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FIRMS' STRATEGIES FOR REDUCING THE EFFECTIVENESS OF CONSUMER PRICE SEARCH

Norman J Ireland

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Firms' Strategies for Reducing the Effectiveness of Consumer Price Search

By

Norman J Ireland

Abstract

This paper considers a simple model of competition based on some buyers making price comparisons between two suppliers. The difficulties of making appropriate comparisons are made greater by exclusive dealer agreements and restrictions, and by suppliers trading under more than one name. It is argued that suppliers will set prices using mixed strategies, and that prices become less competitive as price comparisons become more difficult. The implications for competition policy are considered in the light of recent judgements of the UK's Office of Fair Trading and the European Court of Justice.

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Department of Economics
University of Warwick
Coventry CV4 7AL
UK
N.J.Ireland@warwick.ac.uk

1. Introduction

There are many strategies that firms can adopt to increase their profits.[1] Two such strategies are to trade under different names and /or to enter into vertical agreements of the exclusive-dealer kind. This paper argues that one way of assessing policies such as these is to consider the extent to which they help firms prevent their customers from making price comparisons and hence making the market competitive. To make this argument we have to construct a very simple model of consumer search and identify equilibrium price distributions set by suppliers. As a secondary task we also have to gage the motivation for consumers to search, and whether these policies represent strategic actions of firms to support monopoly profits.

How far competition succeeds in driving prices down towards costs clearly depends on how far consumers are willing to search out and compare prices. At its simplest, if all prices are expected to be the same and consumers see no gain in searching around, then no search will result and hence no competitive pressure on prices will take place. In particular, if you believe that your own action is too insignificant to affect the price distribution, then you will only search if it is in your own private interest: that is, yield an expected gain from a lower price. No such interest exists if prices are the same. An equilibrium in search behaviour exists with no search if all prices are the same, whether the common price is a monopoly price or a competitive price. Only if there is a non-degenerate distribution of prices will individuals be motivated to search out and compare prices: a situation where all suppliers charge the

[1] Other processes such as adopting non-linear pricing, product bundling, or more general product design to differentiate from competitors are too well known to warrant additional treatment here. Our emphasis here is on strategies which lead consumers to believe that price comparisons have taken place when these are in fact illusory.

monopoly price implies no private advantage from an individual's search, hence no search, and hence no competitive force for price reductions.

A number of classic papers have emphasised search costs and the breakdown of the "law of one price", including Pratt, Wise and Zeckhauser (1979), Salop and Stiglitz (1977) and Wilde and Schwartz (1979). Pratt, Wise and Zeckhauser (1979) include convincing data to the effect that there exist wide disparities in prices quoted for virtually identical products by retail suppliers. A common feature of models used in both that paper and Salop and Stiglitz (1977) (and many others [2]) is that there are different types of buyers, some with higher search costs than others. Then sellers can specialize in selling to informed buyers or uninformed buyers, with a "volume against margin" trade-off. Varian's (1980) model of sales has a similar trade-off, but different cost structure for the firms. In this model, the firm with the lowest price sells to all the informed buyers, and an equilibrium is found with firms randomising their price choice each period. Thus the temporal variations in price prevent uninformed buyers from learning which firm or store generally gives the best deal.

Our model here is most closely related to that of Wilde and Schwartz (1979). In that paper, the consumer has decided how many points of sale to visit and hence how many prices to observe. Some consumers only visit one store; others visit more than one. Thus the "informed" buyers are replaced by a class of buyers who search out prices to compare. The resulting mixed strategy price equilibrium in the suppliers' game suggests that "the state should reduce the costs to consumers of *comparing* purchase alternatives" (Wilde and

[2] See for example Gabszewicz and Garella (1982) in terms of product differentiation, and Arnold (2000) who finds price dispersion because the cheapest sources may suffer stock-outs and hence waste buyers' valuable time. The latter paper does not require differences between buyers or sellers to obtain price dispersion. Ireland (1993) uses a similar price comparison model to that applied in the current paper but adds a first stage where

Schwartz, 1979, p551, italics in original). The issue that we wish to address is whether the state should indeed explicitly consider this objective in relation to competition policy investigations into exclusive dealer agreements, vertical restrictions more generally and multiple trading names.

