Chain-Store Pricing Across Local Markets

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ABSTRACT
Chain-stores now dominate most areas of retailing. While retailers may operate nationally or even internationally, the markets they compete in are largely local. How should they best operate pricing policy in respect of the different markets served – price uniformly across the local markets or on a local basis according to market conditions? We model this by allowing local market differences, with retail markets differing by their size and the number of players present. We show that practising price discrimination is not always best for a chain-store. Competitive conditions exist under which uniform pricing can raise profits.

Key Words: Chain-store, Pricing Policy, Price Discrimination, Local Markets

JEL Codes: L10, L11, L40, L66, L81
1. Introduction

Our analytic focus in this paper is the geographic scope of pricing. Specifically, is it better for a chain-store retailer to set prices according to local market conditions (reflecting differences in competition) or to set common prices that apply across all its stores, i.e. adopt a uniform pricing policy? Are likely firm decisions on this in line with consumer preferences?

The geographic scope for pricing is a very real issue for multiple retailers. It is evident that in practice some chain-store groups adopt uniform pricing while others do not. In some sectors, all multiple retailers price identically across their stores, e.g. UK electrical goods retailers (MMC, 1997a,b). By contrast, in other sectors local pricing is practised to the extent that product prices might vary considerably from one store to another. As a leading example, the FTC found that for office supply superstores average prices varied by as much 16% depending on the extent of local competition in the US.\(^1\) Moreover, this pricing policy distinction applies not just to different sectors but can apply within the same sector, as with UK supermarkets where, of the leading fifteen groups, eight priced uniformly while seven priced according to local conditions (Competition Commission, 2000).\(^2\)

Yet, in these days of computer-based pricing systems, it can hardly be said that ticketing costs are high\(^3\), or that local demand and cost conditions cannot be effectively gauged. Hence, choosing a uniform price must be seen as a conscious act. Of course, uniform pricing might not be practicable when retailing costs are substantially different from one area to another.\(^4\) Nevertheless, for many multiple retailers both local and uniform pricing might be feasible but a choice has to be made on which to adopt.

This leads to two questions, first why it might ever be preferable for a chain to impose a constraint on its own behaviour, and second the circumstances under which the constraint is desirable. Our key insight on the first question is as follows: A firm will find itself under more competition in some markets than others. By practising uniform pricing, it softens competition between itself and rival players. Thus casual intuition from monopoly market arguments fails. Uniform pricing entails setting a higher price in those markets subject to (more) competition, at the expense of lower prices in markets where it is not subject (or is
less subject) to competition, compared with a practice of market-specific pricing. The higher price in turn makes the action one which rivals find attractive, so it does not require explicit agreement. Thus if the markets under competition are important enough to the firm, its net gain is positive.

Hence our paper’s prime focus is on the parameters associated with the nature and intensity of competition that might influence this choice; that is on characterizing the conditions under which a commitment to uniform pricing pays for a chain-store. Our key intuition on this second question is as follows. Assume the uncontested markets are large enough and competition sufficiently intense for the monopoly price in the uncontested markets to be above the price in contested markets. The cost of lowering price in the uncontested markets in order to practise uniform pricing will be worthwhile so long as competition in contested areas is not too intense, and the uncontested markets are not too large. Therefore, parameterizing market size and the degree of competition, it is for intermediate values that uniform pricing is most likely. Furthermore, we find there is some tradeoff between these parameters – a greater degree of competition may be countered by a relatively smaller uncontested market.

Our contribution in this paper has links with related questions on third-degree price discrimination in oligopoly and most-favoured customer (“MFC”) clauses. More specifically, the issues raised here tie in with why oligopolistic firms would wish to limit or even entirely avoid price discrimination, e.g. Winter (1997) and, most directly, Corts (1998), or adopt practices which provide the same outcome, notably contemporaneous MFC clauses, e.g. DeGraba (1987) and Besanko and Lyon (1993). The result that uniform pricing may be better for firms than third-degree price discrimination in oligopoly markets was first uncovered by Holmes (1989) who used a very specific “weak market-strong market” model.

