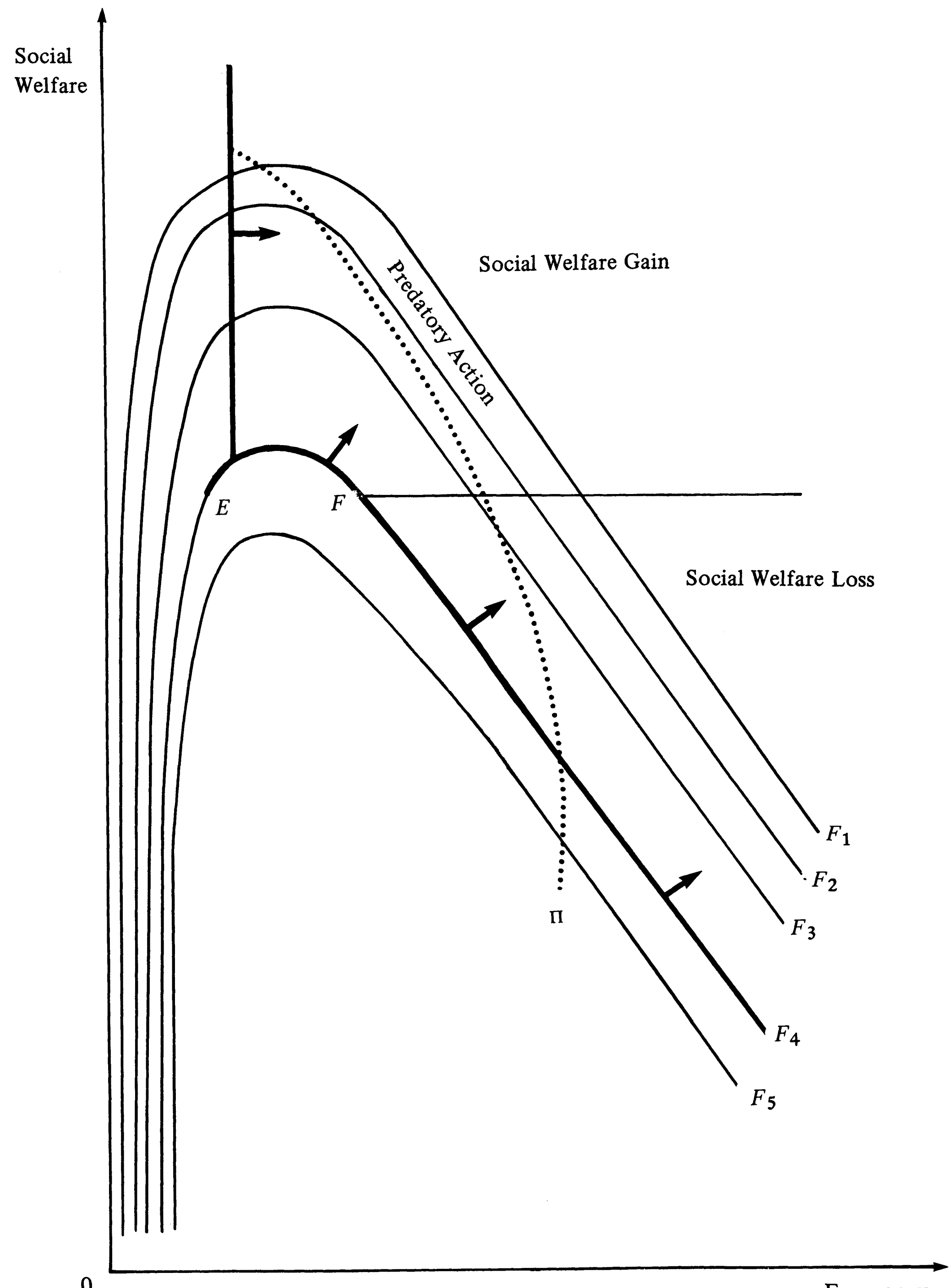
Social Welfare
Social Welfare Gain
Predatory Action
Social Welfare Loss
E
F
Π
F_1
F_2
F_3
F_4
F_5
0
Frequency Buses/Hour

FIGURE 2

TABLE 1

	Frequency	
	Low	*High*
High Fare	(1)	(2)
Low Fare	(3)	(4)

route are shown in Table 1. Entrants to the stage bus industry will seek to make a profit, and will thus attack the routes and timings of the existing operators where they can make the most money. Therefore it is unlikely that the routes under attack will be of type (3) or (4). The two feasible route types, (1) and (2), need to be studied to see whether or not competition will bring a social welfare gain.

Case (1) is where the monopoly frequency is less than the optimum, as it may be particularly in some peak periods. This is illustrated in Figure 2. The monopoly fare/frequency combination is at point *E*. A feasible region for competition can be defined by applying two criteria:

(1) that fares cannot increase (the classic kinked demand curve)

(2) that frequency must increase by at least one bus per unit of time, as the competitor has to introduce some capacity (!). The representation of this in Figures 2 and 3 will depend on the horizontal scale adopted.

This is the area above and to the right of the bold line. The part of the area beyond the breakeven contour represents fare/frequency combinations which would make the route unprofitable.

If a horizontal is drawn through the feasible region at the same level of social welfare as point *E*, it is observed that all points above this line represent a welfare gain and all points below a loss. In this particular case it is noted that, on the frequency/welfare function between points *E* and *F*, social welfare can be increased by introducing new capacity alone, without the need for reductions in fare.