We will take a very simple model where are two kinds of consumer: one kind maintains the competitive element in the market, by engaging in limited search activity; the other provides a monopoly element, by not searching. By trading under more than one name, a firm can undermine some measure of the search activity and thus reduce the competitive element in the market: put simply, search might result in spurious price comparisons between firms or brands with the same ownership. From the perspective of consumer search, the presence of firms supplying through multiple trading names will be found to be very similar to the existence of price fixing agreements among a subset of suppliers. Furthermore, exclusive dealer agreements might mean that the best price comparisons (that is of the closest products) are only available at dealers with a common ownership (and sharing the exclusive dealer contract). Vertical supply restrictions may also be used to eliminate aggressive sellers and maintain profit mark-ups. Price comparisons can easily become largely illusory. An obvious further step suggests that if price comparisons become less effective as a consumer search activity, then fewer consumers will engage in search, and the market will become more akin to a monopoly.

This topic has considerable importance for monopoly policy. However, little active stance on the issue appears to have been taken. Within the UK, there is no legislation or restrictions on

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price information is sent to consumers by suppliers as advertising messages. Firms have incentives to restrict such information flows.

groups of firms owned by a parent company trading in similar areas of activity under more than one name. There is no automatic consideration of vertical agreements by anti-monopoly agencies. For example, a recent enquiry by the Office for Fair Trading into an exclusive dealership agreement between DSG Retail Ltd and computer manufacturers was only instigated after requests from other retail players, and the enquiry found for DSG. DSG sells computers under three chains with individual trading names (Dixons, Curry's and PC World). Further, the European Court of Justice has recently come to a judgement that Levi Strauss were entitled not only to refuse to supply a large supermarket chain (Tesco) but also to stop Tesco from sourcing Levi jeans from other agents outside the European Union (essentially dealers in the USA). Whatever other factors this decision reflects, it is clear that consumers will be less able to make price comparisons than if their local supermarket stocked Levi jeans. There will be less downwards pressure on retail prices and hence less downwards pressure on the manufacturers' margins. We will return to both these cases after discussion of our model. Within the USA, there is no presumption that vertical restraints or multiple trading names is anti-competitive: rather, vertical constraints other than on price (such as retail price maintenance), are judged by a "rule of reason (which) requires an investigation into the challenged conduct" (Carlton and Perloff, 2000, p645).

Section 2 below presents the simplest model for our purposes. It presents equilibria for a market with independent firms and one with firms where each pair of firms has a common owner. The equilibria are compared and the effect of the industry structure changing and moving the equilibrium from one to the other is studied. The effect on the private return from a consumer's search is part of the comparison since this would yield a response from consumers' behaviour to the perceived gains from search in past purchases. We also present the equilibrium where one firm trades under two names while all other firms trade independently. Section 3 considers the policy implications, particularly for competition policy and draws some conclusions.

2. The Model

The n-Firm Symmetric MSNE

To make our model as simple as possible, consider a market for a homogeneous product, let demand by each consumer be either one unit or no unit, and let the measure of consumers be 1 (eg 1 million consumers). Each consumer will choose to buy from the firm which offers to supply at the lowest price from the set of firms (suppliers) that is observed by that consumer, provided this price is not more than her reservation price of 1. There are no costs of production but the number of firms is fixed at $n \geq 4$. Let each firm i (for $i = 2,\dots,n$: that is all firms other than firm 1) choose its offer price p_i according to the distribution function $F(p_i)$, with $F(L) = 0$ and $F(1) = 1$, $F'(p_i) \equiv f(p_i) > 0$, $L \leq p_i \leq 1$. We solve for this distribution function so as to ensure that firm 1 is indifferent to choosing any price in [L, 1] and then we use a symmetry argument to define this as the mixing function for all firms including firm 1. We begin by defining firm 1's expected profit. This definition relies on buyers being initially ignorant of the actual prices charged by different firms. They need to incur some (unspecified) cost to find out the price at any firm. We assume that consumers adopt one of only two possible strategies for search. Those with relatively high search costs simply choose a firm at random and buy provided the price is no more than 1. These consumers are termed "one-timers" and constitute a proportion (and number) θ of consumers. All other consumers (of proportion or number $1-\theta$) visit two firms and then buy from the firm with the lower price (again assuming this is no more than 1). These are termed "two-timer" consumers. The number of one-timers expected to visit firm 1 is thus θ/n since each consumer chooses one of n firms at random. Similarly the number of two timers is $2(1-\theta)/n$ since there are 2 chances in n that firm 1 will be selected. Firm 1 sells to these latter consumers only if it offers the lower price, which happens with probability $1 - F(p_1)$. Thus firm 1's expected profit if it chooses price p_1 is:

$$V_1 = p_1[\theta/n + (2(1-\theta)/n)(1 - F(p_1))] \quad \text{for } p_1 \leq 1 \tag{1}$$

When $p_1=1$, V_1 is θ/n, because θ/n sales can be expected if the firm sets a higher price than other firms and thus only sells to one-timers. Thus the distribution function F must satisfy[3]:

$$p_1[\theta/n + (2(1-\theta)/n)(1 - F(p_1))] = \theta/n \qquad \text{for } L\leq p_1 \leq 1 \tag{2}$$

This implies that firm 1 is indifferent to any choice of p_1 in $L\leq p_1 \leq 1$. This is necessary in order for the firm to be willing to mix the price randomly.

