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"Competition, Contestability and Predation:
The Economics of Competition in Deregulated Bus Markets"

by

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COMPETITION, CONTESTABILITY AND PREDATION: THE ECONOMICS OF COMPETITION IN DEREGULATED BUS MARKETS

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I. Introduction

Following publication of the Buses White Paper in 1984, which set out the Government's plans, local bus services in Great Britain were deregulated on October 26th 1986. From that date operators were no longer required to have Road Service Licences for the services they provided, and so entry to the industry could be said to be - for the first time since 1930 - free to all. The British "experiment" with bus deregulation has, like the earlier American one with airline deregulation, been extensively monitored, and it has been the subject of considerable international interest. It is to be followed by deregulation along similar lines in 1990 in New Zealand.

This paper reviews the application of economic models to analyse the consequences of deregulation. We consider: the relevance of the contestability theory logic which underlay the Government's deregulation policies; second thoughts on contestability; the implications of theoretical work on the rationality of predatory behaviour; and the use of models of horizontal and vertical product differentiation to predict long-term equilibrium outcomes in oligopolistically competitive markets.

II Contestability

"The bus market is therefore a highly contestable one" (Department of Transport, et.al., 1984 - the Buses White Paper - p.52)

Perfect contestability is a benchmarket market structure developed by Baumol (1982) and his associates, and used to analyse industries where barriers to entry and exit are thought to be low. In particular, the theory of contestable markets has been applied to the airline industry and to the bus industry. In both industries the main item of capital, the aircraft or the vehicle, is mobile, and can be leased, or resold, or moved to another route.

The theory of contestable markets predicts that the threats of entry and of competition will lead to firms in the industry setting prices which are equal to average costs and acting so as to produce their output at maximum technical efficiency (and hence at minimum cost for the output level produced). Moreover, provided that the industry is not a natural monopoly (with continuously declining average costs in the range of output where industry demand exceeds unit costs) - so that the industry can sustain two or more firms - prices will also equal marginal costs. Hence, perfectly contestable, non natural monopoly, markets will produce the economically-efficient, Pareto-optimum, levels of output. If the industry is a natural monopoly, the threat of entry will ensure that the existing monopoly incumbent will be technically-efficient and price at average costs, since failure to do this would attract entry and replacement by a more-efficient newcomer. However, the declining average cost curve means that average costs and price will exceed marginal cost.

These predictions are based on a number of assumptions. They are:

1. There must be free entry and exit from the industry. As well as the absence of artificial entry barriers in the form of Government regulations, this means that there must be no sunk costs, which are costs that cannot be recouped if an entrant decides to leave the industry.

2. All firms must have access to the same technology. Existing firms cannot have the protection of patents or other restricted access to specialised knowledge needed to produce output. In addition, existing firms must not have protected access to the means of production.

3. Potential entrants must be able to evaluate the profit prospects of entry at the pre-entry prices. This means

that entry must be possible before existing firms have time to respond by lowering prices. Hence, contestable markets and their incumbent firms are said to be vulnerable to "hit-and-run" entry.

We might judge the relevance of the contestable markets hypothesis to the bus industry both by considering the relevance of its assumptions and the validity of its predictions. The Popperian view, as interpreted for economists by Friedman (1935), is that it is the validity of the predictions that is important. However, although there is case-study evidence, so far as local bus services in Britain are concerned empirical tests of contestability of the types undertaken for US airlines by Morrison and Whinston (1987) and for UK express coaches by Jaffer and Thompson (1986) have yet to be carried out. But it is worth considering the realism of the assumptions, particularly because Schwartz (1986) has shown that the predictions of the model are vulnerable to small perturbations in the underlying assumptions.

It is certainly true that sunk costs in the local bus industry are low, though they are not zero. The vehicle itself is relatively cheap and can be moved with very low cost from market to market: moreover there are thriving leasing and second-hand markets. There appear to be more-or-less constant returns to scale with respect to fleet size, so entrants do not need a minimum fleet size in order to compete effectively with incumbents. The road network is provided by government, and local buses can load and set down by the road side with minimal roadside facilities. Local authorities may provide stop signs or shelters, while bus operators can even dispense with these altogether by operating "hail-and-ride" services. Local buses do not need expensive terminal facilities as do airlines, and local bus services are much less dependent on city-centre termini than are long distance services. Some maintenance facilities are needed, but this may be contracted out (especially in the case of minibus services), while hard-standing for storing vehicles overnight can be leased on a short-term basis. So too can office space for administrative staff.

Nevertheless, there are some sunk costs. New services will normally need to be advertised. The usual methods are by means of adverts in local newspapers and by printing timetables and handbills. In Preston the large-scale entrant, Zippy, also used a local radio campaign (1). Staff will usually need to be trained, and these training costs will usually not be recoverable if staff leave or if services are abandoned. Other administration costs incurred in planning and setting up services will also be sunk.