Our results also relate to Armstrong and Vickers (2001). In their investigation of a model similar to Holmes’, Armstrong and Vickers find that if a market is sufficiently competitive, profits always increase with discrimination. This leads them to conclude that “Holmes’ result that profits may fall with discrimination requires markets to be reasonably uncompetitive.”
However in our framework, which also in effect has a weak and a strong market, profits may fall with discrimination *whatever the degree of competition*. That is, however uncompetitive the market, uniform pricing can be profitable. What is required for this is each individual monopoly market, in our context, to be sufficiently large.

To consider how different competitive conditions affect the scope-of-pricing decision, the model developed here has a ubiquitous chain-store operating in all local markets. These local markets, though, are assumed to differ in respect of the scale of consumer demand and whether or not the chain-store faces competition. There are two market types. In each of the larger, “affluent” markets, the chain-store faces competition, represented by a local independent retailer. Yet, in smaller, less affluent markets the chain-store is taken to have a monopoly position (say, protected by natural or institutional barriers, e.g. tight planning restrictions). In this setting, we show that a chain-store would not necessarily prefer to use local pricing as a profit-enhancing price discrimination tool. Competitive conditions exist in the form of a non-degenerate region of parameter space trading off the degree of substitutability between the chain-store and independent retailers’ product/service offering and the degree to which duopoly markets are larger than monopoly markets. Here, the chain-store would prefer to commit to a policy of uniform pricing when this allows for softer competition in contested local markets, to the extent that this raises its aggregate profits. While the prospect of strategic behaviour through dampening price competition influences the preference between local or national pricing, a chain-store’s choice is not inevitably at variance with that preferred by society. In particular, a store’s willingness to commit to national pricing can in certain circumstances not only enhance its profits but also raise social welfare if not consumer surplus. Yet market conditions exist under which welfare would be adversely affected by the chain-store following its preferred choice.

Although our model is undoubtedly specific, the results are considerably more general and we sketch some extensions. Our general results are (1) that under a range of conditions including very competitive markets, uniform pricing is privately optimal both for a chain-
store and its competitors without the necessity for co-ordination and (2) that enforcing uniform pricing where firms would prefer local pricing by no means necessarily advances social welfare. The significance of the first is that existing papers have concentrated heavily on co-ordinated action on uniform pricing. By contrast, policy has often focused on whether firms practice uniform pricing, viewing this with approval, something potentially in conflict with our second point.

The remainder of the paper is organised as follows. Section 2 discusses the analytical framework whereby a chain-store retailer operates across all local retail markets but faces competition in some of these markets, while benefiting from a monopoly position in the others. Section 3 then examines and compares the outcomes where the chain-store uses local pricing against where it adopts a uniform (national) pricing approach. Section 4 then considers the chain-store’s preferences over pricing policy and specifically how it might commit itself to a uniform policy in a manner that will affect competition in its desired manner. Section 5 addresses consumer welfare considerations. Section 6 concludes the paper.

2. The Framework

The situation considered is of a country made up of \( N \geq 2 \) distinct and economically separate local retail markets. A chain-store, labelled \( C \), has emerged and serves all of these local markets. The markets served fall into one of two types: large/affluent markets which support competition and smaller/poorer markets, which do not. Specifically, it is assumed that in each of the larger, more affluent markets the chain store faces competition from a single local independent retailer, labelled \( I \), thus making the market a local duopoly. In contrast, in the smaller markets such competition is absent and the chain-store in each instance has a local monopoly. In the former case, there are \( D < N \) local duopolies where competition is characterised by the Bertrand-Nash outcome in a duopoly pricing game. Complete information applies and it is assumed that while the competing retail services may be different, the chain-store has no cost or demand advantage over the independent retailer. In the latter case, there are \( M = N - D \) markets where the chain-store enjoys a monopoly position (for example, due to entry being blockaded by the unavailability of suitable sites or providing insufficient demand opportunities for a rival operation).
The relevance of this distinction between markets, and the relative number of each type, will become apparent from the analysis. For the moment, though, observe that this bifurcation of markets captures in a very simple manner the notion, as observed in practice, that local markets differ according to the number of players operating and the resulting intensity of competition.\textsuperscript{12}

To ease the exposition further, we assume that within each market type, market demand and operating costs are identical. However, crucially, we allow the two market types to differ in the extent of consumer demand. This is captured in the model by allowing the demand intercept term to be lower in the monopoly markets than the contested duopoly markets.\textsuperscript{13}

It is further assumed that there is no demand or cost connection between the markets (so that profits are separable across markets).\textsuperscript{14} We also assume that operating costs are identical for all retailers and, in addition, that the retailers operate under constant unit and marginal costs which, without further loss of generality, are taken to be zero.