Thus, using $p_1=L$ and $F(L) = 0$ in (2), we have that L solves

$$L = (\theta/n) /[(2-\theta)/n] = \theta/(2-\theta) \tag{3}$$

And in general the distribution function solves

[3] The distribution must include a positive density of 1 since otherwise at least one firm would play a price which was certain to be undercut and would do better by shifting that density to the buyer's reservation price of 1. Holes or spikes in the interior of the distribution are ruled out from similar arguments.

$$F(p_1) = (2 - \theta - \theta/p_1)/(2(1-\theta)) \qquad (4)$$

This result can be summarised as

Lemma 1: With n independent firms setting price in a MSNE, a symmetric equilibrium exists with L given by (3) and each price has distribution function

$F(p_i) = (2 - \theta - \theta/p_i)/(2(1-\theta))$ for $L \leq p_i \leq 1$ and all i = 1,..,n.

This MSNE is of interest in itself. Since at most 2 firms are visited by any particular customer, so the price behaviour is independent of the number of firms. Each sale is the result of either a monopoly or a duopoly relationship. As $\theta \rightarrow 1$ and all consumers are one-timers, so $L \rightarrow 1$ (from (3)), and the outcome is virtual monopoly pricing. As $\theta \rightarrow 0$ and all consumers are two-timers, so $L \rightarrow 0$ (from (3)), and $F(L) \rightarrow 1$, and the outcome is that of competition.

Pair-wise Ownership

We will contrast the MSNE in Lemma 1 with that resulting from pair-wise ownership of the firms. Consider that n is even and that each distinct pair of firms (firms 1 and 2, firms 3 and 4, etc.) is controlled by the same owner. Consumers are not aware of which firms have the same owner.[4] We assume consumers' behaviour is as before. The owner of each pair of firms

[4] If consumers knew the ownership of firms then they would treat firms 1 and 2 as the same firm, etc. This would imply that there would be n/2 firms in the market and the analysis leading to lemma 1 would hold with half the number of firms. However, Lemma 1 does not depend on the number of firms, and so the same lemma, and distribution of prices, would hold when firms had pair-wise ownership but this was known by consumers.

will choose the same price for each of its firms from a distribution. (We will show later in Lemma 2 that there is a loss to the joint owner from drawing different prices for each of the two firms, from the same distribution.) Let the price distribution of all pairs other than the pair formed by firms 1 and 2 be denoted $G(p_i)$, $i = 3,5,\ldots,n-1$, given that $p_4 = p_3$, $p_6 = p_5$, etc. Now joint expected profit of firms 1 and 2 and thus the expected profit of their joint owner is

$$V_{12} = p_1(2\theta/n + (1-\theta)(s(1-G(p_1)) + v)) \tag{5}$$

where s is the probability of a two-timer customer choosing either one (but not both) of the firms 1 and 2, and v is the probability of a two-timer customer choosing both firms 1 and 2 to sample. From first principles [5], we have

$$v = 2/(n(n-1)) \tag{6}$$

$$s = 4(n-2)/ (n(n-1)) \tag{7}$$

When p_1=1 then $G(p_1) = 1$, and expected profit is $2\theta/n + (1-\theta)v = 2[\theta + (1-\theta)/(n-1)]/n$. This is clear since the firms 1 and 2 have 2/n chance of gaining a one-timer's custom plus a two-timer will buy if she visits both firms 1 and 2, in either order, with each ordering occurring with probability (1/n) (1/(n-1)). All other customers visiting firms 1 or 2 will have a cheaper price (a price less than 1) at another firm to choose. The minimum price M is defined such

[5] To find v, note that there is a 1/n chance of firm 1 being chosen for the first visit and 1/(n-1) chance of firm 2 being chosen for the second visit. V requires both these events but they can happen in 2 permutations. To find s, note that there is a 2/n chance of one of firms 1 and 2 being chosen for the first visit and (n-2)/(n-1) chance of a different firm (not 1 or 2) for the second visit. Again, both these events need to hold but there are again 2 permutations.