There are few, if any, secrets in bus technology. The competitive market for vehicles ensures that all operators

and potential operators have access to the same stock of technology. There were suggestions at the time of deregulation that the major PTE operators were refusing to sell redundant second-hand buses for fear that these vehicles would fall into the hands of competitors, but these actions were short-lived. (Preston, 1988, p.16) There have been a number of cases where operators claimed to be at a disadvantage because they were excluded from city-centre bus termini by existing operators, or were given unsatisfactory positions. For example, in Preston, which is a town where a high proportion of the city centre bus trips originate or terminate in the large bus station, the entrant Zippy was given stands at the far end of the station to the passenger entrance, so, that passengers were more likely to see and board competitors' services. Access problems to bus stations, have, however, been reduced as a result of an investigation and ruling by the Office of Fair Trading in February 1988. In response to a complaint by a small operator on the Isle of Wight that the large incumbent, Southern Vectis, had excluded it from Southern Vectis' bus station at Newport, the Office ruled that access should be permitted on payment of an appropriate charge.

It is the third assumption of the contestable markets theory, that existing firms are vulnerable to "hit-and-run" entry because they do not have time to respond to entry before it occurs, that is the most unrealistic one to apply to the deregulated local bus market in Britain. Under the 1985 Transport Act, entrants must give 42 days notice of entry by registering routes, timetables and stopping points of services with the relevant regional Traffic Commissioners (there is also a sunk cost, in the sense that 42 days notice of withdrawal of service is also needed, though it is not unknown for operators to simply abandon service before the 42 day period is up). No notification is required of fare levels, or of changes in fares by existing operators. Although there may be a few days delay before existing operators hear of the registrations, they have ample time to change fares in response to entry, and they can also plan service level changes to be implemented soon after the entrant starts operating (since such service changes also require 42 days notice) (2). A less scrupulous observer of the rules of the game can also reschedule services unofficially. The major example of an attempt to enter on a large scale with minimum notice to the existing firms was in Preston: Zippy set up their garage and trained all their staff in the six week period after registration of services - however the results were something of a disaster in terms of the resulting reliability and quality of the initial services.

Contestability theory also fails in terms of its predictive accuracy. If the local bus market is perfectly contestable, the theory predicts that the threat of competition will be sufficient to bring prices down to the level of costs. Although the Government expected that deregulation would reduce fares (Department of Transport, et.al.,1984, pp.2,25), this has not happened. Instead, the evidence suggests that fares have only fallen when actual competition occurred (Balcombe, et.al., 1988, p.11 ; White, 1988b, p.12).

The implied conclusion, that deregulated transport markets are not perfectly contestable, is supported by econometric studies of prices in the deregulated British long-distance bus market and in the deregulated US airline industry. Jaffer and Thompson (1986) modelled fares on 103 coach routes in Britain in 1984. Fares were found to be significantly related to cost factors and factors related to the elasticity of demand, but also to the Herfindahl measure of concentration on the route: the fewer the operators on the route, the higher were fares. Jaffer and Thompson explained this in terms of entry barriers in the form of control of city-centre bus stations, especially in London, the established reputation of the main incumbent National Express, and its declared policy of matching entrants' fares. They conclude that coach deregulation had led to efficiency gains, but that the full potential benefits had not been achieved because the market was not fully contestable. They stress the need for an effective competition policy.

Morrison and Winston (1987) consider fares and service levels in the deregulated American airline industry. They compute the optimal (i.e. economically-efficient) combination of fares and frequency levels on each of 769 routes in 1983 using a multinomial logit model of inter-city demand. They then estimate the welfare difference between the optimal and actual fare-frequency combinations for the average passenger on each route. If markets were perfectly contestable, these welfare differences would be zero as long as there was at least one potential competitor. In practice they are not, and Morrison and Winston seek to explain the sizes of the differences by using an econometric model in which the loss on each route is regressed on the number of actual and potential competitors on the route. In contrast to the implications of the theory of contestable markets, the numbers of actual and potential competitors do have a significant impact on the divergence between actual and optimal performance on a route. Morrison and Whinston conclude that the airline industry is "imperfectly contestable" rather than perfectly contestable.

III Predation

"Under present conditions, deregulation in itself may not be sufficient to allow small operators, however efficient, to compete successfully with established operators with greater resources" (Department of Transport, et. al., 1984 -- the Buses White Paper -- p.79).

If markets are not perfectly contestable, existing firms may be able to deter or delay entry by means of strategic entry deterrence in the form of predatory behaviour (3). Predatory behaviour involves the acceptance of less than short-run maximum profits in order to impose losses on entrants. The hope is that these losses (or the expectation of such losses) will persuade the potential rivals to exit the market or not to enter in the first place. Predatory behaviour might involve price cutting, or other action such as increased service frequencies, or schedule matching.

There are two major issues involved with predatory behaviour. The first is the question of whether such behaviour is rational. The second is that of whether, if rational, it can satisfactorily be detected (and the associated question, from the potential predator's point of view, of whether it can be engaged in without detection).