Case (2) is very likely to occur, particularly in an industry with cyclical declining demand. A dynamic version of the model would have the frequency/welfare functions moving downwards and to the left. Attempts to maintain capacity in the face of this would lead to the monopoly frequency being greater than the optimum. This is illustrated in Figure 3. It is observed that the area where a social welfare benefit is possible without losses (the shaded area) is much smaller. For a welfare gain an increased frequency must be matched by a cut in average fare levels. However, for any given increase in competitive capacity, the entrant will maximise his constrained profit by pricing close to the existing fare. This is not

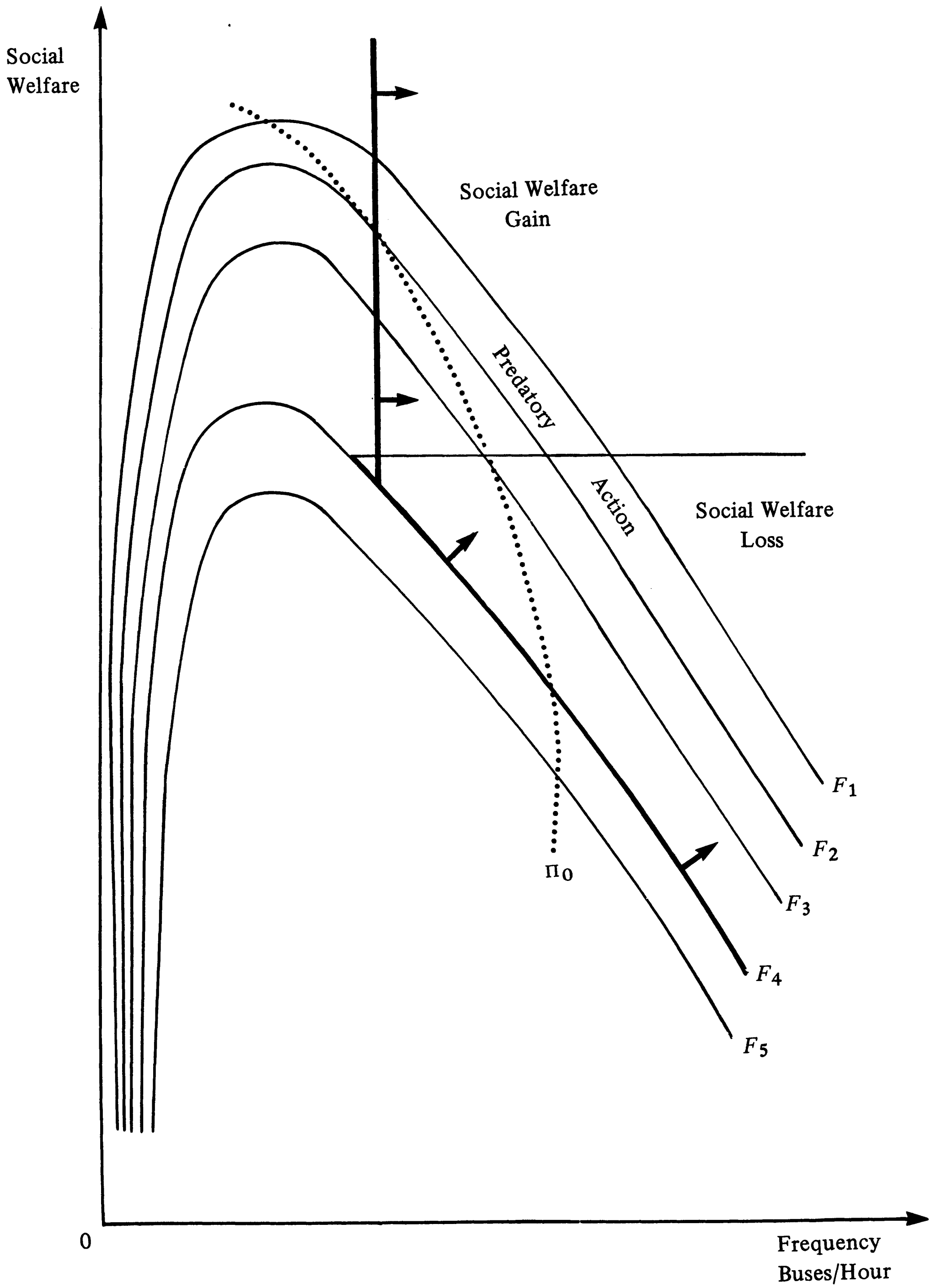
Social
Welfare
Social Welfare
Gain
Predatory
Action
Social Welfare
Loss
F_1
F_2
F_3
F_4
F_5
Π_0
0
Frequency
Buses/Hour

FIGURE 3

compatible with moving to the shaded area. This rule remains valid, however far the point E may be from the optimum frequency.

When the assumptions on costs and timings are relaxed, it is observed that on the entry of a lower cost operator there is a marginal increase in the area where a welfare gain can be experienced without financial loss; but this does not alter the overall conclusion of the analysis. However, if, as has often been observed, entrants have located themselves close to existing timings (a practice known as "headrunning"), society will gain very little consumer benefit at the expense of additional resource costs. In this case it is extremely unlikely that there will be any scope for social welfare gain, even if massive fare reductions are offered.

CONCLUSIONS

Unless peak inadequacy is relieved, or unless substantial traffic is generated – which in practice is unlikely – it appears that in the short run any additional capacity introduced by a competitor will lead to a reduced level of social welfare. This is especially true when the favoured competitive tactic of "headrunning" is employed.

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