that expected profit is equal to this same expected profit when $G(M) = 0$, so that, putting $p_1=M$ and $G(M) = 0$ in (5), and setting this to $2[\theta + (1-\theta)/(n-1)]/n$, gives

$$M(2\theta/n + (1-\theta)(s(1-G(M)) + v)) = M(2\theta/n + (1-\theta)(s + v)) = 2M(\theta + (1-\theta)(2n-3)/(n-1))/n =$$
$$= 2[\theta + (1-\theta)/(n-1)]/n$$

or

$$M = [\theta + (1-\theta)/(n-1)]/ (\theta + (1-\theta)(2n-3)/(n-1)) = ((n-2)\theta + 1)/ (2n-3 - (n-2)\theta) \qquad (8)$$

The lower bound of the price distribution is higher than in the independent firm case, that is

$$M = ((n-2)\theta + 1)/ (2n-3 - (n - 2)\theta) > \theta/(2-\theta) = L \qquad (9)$$

for all $\theta < 1$. (When $\theta = 1$ there are no two-timers and so pair-wise ownership plays no role). Again, by setting (5) equal to $2\theta/n + (1-\theta)v$, we can solve for the distribution function G:

$$G(p) = [2\theta/n + (1-\theta)(s+v) - (2\theta/n + (1-\theta)v)/p]/ (1-\theta)s$$

Or, using s and v from (6) and (7),

$$G(p) = [2n-3 - (n-2)\theta - (\theta(n-2) + 1)/p]/((2n-4)(1-\theta)) \quad \text{for } M \le p \le 1 \qquad (10)$$

We can state and prove

Lemma 2: If each pair of n firms has a common owner, then the symmetric MSNE is that each pair of commonly-owned firms chooses a single price from the distribution function

$G(p) = [2n-3 - (n-2)\theta - (\theta(n-2) + 1)/p]/((2n-4)(1-\theta))$ for $M \le p \le 1$

So that $p_1, p_3, p_5, \ldots$ are independent random draws from G(p) and $p_1=p_2$, $p_3=p_4$, $p_5=p_6, \ldots$

Proof

The derivation (5)-(9) shows the existence of the MSNE, but we have to show that each pair of firms has no incentive to adopt a different price in each of its two constituent firms. Suppose that to the contrary, firms 1 and 2 adopt different independent draws from some distribution. Also that $p_1 < p_2$ without loss of generality. Then the expected profit from one-timers and from two-timers who visit just one of firms 1 and 2 is the same as before. However the expected profit from those two-timers who visit both firms 1 and 2 is then $(1-\theta)v \min\{p_1, p_2\} = p_1(1-\theta)v$. Since the minimum of two draws from a distribution is lower in expectation than the expected value of a single draw, expected profit is less than with the same price in both firms. Hence, a MSNE exists as stated.

Our basic results come from comparing the MSNE in Lemma 2 with that in Lemma 1.

Theorem 1:

(i) G(p) < F(p) for all p<1, that is G(p) (first-order) stochastically dominates F(p);

(ii) The mean price observed under pair-wise ownership is higher;

(iii) Expected profits are higher under pair-wise ownership; sales are the same (one per consumer);

(iv) G(p) is increasing in n for a given p;

(v) G(p) $\rightarrow$ F(p) as n $\rightarrow \infty$.

Proof: (i) is easily checked by comparing (4) and (10). Thus G(p) stochastically dominates F(p) for all finite n. Hence (ii) and (iii) hold: the mean price is higher and a higher price is paid on average since consumer behaviour is not changed (same θ). Finally, (iv) can be shown to hold by differentiating (10) with respect to n, and (v) holds by letting n $\rightarrow \infty$ in (10), noting that F(p) is independent of n.

Clearly the price paid both by the one-time consumers and the two-timer consumers is higher on average with the extra monopoly power which comes with each pair of firms being jointly owned. This effect has nothing to do with the number of independent suppliers (as would occur in a Cournot model) but rather to do with the buyers' ability to check prices. The effect is reduced as the extent of competition increases and the likelihood of two-timers choosing both firms with the same ownership declines, but only disappears completely when there are an infinite number of firms. When the number of firms is infinite, M, G(p) collapse to L, F(p), and the effect of pair-wise ownership disappears since the probability of any customer choosing a particular pair becomes arbitrarily small.