Strategic entry deterrence imposes costs on the incumbent firm because it involves the firm in taking action which it would not otherwise do: hence short run profits are not maximised. In a world of perfect information, the potential entrant will know this, and will also know that the incumbent firm knows that the entrant knows. In other words, once entry has occurred, both players know that the best response by the incumbent to entry is to accommodate the entrant, and not to engage in predatory behaviour. Hence, knowing this, the entrant will enter, and the incumbent will accommodate. This is the gist of the argument by McGee (1958, 1980) and other Chicago economists that predatory behaviour is irrational, and that there is consequently no need to legislate against it.

It might be noted that, for a strategy which is supposed to be irrational, predatory behaviour has generated an enormous amount of literature on how to detect it in practice! (4) Recent work has shown why predatory behaviour may , in practice, be rational. In a world of imperfect information, and particularly asymmetric information, incumbent firms may indeed have an incentive to prey. Work on imperfect information games has been pioneered by Milgrom and Roberts. In a recent survey of this work they note that the "existence of ... private information can obviously lead to interesting strategic play: bluffing, signaling, reputation building, etc" (Milgrom and Roberts, 1987, p.185).

Milgrom and Roberts (1982) developed a multi-market model in which an incumbent firm faces the prospect of sequential entry into his different markets. As long as there is some uncertainty on the part of the entrant about the incumbent's objective, and some non-zero possibility that the incumbent's actions can be inferred from previous actions, Milgrom and Roberts show that the incumbent has an incentive to prey in some markets, in order to build up a reputation for preying that will lead potential entrants in other markets to expect that entry will be met by a predatory response. Preying may be intended to convey false information about demand conditions in the industry (to suggest that demand is less buoyant than is actually the case in practice), about the incumbent's cost conditions (to imply that his costs are lower than the entrant's) , or about the motives of the incumbent (to imply that he is not a profit-maximiser).

The possibility of non-profit-maximising behaviour is particularly relevant in the bus industry. Before deregulation many operators, particularly those under local authority control, had public service objectives, such as the maximisation of passenger-miles (i.e. output) subject to a budget constraint. An output-maximiser is more likely to respond to entry with retaliation than is a profit-maximiser (Thompson, 1987, p.373). Although the 1985 Transport Act required that the local authority bus companies be reconstituted so as to have an arms-length relationship with their owners, they were still suspected of retaining their old objectives -- for example, with regard to the main companies on Merseyside, Donald (1987, p.10) notes that the "main aim appears to have been to maximise the amount of mileage operated close to the levels operated before deregulation, rather than to seek to maximise profits".

Another important rationalisation of predatory behaviour is the "long-purse" hypothesis modelled by Benoit (1984). If the incumbent has superior access to funds (perhaps because the incumbent is a larger firm with substantial reserves, or operates in other protected markets which generate profits, or has better access to lending), then the potential entrant knows that the incumbent can always outlast a price or service war for at least one period longer than the entrant. Knowing this, the incumbent has an incentive to meet entry with a predatory response, and entry will not occur. In the early days of deregulation there were suspicions that some of the former PTE bus operators had been provided with resources which would enable them to engage in such behaviour. As Gomez-Ibanez and Meyer (1987) comment "It is widely thought within the bus industry that many of the PTCs were treated quite generously and endowed with significant 'war chests' ..... Generous treatment may have indeed been advisable to ease the transition to a new competitive regime, but it may have also delayed the transition by allowing the PTCs to hold on to unprofitable routes or to aggressively discourage new entrants longer than

they could otherwise (p.31) ..... Even the perception, true or not, that the companies had substantial war chests may have discouraged entry and competition (p.34)".

Predation is often illegal, but there are two major difficulties in detecting predatory behaviour. First, predatory behaviour may involve price-cutting, but reductions in prices are also to be expected as a result of competition. In the absence of information on costs, it may be very difficult to distinguish predation from a genuine competitive response, and there is a danger that entrants may try to shelter behind predatory behaviour rules when they face such a competitive challenge. As a consequence, tests of predatory behaviour often rest on evidence of intent. The second problem is that if preying is illegal, firms will not leave evidence, nor engage in predatory behaviour if it is easy to detect. As Easley et. al. (1985) note: "Economists who opine that predation is rare have little evidence to go on. (If economists could definitely detect predation then; (1) it might not pay to prey if potential entrants could hire economists, and (2) predators could easily be brought to justice). Predators are unlikely to admit to predation lest they lose their bluff or get prosecuted. Only if it does not expect to be detected will a monopolist prey".

There are two broad types of approach to deal with predatory behaviour. One is to develop rules, or "bright-lines", which define illegal action. The best known of these is the Areeda-Turner rule of not pricing below "reasonably-anticipated"average variable cost (Areeda and Turner, 1975), but others have been proposed, including restrictions on increasing output after entry occurs (Williamson, 1977), and restrictions on increasing prices after exit has taken place (Baumol, 1979). One problem with "bright-lines" is that any individual rule will not cover all instances of predatory behaviour, so "bright-lines" may provide "the instruction manual on how to prey with impunity" (Easley, et. al., 1985, p.457).