In setting out the demand specification for each market, we will denote each of the duopoly markets by $h = 1, \ldots, D$ and the $M$ monopoly markets by $k = 1+D, \ldots, N$. Consumer preferences in each of the two market types are represented by a standard quadratic utility function. In the case of contested duopoly markets, the utility function for the representative consumer takes the form

$$V_h(q_{Ch}, q_{Ih}) = q_{Ch} + q_{Ih} - (q_{Ch}^2 + 2\gamma q_{Ch}q_{Ih} + q_{Ih}^2)/2 + z_h \quad \forall h$$

where $q_{Ch}$ and $q_{Ih}$ respectively represent the quantity supplied by the chain-store and the independent retailer for market $h$, while $\gamma \in [0,1)$ captures the consumer’s perception of the substitutability between the retailers’ services and product offering (becoming closer substitutes as $\gamma \to 1$), and $z_h$ represents all other goods and has a price normalised to unity. The consumer’s budget constraint is taken as $m_h = p_{Ch}q_{Ch} + p_{Ih}q_{Ih} + z_h$.

In monopoly markets, with the absence of variety, the utility function takes the form for market $k$:
\[ V_k(q_{Ck}) = \alpha q_{Ck} - (q_{Ck}^2/2 + z_k) \quad \forall_k \quad \alpha \in (0,1] \]

Here, the consumer’s budget constraint is \( m_k = p_{Ck}q_{Ck} + z_k \).

Constrained optimisation of the utility functions reveals indirect demand in each market as

\[
\begin{align*}
    p_{Ch}(q_{Ch}, q_{Ih}) &= 1 - q_{Ch} - \gamma q_{Ih} \quad \forall_h \quad (1a) \\
    p_{Ih}(q_{Ih}, q_{Ch}) &= 1 - q_{Ih} - \gamma q_{Ch} \quad \forall_h \quad (1b) \\
    p_{Ck}(q_{Ck}) &= \alpha - q_{Ck} \quad \forall_k \quad (1c)
\end{align*}
\]

Solving for the direct demand functions reveals

\[
\begin{align*}
    q_{Ch}(p_{Ch}, p_{Ih}) &= (1 - \gamma - p_{Ch} + \gamma p_{Ih})/(1 - \gamma^2) \quad \forall_h \quad (2a) \\
    q_{Ih}(p_{Ch}, p_{Ih}) &= (1 - \gamma - p_{Ih} + \gamma p_{Ch})/(1 - \gamma^2) \quad \forall_h \quad (2b) \\
    q_{Ck}(p_{Ck}) &= \alpha - p_{Ck} \quad \forall_k \quad (2c)
\end{align*}
\]

The linear demand specification, represented by (1) and (2), allows for profit functions to be continuous, bounded, twice-differentiable and strictly concave, enabling us to determine pure-strategy equilibrium outcomes based on profit maximisation. In the case of demand in the monopoly markets, \( \alpha \) represents the demand intercept term, where as \( \alpha \) declines the consumer’s willingness to buy falls for all price levels (given that the slope of the demand curve is constant at \(-1\)) and thus the market size declines. In essence, \( \alpha < 1 \) allows for the possibility of viewing monopoly markets as being both smaller and less affluent, and therefore less able to support new entry or for planners to allow new entry, than in larger/richer markets.

Competition and equilibrium outcomes for the chain store and the independent retailers are modelled in the form of a two-stage game. In the first stage, the chain-store decides its pricing policy – whether to practice local (L) or uniform (U) pricing. In the second stage, the firms simultaneously determine their prices being aware of the first-stage decision. The equilibrium concept is subgame perfection. In the next section, we compare outcomes from the second stage with those arising when the chain store practices local pricing with those arising national pricing. While it will be shown that market conditions do exist under which the chain store can gain by setting national rather than local prices, in regard to the first stage of the game, the “default mode” for the chain-store is always to use local pricing. Only with a credible, visible commitment to uniform pricing can national pricing be sustained in
equilibrium. Section 4 details the type of commitment and necessary conditions for this to be feasible.