Incentives and endogenous consumer behaviour

The next issue that arises and needs addressing is whether the incentive to act as a two-timer is greater or less with the lower spread of prices in the pair-wise ownership case. If the incentive differs then we can expect a different θ and thus a further difference in the comparison of the two cases. For example, if the incentive to visit two prices rather than one is smaller in the pair-wise case, then θ would be higher in that case as fewer consumers felt that the additional search was worth the time or money. The expected difference in expected price for changing behaviour from a one-timer to a two-timer can be shown to be [6]

$$\Gamma^* = \int_L^1 (F(1-F)\, dp \qquad (11)$$

for the independent firm case with *any* number of firms (n ≥2), and

$$\Gamma(n) = \int_M^1 (G(1-G))\, dp \qquad (12)$$

for the pair-wise-owned structure with n firms (n≥4). The difference in incentive is

$$\Delta = \Gamma(n) - \Gamma^* \qquad (13)$$

The calculation of Δ and the determination of its sign is not immediate, but is important since it may lead to a second round effect from the structural change. Part of the difficulty of coming to an analytical conclusion is because Γ(n) is not monotonic in θ. Thus at large θ there is little to be gained from a further search since prices are already closely packed near the monopoly price of 1. The additional monopoly power of pairwise ownership makes little (but positive) difference. At very low values of θ, pairwise ownership makes considerable difference to the gains from two-timing. The shift upwards of the price distribution from an

[6] With all integrals from L to 1, the expected price paid by a one-timer is $\int p\, dF(p)$, and the expected price paid by a two-timer is $\int p\, d[-(1-F(p))^2]$. Subtracting the second expression from the first and integrating by parts

initial near-competitive level yields a bigger incentive to two-time, and $\Delta > 0$. On the other hand, if θ has a middling value of near 0.5 then there is already a heavy element of monopoly pricing, and further monopolisation with pairwise ownership tends to reduce the variability of prices (concentrating them towards the monopoly end) and hence reduce the return to two-timing.

Hence for given n firms we have that Γ depends on the parameter θ, possibly in an inverted U-shaped way, for example with n=8 or 16 in Table 1 the relation is inverted U-shaped. Figure 1 sketches a typical result. We will write Γ as $\Gamma(n;\theta)$. Of course the value of θ is itself dependent on the incentive to two-time, $\Gamma(n)$, via the consumers' individual decisions. A simple model of the latter would have individuals indexed by θ and with costs of making a further visit to a firm as $c(\theta)$ where $c'(\theta) < 0$: thus the higher the index, the lower the cost to that individual in changing to being a two-timer. The issue is now whether there is a unique solution to the determination of θ and Γ for a given n. Also, whether this solution implies a higher value of θ (and thus less consumer search and more monopoly power) than the value that would exist if $\Gamma = \Gamma^*(.; \theta)$, (no pair-wise structure). In Figure 1, we attempt the first part of just such an analysis. The additional cost of two-timing is shown as the schedule $c(\theta)$. The additional gain is shown as $\Gamma(8; \theta)$ for the pair-wise structure with 4 pairs of firms.

The system is in equilibrium when all types are choosing the right (for them) strategy for searching. As drawn, there are three equilibria. One equilibrium is the full monopoly case. Here no-one searches twice (and $\theta = 1$). Costs are greater than benefits (equal to $\Gamma(8; 1)$),

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yields $1 - \int F(p)dp - [L + \int (1-F(p))^2\, dp] = \int (1-F(p)) - (1-F(p))^2\, dp = \int (1-F(p))F(p)\, dp$. (12) is derived in a similar way.

even for the individual (type 1) who has the least cost of two-timing. Thus this no-search position is an equilibrium where no prospect of choosy customers leads to monopoly pricing and there is no gain for the individual from being choosy. However, it is an unlikely equilibrium since it is based on monopoly pricing being pervasive. In this situation, firms may compete in advertising messages, and more importantly the anti-trust authorities might seek to cap prices or improve consumers' price information. There are two other equilibria where the schedule of gains crosses that of the costs. At θ_1, the benefits are $\Gamma(8; \theta_1)$ and all individuals with higher cost (measure θ_1) choose to be one-timers while all others choose to be two-timers. The same is true at θ_2. However the latter is a much weaker equilibrium since it is unstable. If the initial share of one-timers is slightly higher than θ_2 (lower than θ_2) then $\Gamma(8; \theta) < c(\theta)$ ($\Gamma(8; \theta) > c(\theta)$), and individuals will change to one-timing (change from one-timing) and a share θ_2 will not be reached. On the other hand, both θ_1 and 1 are stable equilibria. Finally, note that if the cost schedule shifts upwards then the three equilibria may collapse to just a single equilibrium, either of a type θ_1 or at 1. If the schedule shifted downwards the set of equilibria may collapse to a single point of type θ_1.