The alternative approach, which is the one adopted in the UK, is to take each case on its merits. Predatory behaviour is governed by the 1980 Competition Act, which is policed by the Office of Fair Trading. The Act forbids "anti-competitive actions". According to the OFT "... if a competitor with market power adopts policies or practices which prevent, exclude or restrict competition from other firms, deter potential new entrants, or distort the process of competition in some other way, the adverse effects on these firms may be evidence of anti-competitive behaviour.....It is the effect on competition rather than the form of the practice that determines whether it is judged anti-competitive". (Office of Fair Trading, 1986a, p.9).

IV Empirical evidence on entry and post-entry behaviour

Evans (1988b) has carried out a detailed case study of the trial area deregulation in Hereford which started in October 1981, and where there was extensive route competition. Evans concludes that incumbents on sole-operator routes may engage in entry-deterring strategies. In Hereford, entry was first met by extensive price-cutting, and later by service increases. Evans estimates that both incumbent and entrants were making losses, and this is confirmed by other sources (Department of Transport, et. al.,1984, p.77). Most entrants were forced to withdraw. Predation here might best be explained in terms of the "long-purse" hypothesis, since the incumbent, Midland Red West, was a large regional National Bus Company subsidiary which could absorb losses longer than its small competitors. Evans (1988b, p.299) notes that the Company may also have been aiming at a general demonstration effect of the perils of competing with a large incumbent, on behalf of its fellow National Bus Company companies. Evans' view is that "we can expect large incumbents to defeat small challengers, unless they are simultaneously challenged on too many routes" (Evans, 1988b, p.300).

After full deregulation, competition was slow to start in many areas. This was not surprising in the first three months after October 26th 1986, because operators had had to register commercial services before the end of February, in an environment where it was very uncertain as to what commercial services other operators would register. Moreover, these newly registered services were to be operated until the end of the transitional period on January 27th 1987. It was not surprising that few were willing to commit themselves in this way when in twelve months time the situation would be much clearer, and the opportunites for reversing decisions much easier. The study by Balcombe et.al. (1988) which reviews the first year of deregulation notes that in this period between October and January there were only modest numbers of examples of competition by rival operators on common routes. Nevertheless, by the Summer of 1987 there were very many more examples. They note that major examples were the cases of minibuses operated by United Transport in Manchester (Beeline) and Preston (Zippy), and by Thames Transit in Oxford. Preston (1988, pp.12-13) reports a survey of all 159 free-standing urban areas with over 40,000 population. In 44 of these there was active on-the-road competition affecting at least two main routes in the two years following deregulation, and virtually every area had some form of minor competition.

Balcombe and his colleagues note that in many cases the response to entry was very aggressive, and their chosen wording appears to imply that the response was predatory:

"The reaction of the large operators to small independent operators is mixed. While there are cases where new operators

are not inhibited in any way by the larger operator, the more usual reaction is for the larger operator to compete very hard with the newcomer, deploying rather more resources than the situation would appear to warrant. Current evidence would suggest that many new operators are sustaining this competition, but that some have succumbed to it.

There has been speculation about how operators are managing to pay for the losses which they seem to be incurring as a result of intense competition, in spite of measures designed to make more productive use of labour. The choice must be between cross-subsidy from other routes (or operators?) and use of reserves. " (Balcombe,et.al.,1988, p.19, our italics).

Suggestions of predatory behaviour also come from the Office of Fair Trading. By October 1987 the Office had received some seventy complaints about behaviour of incumbents in the bus industry since deregulation. About a half of these complaints concerned alleged instances of predatory pricing. The Office had also conducted a formal enquiry into the complaint against Southern Vectis' block on a competitor's use of its bus station (see above, page 4). In June 1988 they instituted formal investigations into two further alleged instances of predatory behaviour by established operators against small entrants. Results were expected to be published in March 1989.Even before deregulation the Office had clearly signalled its view of predatory price cutting. The Office had informally considered two cases of free or low fares offered by incumbents, one a commuter coach operator in the London area (Office of Fair Trading, 1986b,p.64) and the other a local operator in East Anglia (Office of Fair Trading, 1987, p.76). They also took the opportunity to state their view on the anti-competitive nature of price-cutting in the bus industry:

"Whether a company's conduct appears predatory depends on its effect, that is whether it is intended or seems likely to eliminate competition. It is not possible to lay down in advance how large a reduction in price in response to competition, or what price relative to the price of the company under attack, is predatory. Each case has to be considered in rlation to its particular circumstances.....the Director-General is guided by the basic objective of promoting competition in the deregulated bus market. In many cases...new competition is likely to be provided by new entrants. Often these will be smaller entrants than the companies who provided the service under the previous regulated system. Effective competition in the long term may depend on the success of new entrants. While a desirable consequence of additional competition should be more vigorous competition on fares, new entrants can be vulnerable to predatory behaviour by the established bus companies who may be able to tolerate short-term losses because of the scale or scope of their operations. Such a response by established companies on services previously regulated would be incompatible with the continuation and

promotion of effective competition". (Office of Fair Trading, 1987, p.76).

