

MONOPOLY EXCLUSION OF LOWER COST ENTRY

Loyalty Contracts in Ocean Shipping Conferences

By William Sjostrom*

Ocean shipping conferences have used deferred rebates since 1877; more recently, they have also used dual rate contracts. Some economists (Lewis, 1949; Marx, 1953; McGee, 1960; Letwin, 1965, Bennathan and Walters, 1969) have argued that these contracts are used by monopoly shipping conferences to exclude entry by lower-cost entrants, and thus to maintain their monopoly. Bork (1978) challenges this view. He argues that, if an entrant has higher costs, the conference can exclude the entrant by cutting price without any exclusionary contracts. If the entrant has lower costs, the conference cannot exclude the entrant, because shippers will buy from the entrant rather than accept an exclusionary contract. By laying out a model in which these contracts can exclude entry, I wish to show the particular circumstances in which this can happen.

Lewis (1949) coined the term "loyalty contracts" for these two contracts. The common characteristic of loyalty contracts is that the conference offers a shipper a discount off the regular price if the shipper agrees to purchase exclusively from the conference. The point is to retain the loyalty of its customers by making it expensive to switch from conference vessels to non-conference vessels.

With a deferred rebate, if the shipper purchases exclusively from the conference in the first six months, he earns the discount, but does not actually receive it. The shipper receives the discount in the form of a rebate at the end of the second six months, but only if he continues to purchase exclusively from the conference during the second six months. If at any time the shipper purchases from another conference, he loses both the rebate he was building during that six months and the rebate from the previous six months.

A shipper who signs a dual rate contract agrees to purchase exclusively from the conference, and gets the discount at the time of purchase. If he then purchases from a non-conference carrier, he must pay damages to the conference.

Dual rate contracts are used largely in the US trades, where deferred rebates are illegal. Some non-US conferences, however, give shippers a choice, but give them a larger discount with the deferred rebate. Much has been made of the differences between the exclusionary effects of the two contracts. McGee (1960) has pointed out, however, that they are identical in the absence of enforcement costs.

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Bork's challenge to the exclusion argument is simple. He argues that the relevant price to a shipper is net of the discount. If the entrant's costs are above this price, the entrant will be excluded. If the entrant's costs are below this price, the entrant can undercut the conference. No shipper would ever agree to an exclusionary contract when he had the option of purchasing from the lower-cost entrant. Bork implicitly assumes that the entrant can provide all the capacity the shipper demands. Given this assumption, his argument seems to me to be wholly persuasive.

An important form of entry in the ocean shipping industry is empty space in tramp ships. I argue that tramp ships are constrained in the frequency of service they can offer to small shippers (that is, those whose shipments are too small for an entire vessel), whereas liner conferences are not so constrained. This is because tramp services to small shippers are in the form of space left over after they have picked up a large shipment. I develop a model in which a monopolist that is not constrained in the amount of frequency it can offer (specifically, one whose increases in frequency are provided at constant marginal cost) can exclude an entrant whose costs of providing additional frequency are rising (specifically, one whose marginal cost curve is constant up to some limit, after which it becomes vertical).

In the next section I will show that the demand for frequency of service is downward sloping, and therefore can be treated like any other demand curve. Then I use that result to show that a conference can use loyalty contracts to exclude entrants that are capacity constrained. Finally I offer some concluding comments.

DEMAND FOR FREQUENCY OF SERVICE

First I show that the demand for frequency of service is downward sloping. Consider a shipper who wants a package shipped at some random time. A vessel arrives to pick up the package every T periods, so the shipper must wait for anything from 0 to T periods before he can ship the package. If the shipper waits t periods, he incurs storage costs of

$$(s/r)[1 - \exp(-rt)] + [V - V\exp(-rt)] \quad (1)$$

where s is the physical storage cost per period, V is the value of the package to be shipped, and r is the interest rate. The first term in (1) is the present value of the physical storage costs incurred while waiting. The second term is the loss in value of the package because it is shipped at t rather than immediately.

The storage cost formula in (1) is a function of the random variable t , which is distributed uniformly because the time when a particular shipper wants to ship is presumably independent of the arrival of vessels. The expected value of (1) is

$$(V + s/r) \{1 + [\exp(-rT) - 1]/rT\} \quad (2)$$

The frequency of arrival is $F = 1/T$. For example, if time is measured in weeks $T = 4$ means a ship arrives every four weeks; that means frequency is $1/4$, which can be thought of as $1/4$ of a vessel arriving every week. Substituting $T = 1/F$

into (1), we get

$$(V + s/r) \{1 + [\exp(-r/F) - 1] F/r\} \quad (3)$$

These costs can be reduced by purchasing greater frequency at a price of P . This means that the price of shipping the package includes a charge for frequency PF . The shipper selects a value of F that minimises the sum of expected storage costs (equation 3) and the frequency charge, PF ,