Figure 2 contrasts the graphs of $\Gamma(8; \theta)$ and Γ^* (approximated by $\Gamma(100; \theta)$). It is clear in this case, that the equilibrium at θ_1 shifts to the left when the benefit schedule shifts from Γ^* to $\Gamma(8; \theta)$. It is relatively easy to draw $c(\theta)$ to produce a different result. For example c^ gives an alternative outcome, where the equilibrium θ_1 is at the declining part of the benefit functions and the shift is a shift downwards leading to a higher θ_1 and thus more monopoly power of firms. The broad conclusion of our analysis of second round effects of moving to a pair-wise structure is that a competitive situation would get better, due to more individuals searching, while an already monopolistic situation would get worse, since individuals would tend to search even less.

A final comment on the incentive to search is that we can think of the individual learning from experience, rather than knowing the distributions of prices and calculating the expected benefit from search. In this interpretation, however, the individual has to rely on experience of others or her own experience within different markets or at different times to inform her decision. Thus poor returns to search in unrelated purchases can lead to the decision not to bother to search for the current purchase.

An Asymmetric Equilibrium

An alternative comparison of interest is where one firm trades under two names while all other firms each trade under a single name. This leads to an asymmetric equilibrium and here we present a candidate equilibrium where each firm gains in expected profit relative to the outcome in Lemma 1. The importance here is to demonstrate the incentive for firms to adopt the kind of strategies we have been discussing, even when they would be acting on their own. Expected profit for the jointly-owned firms 1 and 2 is still

$$V_{12} = p_1(2\theta/n + (1-\theta)(s(1-F(p_1)) + v)) \tag{5}$$

Where s,v are as defined in (6) and (7), and F(p) is the distribution function of other firms' prices. The expected profit of all these other firms is

$$V_i = p_i(\theta/n + (1-\theta)((s/(n-2)(1-G(p_i)) + v(n-3)(1-F(p_i)))) \tag{14}$$

Where G(p) is the distribution function of $p_1=p_2$. We solve for a mixed strategy equilibrium with the properties given in Lemma 3.

Lemma 3: An asymmetric equilibrium exists with the following properties.

(i) Each firm i > 2 sets price according to F(p), with F(1) = 1 and $F(L_a) = 0$ where $L_a = (\theta + 1/(n-2))/(2 - \theta + 1(n-2)$ and $1-F(p) = [((n-2)\ \theta + 1)/(2(1-\theta)(n-2))]\ (1/p - 1)$.

(ii) The jointly owned firm 1 and 2 sets price according to G(p) where $G(L_a) = 0$, $G(1) = 1-m$ and m is a mass point at p=1with value $m = (n-1)/[2((n-2)(2-\theta) + 1)]$, and $1 - G(p) = (2\theta - (n-3)/(n-2))\ (1/p - 1)\ /(4(1-\theta)) + m/p$

(iii) $V_{12} = 2\theta/n + v(1-\theta)$ and

$V_i = \theta/n + (s/(n-2))\ (1-\theta)\ m$

Proof

Given the strategies defined by (i) and (ii), the value of V_{12} is $2\theta/n + v(1-\theta)$ for all p in $[L_a, 1]$ and the value of V_i is $\theta/n + (s/(n-2))\ (1-\theta)\ m$ for all p in $[L_a, 1)$. Further, any price below L_a yields lower value for any firm than a price of L_a since all price comparisons would be won in either case but a price of L_a yields more profit per sale. Finally, no price above 1 makes any sales, and a price of 1 for an independent firm is (at least weakly) dominated by the limiting price $p\rightarrow 1$ under the joint firm's mass point at 1.[7]

Compared to lemma 1, all firms make higher profit in this asymmetric equilibrium. Thus no firm i (i>2) will object to firm 1 and 2 being jointly owned. Indeed the independent firms make more profit per firm than the jointly-owned firms since m > ¼. The explanation is

[7] For any allocation of sales if both the joint firm and firm i (i>2) choose price equal to 1.

simple: the jointly firm has an added reason to play the monopoly price since consumers who visit both its constituent firms are captive while the other firms can undercut the monopoly price when in direct competition. Such a result has obvious parallels in cases where partial cartels enforce high prices but are undercut by non-cartel members, and indeed in Cournot competition where horizontal merger benefits other firms more.

Clearly higher expected profits shows that prices paid by consumers are on average higher than in Lemma 1. The model still has all consumers purchasing and so reducing the ability to make price comparisons has no overall wefare loss since it creates no distortion. However, the shift from consumers' surplus to producers' surplus is of obvious relevance to competition policy.