In the event, the most common response to entry in the post-deregulation period has been for the incumbent to increase frequencies on his own services, thus spreading demand unprofitably thinly. Sometimes this has been accompanied with competitive timings, running just before the entrants' buses (5). It may be that the OFT's specific ruling about fare-cutting scared operators off this tactic, or that the widely-reported fare wars in Hereford had a demonstration effect in persuading operators that this practice might prove to be too mutually-costly. It may also be that, because fare cuts can so easily be reversed, service changes are seen as a more credible threat.

The best example of a response in terms of frequency increase was that of the large incumbent in Greater Manchester, GM Buses, to entry by the only large scale entrant so far from outside the industry, United Transport Buses. United Transport Buses was a subsidiary of United Transport International, which in turn was a subsidiary of the British-based multi-national BET. BET had originally operated bus services in Britain, but sold out to the Government in 1969. United Transport International operated bus services in a number of countries outside the UK. BET's total turnover in 1986 was £1.3 billion, and its operating profits £150 million.

In January 1987, following an abortive attempt to form a joint company with Greater Manchester, UTB's subsidiary, Manchester Minibuses (trading as the Bee Line Buzz Company) started operating in South Manchester with a fleet of minibuses which soon totalled 225 vehicles. The incumbent's response was to match the entrant's services with its own fleet of minibuses (marketed as Little Gem) with matching fare levels. When Bee Line changed their routes, Little Gem soon followed. There followed a game of bluff, in which each side claimed that they were making money, and in which the major uncertainties were the total finance UTI were prepared to commit to the operation, and the length of time GM buses could afford to continue their blocking strategy. In August 1988, UTI abandoned the exercise, and sold out to Ribble.

UTB had planned similar operations in other towns. Their next choices after Manchester were Leeds and Bradford. Fearing this the main incumbent operator Yorkshire Rider, the ex-PTE company, responded by purchasing its own fleet of minibuses (Headicar, et.al., 1987). These could form a "fighting fleet", available immediately to meet any competitive challenge . In consequence, UTB turned next to Preston, starting operations with a planned fleet of 75 minibuses in April 1987 under the Zippy brand name. The main incumbent, Preston Borough Transport, also responded by purchasing and deploying minibuses, though route-matching was less thorough than in

Manchester. Zippy also challenged Ribble, the other main operator in the Preston area, and met a similar response. The incumbents in Preston had the advantage over GM Buses in Manchester, in that the UTB challenge in Preston was much more poorly-organised than that in Manchester, and suffered serious managerial and organisational problems. Preston and Mackie (1988) estimated that both Zippy and Preston Borough Transport were unprofitable, and Zippy sold out to Ribble in March 1988: Preston and Mackie (1988, p.7) note that Zippy was "not so much bought out as given away".

While predatory practices are notoriously difficult to prove (especially where, as in Britain, the OFT do not have powers of search, unlike their European counterparts), we conclude that it is likely that predation has had some impact on the UK bus market, and that effective competition laws are essential in deregulated bus markets. It is interesting to note that in his survey of "surprises" of US airline deregulation, Kahn (1988) notes the trend to re-concentration in the industry, and comments:

"the concentration process reflected also what many advocates of deregulation would characterize as a lamentable failure of the administration to enforce the policies of the antitrust laws -- to disallow a single merger or to press for divestiture of the computerized reservation systems or attack a single case of predation. None of these cases would have been easy.....the feasibility of identifying and moving against instances of predation are extremely uncertain. At the same time, I take perverse satisfaction in having predicted the demise of price-cutting competitors like World and Capitol Airways if we did nothing to limit the predictable geographically discriminatory response of the incumbent carriers to their entry, and having rejected the conventional wisdom that predation would not pay because any attempt to raise fares after the departure of the price-cutting newcomers would elicit instantaneous competitive reentry (Kahn, 1988, pp.318-319, our italics).

Concern about the possible predatory action in European airlines is reflected in the commissioning of a study on the identification of predatory behaviour in the airline industry by the European Commission.

V Competition

"Operators of any size out to make a profit will not hazard the goodwill of travellers by unreliability or by frequent changes in timings, routes, or fares" (Department of Transport, et.al.,1984 -- the Buses White Paper -- p.51).

Of course, entry is by no means always deterred. The question then is what form competition takes when it does occur. Analysis has considered two alternative models of competition in differentiated product markets. The first is based on horizontal product differentiation, and the second on vertical product differentiation. Horizontal differentiation occurs when consumers differ as to their evaluation of services when services charge the same fares. Vertical product differentiation occurs where all consumers agree as to which is the best service, which the second best, etc, when all services are provided at the same fare.

Models of horizontal differentiation are based on Hotelling's spatial location model. Travellers can be viewed as having different preferences as to the optimal time to travel, and as having re-scheduling costs if there is no bus service available at this preferred time. Each traveller then chooses the service which minimises fare plus re-scheduling costs. Operators have to choose both fare and service timing. Equilibrium in such models is possible if it is assumed that each firm will only react to a rival's fare or timing change if this change means that the change attracts all his customers (6). The resulting equilibrium will involve firms charging the same prices, with equal intervals between services if consumers are uniformly spaced with regard to desired time of travel (7).