3. Pricing Outcomes

3.1. Local Pricing

We begin by outlining the outcomes when the chain-store adopts local pricing before considering the situation where it adopts uniform pricing.

For each independent, operating under zero unit cost, its profit function is:

$$\pi_{ih} = p_{ih}q_{ih}(p_{ih}, p_{Ch}) = p_{ih}(1 - \gamma - p_{Ch} + \gamma p_{Ch}) / (1 - \gamma^2) \quad \forall h$$  \hspace{1cm} (3)

Optimising with respect to its price, $p_{ih}$, allows us to determine its best-response function as

$$p_{ih}(p_{Ch}) = (1 - \gamma + \gamma p_{Ch})/2 \quad \forall h$$  \hspace{1cm} (4)

For the chain-store, it sets a price for each local market to maximise profit in that local market. In the case of each monopoly market where $\pi_{Ck} = p_{Ck}q_{Ck}$, substituting in the expression for demand, (2c), optimising with respect to $p_{Ck}$ and solving yields the monopoly price as $p^{L}_{Ck} = \alpha/2$, quantity as $q^{L}_{Ck} = \alpha/2$ and local market profit as $\pi^{L}_{Ck} = \alpha^2/4$. For each contested market its profit function is

$$\pi_{Ch} = p_{Ch}q_{Ch}(p_{Ch}, p_{ih}) = p_{Ch}(1 - \gamma - p_{Ch} + \gamma p_{ih}) / (1 - \gamma^2) \quad \forall h$$  \hspace{1cm} (5)

On optimising with respect to $p_{Ch}$, the chain-store’s best-response function in each contested market is

$$p_{Ch}(p_{ih}) = (1 - \gamma + \gamma p_{ih})/2 \quad \forall h$$  \hspace{1cm} (6)

Using (4) and (6) we can solve for the pair of local pricing equilibrium prices

$$p^{L}_{Ch} = p^{L}_{ih} = (1 - \gamma) / (2 - \gamma) \quad \forall h$$  \hspace{1cm} (7)

Then, from (2a), (2b), (3) and (5), the quantity sold by the chain-store and the independent and their respective profit levels in each contested market are:

$$q^{L}_{Ch} = q^{L}_{ih} = 1/[(1 + \gamma)(2 - \gamma)]; \quad \pi^{L}_{Ch} = \pi^{L}_{ih} = (1 - \gamma) / [(1 + \gamma)(2 - \gamma)^2] \quad \forall h$$  \hspace{1cm} (8)

Combined profits for the chain-store across all its markets under local pricing are thus

$$\Pi^{L}_{C} \equiv \sum_{h=1}^{D} \pi^{L}_{Ch} + \sum_{k=D+1}^{N} \pi^{L}_{Ck} = D(1 - \gamma) / [(1 + \gamma)(2 - \gamma)^2] + (M \alpha^2) / 4$$  \hspace{1cm} (9)
3.2. Uniform Pricing

With uniform pricing, the chain-store sets a single price to maximise its combined profits:

\[
\Pi_c(p_c, \mathbf{p}_{lh}) = p_c \left( \sum_{h=1}^{D} q_{ch} + \sum_{k=D+1}^{N} q_{ck} \right) = p_c \left( D(1 - \gamma - p_c) + \gamma \sum_{h} (p_{lh}) + M(\alpha - p_c) \right) \tag{10}
\]

Rearrangement of the first order condition shows that the best-response function for the chain in this case is

\[
p_c(\mathbf{p}_{lh}) = \frac{1}{2} \left( \frac{(1 - \gamma)(D + \alpha M (1 + \gamma)) + \gamma \sum_{h} (p_{lh})}{D + M - Mt^2} \right) \tag{11}
\]