$$\min_F (V + s/r) \{1 + [\exp(-r/F) - 1] F/r\} + PF \quad (4)$$

The first order condition is

$$(V + s/r)(1/r)[(1 + r/F)\exp(-r/F) - 1] + P = 0 \quad (5)$$

The second order condition for a minimum is

$$D = (V + s/r)\exp(-r/F)r/F^3 > 0 \quad (6)$$

The next step is to derive the comparative statics results. In equation (5), F is an implicit function of P . If the second order condition is satisfied, then, by the implicit function theorem, F can be solved for as an explicit function of P , $F = g(P)$. If we substitute $g(P)$ into the first order condition, we have an identity we can differentiate with respect to P (Silberberg, 1978). Solving for dF/dP , we get

$$dF/dP = -1/D < 0 \quad (7)$$

The downward sloping demand for frequency implies that shippers will pay more for greater frequency, but that the extra amount they will pay for increased frequency falls as frequency increases.

EXCLUSION OF ENTRANTS

In this section I analyse the problem of a monopoly conference which can provide frequency to a shipper at a cost of c , faced with an entrant which can provide additional frequency at a cost of c' , but only up to F_1 , at which point marginal cost becomes infinite. It is important that F_1 be smaller than the frequency a shipper would demand at the price for frequency charged by the conference; otherwise, the entrant would not be effectively constrained in its capacity. For the present I will assume that $c' > c$, though that assumption will be relaxed. I assume that shippers are identical, so that we can examine a representative shipper.

In Figure 1 the demand curve is AD, the conference's marginal cost is c and the entrant's marginal cost is c' up to F_1 and vertical thereafter. With the entrant in the market, the conference acts as a dominant firm; it faces the residual demand curve EGBD, sets a price for frequency of P_0 , and sells $F_2 = F_3 - F_1$.

I will show that, under these conditions, both the shipper and the conference can gain from a contract under which the shipper agrees to purchase exclusively from the conference in exchange for a price below P_0 . The conference could in principle offer to sell the shipper an additional amount of frequency equal to F_1 at a marginal price lower than P_0 (call it P_1), while still charging P_0 for the initial

F_2 units of frequency. In exchange for this two-part tariff, the shipper would agree not to purchase from the entrant. Because the shipper would get the same amount of frequency at a lower total cost, he would accept such an arrangement. The entrant would have an incentive to lower its price to below P_1 , which in turn would induce the shipper to reject the conference's offer. The highest P_1 the entrant would not undercut is c' , its marginal cost. Therefore, if the conference set P_1 equal to c' , the shipper would be indifferent between dealing and not dealing with the entrant. If the shipper did not deal with the entrant, the conference's profits would rise, because, by assumption, $c < c'$.

Suppose now that the conference cannot engage in such two-part pricing. The shipper would be indifferent between paying P_0 for F_2 and P_1 for F_1 , and paying P_2 for F_3 , where P_2 is the weighted average of P_0 and P_1 : that is,

$$P_2 = (P_0 F_2 + c' F_1) / F_3, \quad (8)$$

recalling that $F_3 = F_1 + F_2$ and that $P_1 = c'$. Therefore, the shipper would also be indifferent to a contract giving him the right to purchase F_3 at P_2 in exchange for his agreeing not to purchase from the entrant. This contract would raise the conference's profits by $(c' - c)F_1$ over what they would be without the contract. The shipper can be induced to prefer the contract if the price is set slightly below P_2 to give the shipper part of the gain from the contract. Therefore, the conference can profitably exclude a capacity constrained entrant with higher costs.

The conference does not, however, need to lower the price below P_2 to induce the shipper to accept the contract. Because P_2 is necessarily lower than P_0 , frequency demanded at P_2 will be greater than F_3 . At P_2 , the shipper wants to buy F_4 rather than F_3 . If $c < c'$, it is unambiguously profitable for the conference to expand frequency from F_3 to F_4 (where F_4 in Figure 1 is the quantity demanded at P_2). To see this, subtract c from both sides of (8) to get

$$P_2 - c = (P_0 - c)(F_2/F_3) + (c' - c)(F_1/F_3) \quad (9)$$

because $P_0 > c$ and $c' > c$, $P_2 > c$. This means that, if the entrant has higher costs, it is profitable to expand frequency. The conference's profits increase by $(P_2 - c)(F_4 - F_3)$, which is the area HJKL in Figure 1. Moreover, the shipper now strictly prefers the contract, because he gains additional surplus from it (the area HLM in Figure 1). Therefore, the shipper accepts the contract, the conference's profits increase, and the entrant is excluded.