This model has been used by Evans (1987). Evans shows that with competition, the levels of both fares and frequency will be higher than socially optimal. The model does not determine the number of operators, only the number of services. In his later work, Evans (1988a, pp.8-9) suggests that a single incumbent operator might fix frequency at the competitive level, but with fares which earn super-normal profits. Entry will be deterred because potential entrants know that fares can be immediately lowered to the competitive level should entry be threatened.

A model of vertical product differentiation developed by Shaked and Sutton (1982), when applied to the bus industry, implies that competition will lead to, at most, two firms offering different combinations of fare and service quality (Dodgson and Katsoulacos, 1988a, 1988b). The model assumes that consumers differ in income, with higher income consumers choosing the better quality service at higher fares, and lower income consumers choosing the poorer quality service at lower fares,

or choosing not to travel at all. The model was developed in response to simulation work by Glaister (1985, 1986). Glaister showed that in some circumstances big, conventional-sized, buses might co-exist with higher quality, premium-fare, minibuses. In turn this work seems to have been stimulated by the experience of a number of developing country cities in which conventional buses and privately-owned minibuses compete on fare and service quality (3).

In our work we sought to find out whether such an outcome was possible as the result of a competitive market process which could lead to a sustainable equilibrium (in the sense that firms were financially-viable but did not attract further entry). The model suggests that it is, but at the cost of a somewhat unrealistic argument in terms of the urban bus market. This assumption is that travellers are committed in advance to the service they will use. In practice, it has been argued (Preston, 1988, p.24), travellers will board the first bus to arrive at a stop, even if it provides a poorer quality of service than another whose arrival (and hence total journey time) is uncertain. Alternatively, as we note at the end of our 1988 paper (Dodgson and Katsoulacos, 1988b, p.280), the appropriate market may be the overall urban public transport market, in which two road services already exist, namely bus services, and higher quality, higher fare, taxi services. If this is the case, our model then predicts that there will be no room for a further fare/quality combination in the market, as long as the range of income distribution is limited in the way specified by the model.

In the event, route competition in Britain since deregulation has not involved different fare/quality competition. Instead, operators have competed on service levels in terms of frequency but with matching fares, or have (in many fewer instances) competed on fares but with similar qualities of service.

First impressions after deregulation may have suggested that the prevailing form of route competition would be where different operators operated a route with equal-spaced frequencies, and the same fares. However, these examples generally reflected instead collusion by operators acting as monopolies. Before deregulation it had been quite common for operators to provide joint services, with revenue-sharing. Under the 1985 Transport Act, operators were for the first time required to register all such agreements with the Office of Fair Trading. In the first two years 239 agreements were submitted to the Office.

In November 1988, much to the industry's apparent surprise, the Director-General announced that 142 were judged to be registrable, that is they contained clauses restricting the parties' freedom to make decisions. Of these, 115 (involving 66 different operators) were said to be anti-competitive, in the sense that they fixed fares and shared out the market by

agreeing timetables. The Director-General alleged that the overall effect of such agreements was to undermine the drive for more competition in the bus industry.

Under the 1976 Restrictive Practices Act, the Director-General is required to refer all registered agreements to the Restrictive Practices Court for ruling as to whether they are against the public interest. However, it is normal practice to first give the parties to such agreements the opportunity to end the agreement. Alternatively, the parties can choose to defend the agreements before the Court, on the grounds that the agreement satisfies one of the "gateways" set out in the 1976 Act. The Director-General wrote to all the 66 companies in November 1988, telling them that the agreements would be referred to the Court unless they were abandoned. By the end of January 1989, discussions between the industry and the OFT were still continuing, and a decision had not been made as to whether the agreements would go before the Court. If they do and the Court rules against them, then operators might be fearful of getting into an equilibrium position of the type predicted by Evans' horizontal differentiation model, for fear that they might be suspected of implicit collusion even when this is not actually the case!

In conclusion, it can be said that competition in the provision of local bus services in Britain has not taken the form of the type of quality competition suggested in Glaister's simulation exercises and in our model of vertical differentiation. Observed multi-operation of the type implied by models of horizontal differentiation might instead be due to collusion between operators, or to predatory and unstable service wars of the type experienced in Hereford, Manchester, or Preston.

Nevertheless, with an effective competition policy which outlaws predatory practices, we believe that it is possible to have an equilibrium involving more than one operator on a route. For example, a new operator, Fareways entered the market in the Liverpool area in early 1987. Fareways operated similar conventional vehicles to the incumbent and charged lower fares. The routes operated are not exactly the same as those of the incumbent, though buses of both companies operate along most sections of the routes. Apart from some relatively minor route rescheduling, the incumbent did not respond (although fares were eventually matched on some of the routes about eighteen months after entry). Two years after entry, the entrant operates five commercial routes with a fleet of seventy buses. It appears to be a permanent feature of the bus scene in the area, though it has by no means displaced the incumbent from the area now served by both operators.