3. Policy and Conclusions

Anti-trust Policy

We have shown that prices are on average higher with pair-wise ownership unless there is a significant increase in consumer searching in response (shift to two-timing). Both of these outcomes may be contrary to the objectives of regulatory authorities. Higher prices benefit firm owners at the expense of consumers and consumer search has a cost to the searchers. What we have shown additionally is that it is not the reduction in the number of independent firms that is the problem, but rather that the pair-wise ownership is not obvious to consumers. The possibility of a price being compared with another price which is in fact controlled by the same owner limits the effectiveness of search both as an anti-monopoly mechanism and as an efficient way of making individual purchasing decisions. Thus the prices are higher in the pair-wise structure than when there are half the firms but each independently owned. If the joint ownership of firms was clearly labelled (by each jointly-owned firm having the same trading name for example) then the monopoly problem would be less. The lesson for anti-trust authorities is thus to ensure that consumers know about ownership links of each candidate supplier by ensuring transparent trading names.

There are further points that accompany this lesson. Most obviously, the product offered by different firms may be differentiated. Consumers may therefore also have to seek out comparable product specifications as well as prices. If a particular variety is sold by two firms, then their prices make ideal comparators. However, if the firms share the same owner this comparison is controlled by the owner and is inappropriate for the consumer. Such an event is very likely if the owner makes a sole distributor agreement with a manufacturer, or indeed sells the same "own-brand" across the jointly-owned firms. The latter point returns us to the underlying problem of the confusion created for consumers searching price comparisons. The former point is an additional result from a vertical agreement. The agreement extends the ability of the jointly owned firm to portray its prices as fair. This does not depend on market dominance of either the particular product or the jointly owned firm.

DSG Retail Ltd

In the UK, vertical agreements are normally excluded from prohibition orders, unless the parties concerned have dominant market positions. The recent OFT decision (Office of Fair Trading (2001)) in the case of the DSG Retail Ltd’s agreements for exclusive dealer status with Compaq and Packard Bell was that the exclusion should be confirmed and the agreements permitted. Obviously, many factors went into that decision. In particular, the downstream and upstream market shares were thought not to be dominant (less than 40%) and evidence was cited to the effect that customers were not attracted to particular brands. Rather, "competitive price" was the main reason stated for buying from a particular retailer. Hence, the OFT concluded that buyers were not being disadvantaged by being limited in retail outlets where Packard and Compaq computers were available, since other brands were available elsewhere and brand loyalty or reputation was not an important characteristic. Since dominant market positions were absent, and alternative products available, DSG could not be abusing the competitive operation of the market.

The analysis of the OFT concentrated on market shares and the importance of price in determining sales. The latter would ensure that, for example, Packard Bell computers would need to be priced low if customers were to be persuaded away from other retailers selling other brands. However, the submission of the complainant was rather different: that retailers needed to "stock prominent brands in order to compete" (Office of Fair Trading, 2001, paragraph 73). Our model of comparison shopping by two-timers indeed suggests that the testing of price levels between retailers needs virtually common brands to be sold across at least some competing retailers. An additional factor that did not seem to be taken into consideration by the OFT is that DSG can sell these products under three different retail chain labels (Dixons, Currys and PC World). Consumers who are unaware of the connections (i) may find false comfort from price comparisons between say Dixons and PC World and (ii) will find it difficult to make price comparisons between one of the Dixons group and another, independent, chain, since other chains do not sell these particular products. Of course, even if due attention were given to these arguments, it would still be possible that the advantages of vertical integration may be to the consumer's advantage because of reductions in double margins or scale economies of maintenance and expertise.

Levi Strauss and Tesco

The case of Levi Strauss and Tesco was decided in the European Court of Justice in November 2001 (European Court of Justice, 2001). The decision was that Tesco would be operating contrary to European law if it sourced Levi jeans from the USA without the trademark owner (Levi Strauss) specifically granting permission. Thus Levi Strauss can enforce higher prices in the UK by preventing Tesco from importing from the USA at the cheaper prices which exist there. The issue was based around the legal rights conferred by owning trademarks. From the perspective of enabling price comparisons, however, the elimination of a low price / high volume chain retailer like Tesco is very harmful. Suppose Tesco had won the case. Then the fact that there is a “Tesco” in most towns in England would mean that a benchmark was available to all consumers, and this would have had two effects. First the cost of making price comparisons would decline. This would be partly because the research necessary to find stores which stock the product would be much easier, and secondly Tesco being a supermarket would be visited by many consumers on a regular basis. Second, Tesco would wish to obtain a nationwide reputation for low prices and hence would price aggressively. The model we discussed in section 2 would be replaced by one where random selection of stores would no longer be appropriate. Rather, most customers would visit Tesco, and then some would make a further search to check on designs, fit, etc. at another store. The supermarket would become the price leader, and this would clearly suggest lower prices for consumers. By preventing Tesco from selling its products, both by declining to supply direct and by stopping “grey market” supplies, Levi Strauss have removed a potential price benchmark, and thus placed the market for its products within the scope of the model in section 2.