The conference may be able to exclude the entrant profitably even if the entrant's costs are lower than the conference's costs ($c' \leq c$). So long as $P_2 > c$, the exclusive contract makes both the conference and the shipper better off. If $c' = c$, the second term in (9) is zero, but the first term is positive, so $P_2 > c$. Clearly there is some range in which c' can fall below c that makes the second term negative but not sufficiently negative to offset the positive first term, so that P_2 is still greater than c .

One point that should be noted is that, if $c' < c$, though the conference may be able to exclude the entrant, it will be more profitable to purchase the services of the entrant. This may explain why, in most loyalty contracts in ocean shipping, shippers are allowed to use the services of non-conference vessels without violating the loyalty contract if the conference cannot provide a vessel in some specified amount of time.

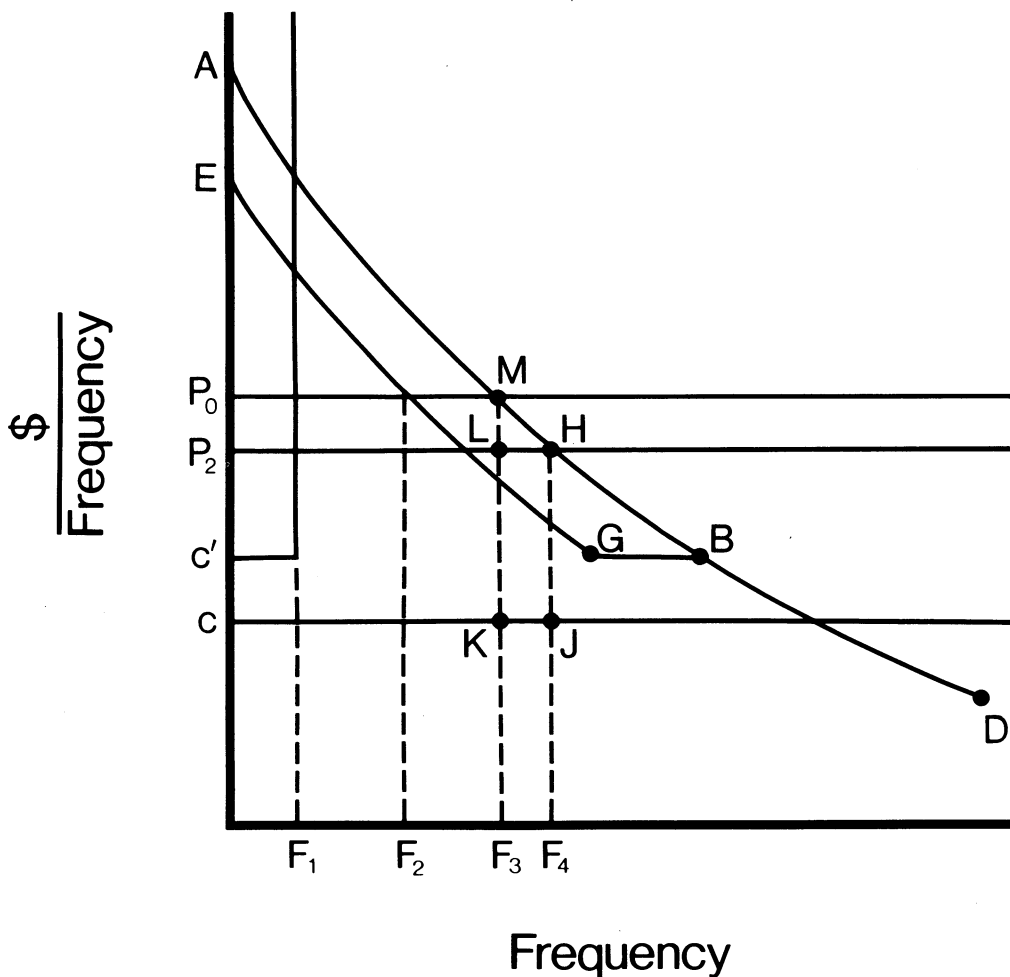


FIGURE 1

CONCLUSION

I have shown that loyalty contracts can be used to exclude even lower-cost entrants if the entrant is constrained in the amount of frequency it can offer, as is the case with tramp shipping. This implies that loyalty contracts can exclude tramp shipping, but cannot exclude liner entrants sufficiently large to offer higher frequency. Bork's conclusion that loyalty contracts cannot exclude entry is wrong. However, it is important to see that his main point is still correct. The loyalty contract is not what allows the conference to maintain monopoly. The

conference's monopoly stems from its ability to expand capacity more cheaply than the entrant. Without that ability, the conference could not exclude. It is also important to see that it is not really the conference that excludes the entrant; the shippers exclude the entrant, because, under the given cost conditions, they are better off if they make a loyalty contract than they would be if they dealt with the entrant.

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