Finally, it should be noted that the expectations of general stability implied in the quotation from the White Paper at the head of this section of the paper have not materialised. Deregulated bus services have been subject to frequent change.

In a market where much consumer information comes from experience and word of mouth, this has led to consumer dissatisfaction and consequent loss of traffic. In this sense deregulated bus markets have been subject to the "turmoil" identified by Kahn (1988) as an unexpected effect of US airline deregulation.

VI Conclusions

In conclusion, we believe that the local bus market is not perfectly contestable as implied by the 1984 White Paper and the quotation from it at the head of Section II of this paper. Consequently, incumbent firms may be able to deter or delay entry by threatening or engaging in predatory action. One difficulty is in proving that such action has occurred and that observed responses are not merely the legitimate competitive responses which are required if competition is to work to reduce prices. This is an area which we are currently investigating (9). A further problem is the impact on welfare if potential competition forces an output-maximising incumbent to change its objective: one of us (Katsoulacos, 1989) shows that if this occurs then social surplus can fall if deregulation does lead to an increase in effective competition.

It should however be stressed that there is no doubt that deregulation has led to the reductions in cost predicted by the supporters of deregulation. These have been noted in a number of the studies monitoring the impact of deregulation (see, for example, Evans, 1988b, p.10; Tyson, 1988, pp.10-11). One of the surprises of UK bus deregulation to most of its opponents was the extent to which operators registered commercial services after years of network subsidies, so that the gaps to be filled by individually subsidised services were much less than expected. While some commercial registrations may have had a strategic purpose, there seems little doubt that the major factor contributing to the fact that nationally some 85 per cent of former vehicle mileage was registered commercially (Balcombe, et.al.,1988, p.1) was the success the industry was having in reducing costs in the face of threatened competition.

Hence, with regard to costs, the UK bus industry experience thus far parallels that of US airlines. The danger is that there may now be a trend, already beginning to be evident, towards re-concentration of the bus industry. Given that the market is not perfectly contestable, this could lead to a gradual erosion of the benefits. In this respect, a further paralleling of the US airline experience seems undesirable.

Footnotes

(1) See Preston and Mackie's (1988) analysis of competition in the City of Preston for one of the best case studies of competiton since deregulation.

(2) Rescheduling within five minutes of existing registrations does not have to be registered, but it is not unknown for buses to run late or early.

(3) Baumol (1982, p.5) notes that, in a perfectly contestable market, no cross-subsidy is available to fund predatory pricing as a weapon of unfair competition.

(4) See, for example, Areeda and Turner (1975), Baumol (1979), and Williamson (1977).

(5) See Lewis and Flowerdew (1988, p.5-10) and Mason (1988, p.9) for details of examples in Nottingham and Merseyside.

(6) This result is due to Novshek (1980), and the reaction rule is known as the modified zero conjectural variation rule.

(7) This result is applicable to the case of the infinitely long day, but the result for a finite day is similar except for the cases of the first and last buses of the day (see Dodgson and Katsoulacos, 1988a, p.60).

(8) For a review of the experience of this type and the lessons drawn, in particular by the World Bank, see Rimmer (1988).

(9) See Dodgson and Katsoulacos (1989).

REFERENCES

Areeda, P., and Turner, D.F. (1975) 'Predatory pricing and related practices under Section 2 of the Sherman Act' Harvard Law Review, 88, 697-733.

Balcombe, R.J., Hopkin, J., and Perrett, K.E. (1988) Bus Deregulation in Great Britain: a Review of the First Year. Research Report 161, Transport and Road Research Laboratory, Crowthorne.

Baumol, W.J. (1979) 'Quasi-permanence of price reductions: a policy for prevention of predatory pricing' Yale Law Journal, 89, 1-26.

Baumol, W.J. (1982), 'Contestable markets: an uprising in the theory of industry structure', American Economic Review, 72, 1-15.

Benoit, J.P. (1984), 'Financially constrained entry in a game with incomplete information' Rand Journal of Economics, 15, 490-499.

Department of Transport, Scottish Office, and Welsh Office (1984), Buses, Cmnd 9300, HMSO, London.

Dodgson, J.S., and Katsoulacos, Y. (1988a) 'Models of competition and the effect of bus service deregulation' in Dodgson, J.S., and Topham, N. Bus Deregulation and Privatisation: an International Perspective, Avebury, Aldershot, 45-68.

Dodgson, J.S., and Katsoulacos, Y. (1988b) 'Quality competition in bus services: some welfare implications of bus deregulation' Journal of Transport Economics and Policy, 22, 263-282.

Dodgson, J.S., and Katsoulacos, Y. (1989) 'Deregulation and predatory behaviour: the case of local bus services. Paper to be presented to the Fifth World Conference on Transportation Research, Yokohama, Japan, July 1989.

Donald, R.G. (1987), 'Experience of bus deregulation on Merseyside', PTRC Summer Annual Meeting, 1987, Seminar B: Public Transport Planning and Operations, 17-36.