Associated Issues

There are a number of issues and strategies closely associated with our main thesis. One is that the retailer's own brand products are equally difficult to test by price comparisons. This may be one reason why in many fields own brands are not promoted as such. Indeed, many own brands seem to have names which conjure up other brand names and indeed might be confused in the buyer's mind for a product which is not an own brand. Perhaps one explanation of own brands which have such hidden identities (ie not the name of the store itself) is again that retailers suggest that price comparisons are possible when they are not. Secondly, own-brands and exclusive brands are excluded from price-matching or price-beating guarantees by definition. (The possibility of such exclusion, if identified by the consumer, will add to the "hassle" factor (Hviid and Shaffer, 1999). Again the existence of multiple trading names may lead to consumer misperceptions as to the nature of price comparisons that can be made. Then the price matching guarantees will succeed in raising prices even though they should not have any significant effect.

The conclusion to this paper must be that price comparisons need to be transparent and readily available. In this way, consumers have an incentive to test prices, confident that this is a fair check on price competitiveness. In a market such as PCs the product range is continually changing and the technology is improving. Many buyers have very imperfect knowledge about the characteristics of the products on sale. Value for money requires a like-for-like price comparison that is not helped by the firms' strategies we have discussed. The broader question is whether the state can or should specifically include such issues in judgements in competition policy. Competition and monopoly policy are dominated by market share issues. The theoretical justification for the importance of market share is the Cournot framework where firms exercise monopoly power on the market share they control.

Within a price-setting, Bertrand framework, market share is not relevant (as it is not within the basic model we have used here), but the ability to compare prices is paramount. Perhaps the policy focus should shift at least some way to issues of enabling such price comparisons to be made.

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Table 1: Returns from two-timing - G(n) varying with n and q. G(100) approximates G.*

	Proportion of one-timers						
	0.01	0.1	0.3	0.5	0.7	0.9	0.99
Number of firms							
4	0.1036654	0.103497	0.095838	0.079442	0.054651	0.020796	0.002207
8	0.0846348	0.096951	0.103497	0.092008	0.066325	0.026238	0.002833
16	0.0615738	0.086434	0.103761	0.095838	0.070550	0.028356	0.003082
100	0.0274377	0.073588	0.102734	0.098227	0.073525	0.029906	0.003267
Sign of Δ	+	+	?	-	-	-	-

Figure 1: Relative gains and losses, from two-timing rather than one-timing, for consumers of index q.

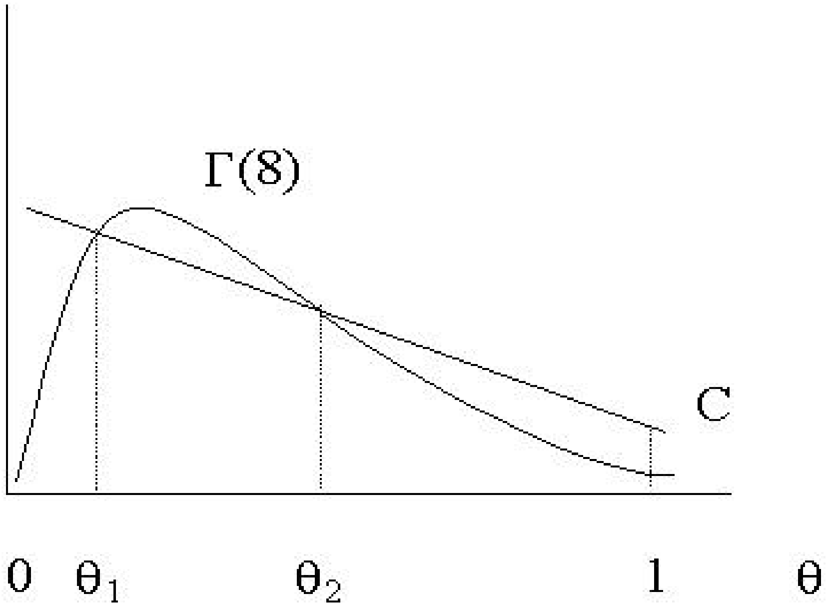

Figure 2: Shift in structure from G to G(8;q). Decreases q1 when cost schedule is C and increases q1 when cost schedule is C^.*