Easley, D., Masson, R.T., and Reynolds, R.J. (1985), 'Preying for time', Journal of Industrial Economics, 33, 445-460.

Evans, A. (1987), 'A theoretical comparison of competition and other economic regimes for bus services', Journal of Transport Economics and Policy, 21, 7-36.

Evans, A. (1988b) 'Hereford: a case study of bus deregulation' Journal of Transport Economics and policy, 22, 283-306.

Friedman, M. (1935) 'The methodology of positive economics' in Essays in Positive Economics, University of Chicago Press, Chicago.

Glaister, S. (1985), 'Competition on an urban bus route', Journal of Transport Economics and Policy, 19, 65-81.

Glaister, S. (1986), 'Bus deregulation, competition and vehicle size', Journal of Transport Economics and Policy, 20, 217-244.

Gomez-Ibanez, J.A., and Meyer, J.R. (1987) Deregulating Urban Bus Service: Britain's Experience and the Lessons for the United States, Urban Mass Transportation Administration, U.S. Department of Transportaton.

Headicar, P.G., Fisher, R.M., and Larner, T.C. (1987) 'The initial effects of bus deregulation in West Yorkshire' PTRC Summer Annual Meeting 1987, Seminar B: Public Transport Planning and Operations.

Jaffer, S.M., and Thompson, D.J. (1986), 'Deregulated express coaches: a reassessment', Fiscal Studies, 7, 45-68.

Kahn, A.E. (1988) 'Surprises of airline deregulation' American Economic Review: Papers and Proceedings, 78, 316-322.

Katsoulacos (1989), 'Firms' objectives and the benefits of deregulation and competition', Liverpool Studies in Bus Deregulation, Working Paper 5, University of Liverpool.

Lewis, K.J., and Flowerdew, D. (1988), Deregulation of Buses in South Nottinghamshire, Transport and Road Research Laboratory, Contractor Report 78, Crowthorne.

Mason, S.J. (1988) 'Bus services on Merseyside in the first two years', Liverpool Studies in Bus Deregulation, Working Paper 4, University of Liverpool.

McGee, J. (1958), 'Predatory price cutting: the Standard Oil (NJ) case', Journal of Law and Economics, 1, 137-169.

McGee, J. (1980), 'Predatory pricing revisited', Journal of Law and Economics, 23, 289-330.

Milgrom, P., and Roberts, J. (1982), 'Predation, reputation and entry deterrence', Journal of Economic Theory, 27, 280-312.

Milgrom, P., and Roberts J. (1987) 'Informational asymmetries, strategic behaviour and industrial organization', American Economic Review: Papers and Proceedings, 77, 184-193.

Morrison, S.A., and Winston, C. (1987), 'Empirical implications and tests of the contestability hypothesis', Journal of Law and Economics, 30, 53-66.

Novshek, W. (1980), 'Equilibrium in simple spatial (or differentiated product) models,' Journal of Economic Theory, 8, 378-393.

Office of Fair Trading (1986a) Anti-Competitive Practices: a Guide to the Provisions of the Competition Act 1980, OFT, London.

Office of Fair Trading (1986b), Annual Report of the Director General of Fair Trading for January to December 1985, HMSO, London.

Office of Fair Trading (1987), Annual Report of the Director General of Fair Trading for January to December 1986, HMSO, London.

Preston, J. (1988) Regulation Competition and Market Structure: a Literature Review of the Stage Bus Industry, Institute for Transport Studies, University of Leeds, Working Paper 267 (updated October).

Preston, J., and Mackie, P.J. (1988) 'Competition in the urban bus market: a case study' PTRC Summer Annual Meeting 1988.

Rimmer, P.J. (1988) 'Buses in Southeast Asian cities: privatisation without deregulation' in Dodgson J.S., and Topham, N. (eds.) Bus Deregulation and Privatisation: an International Perspective, Avebury, Aldershot, 185-208.

Schwartz, M. (1986) 'The nature and scope of contestability theory', Oxford Economic Papers, 38, 37-57.

Shaked, A., and Sutton, J. (1982), 'Relaxing price competition through product differentiation', Review of Economic Studies, 49, 3-13.

Thompson, D.J. (1987), 'Privatisation in the U.K.: deregulation and the advantage of incumbency', European Economic Review, 31, 375-381.

Tyson, W.J. (1988) A Review of the First Year of Bus Deregulation, Association of Metropolitan Authorities, London.

Vickers, J. (1985) 'The economics of predatory practices' Fiscal Studies, 6, 24-36.

White, P.R. (1988a) 'British experience with deregulation of local bus services' in Dodgson, J.S., and Topham, N. Bus Deregulation and Privatisation: an International Perspective, Avebury, Aldershot, 13-43.

White, P.R. (1988b) 'Deregulation of bus and coach services in Britain from 1980' Paper for OECD Conference, Road Transport Deregulation: Experience, Evaluation, Research, Paris 2-4 November 1988.

Williamson, O.F. (1977) 'Predatory pricing: a strategic and welfare analysis', Yale Law Journal, 87, 284-340.