Using (11) along with each independent’s best response function from (4), we can solve for the equilibrium prices when the chain-store adopts uniform pricing:

\[
p_c^U = \frac{(1 - \gamma)[D(2 + \gamma) + 2\alpha M (1 + \gamma)]}{D(4 - \gamma^2) + 4M(1 - \gamma^2)} \tag{12a}
\]

\[
p_{lh}^U = \frac{(1 - \gamma)[D(2 + \gamma) + M(1 + \gamma)(2(1 - \gamma) + \alpha \gamma)]}{D(4 - \gamma^2) + 4M(1 - \gamma^2)} \quad \forall h \tag{12b}
\]

From (2), the individual quantities sold by each firm in each market are

\[
q_{ch}^U = \frac{D(2 + \gamma) + M(1 + \gamma)[2(1 - \gamma)(2 + \gamma) - \alpha(2 - \gamma^2)]}{(1 + \gamma)[D(4 - \gamma^2) + 4M(1 - \gamma^2)]} \quad \forall h \tag{13a}
\]

\[
q_{lh}^U = \frac{D(2 + \gamma) + M(1 + \gamma)(2(1 - \gamma) + \alpha \gamma)}{(1 + \gamma)[D(4 - \gamma^2) + 4M(1 - \gamma^2)]} \quad \forall h \tag{13b}
\]

\[
q_{ck}^U = \frac{2\alpha M (1 - \gamma^2) - D(2 + \gamma)(1 - \gamma - \alpha(2 - \gamma))}{D(4 - \gamma^2) + 4M(1 - \gamma^2)} \quad \forall k \tag{13c}
\]

The combined quantity sold by the chain-store and its total profits are

\[
Q_c^U = \sum_{h=1}^{D} q_{ch}^U + \sum_{k=D+1}^{N} q_{ck}^U = \frac{[D(2 + \gamma) + 2\alpha M (1 + \gamma)] [D + M (1 - \gamma^2)]}{(1 + \gamma)[D(4 - \gamma^2) + 4M(1 - \gamma^2)]} \tag{14}
\]

\[
\Pi_c^U = \sum_{h=1}^{D} \pi_{ch}^U + \sum_{k=D+1}^{N} \pi_{ck}^U = \frac{(1 - \gamma)(D + M (1 - \gamma^2))(2 + \gamma)D + 2\alpha M (1 + \gamma)^2}{(1 + \gamma)[D(4 - \gamma^2) + 4M(1 - \gamma^2)]^2} \tag{15}
\]
Finally, the profit earned by each independent is

\[
\pi_U^h = \frac{(1-\gamma)[D(2+\gamma)+M(1+\gamma)(2+\gamma)+\alpha\gamma)]^2}{(1+\gamma)[D(4-\gamma^2)+4M(1-\gamma^2)]^2} \quad \forall h
\]  

(16)

### 3.3. Profit Comparison for the Chain-store

We are now in a position to compare the profits for the chain-store under local pricing and uniform pricing. To facilitate this comparison it is convenient to make use of the parameter \( \mu = M/N \) (where \( \mu \in (0,1) \)) to indicate the proportion of the markets for the chain-store that are monopoly markets and equivalently \( 1-\mu \) as the proportion of markets that are duopolies. It will also prove convenient to refer to the local pricing equilibrium price in monopoly markets as \( p^m \equiv p_{Ck}^L = \alpha/2 \) and the corresponding price in duopoly markets as \( p^d \equiv p_{Ch}^L = p_{Lh}^L = (1-\gamma)/(2-\gamma) \). In addition, two identities labelled as \( Z_C \) and \( Z_S \) (each defined below) are useful in establishing propositions here and in section 5 relating respectively to comparisons over the chain-store’s profits and consumer welfare levels.

Subtracting the chain-store’s uniform pricing profits (15) from those generated under local pricing (9) and rearranging yields

\[
\Pi_C^L - \Pi_C^U = \frac{DM[2(1-\gamma) - \alpha(2-\gamma)]}{[2\gamma(D(16-\gamma^2) + 16M(1-\gamma^2)) - \alpha(2-\gamma)(D(4-\gamma^2)^2 + 8M(1-\gamma^2)(2-\gamma^2))]} \times \frac{4(2-\gamma)^2[D(4-\gamma^2)+4M(1-\gamma^2)]^2}{4(2-\gamma^2)[D(4-\gamma^2)+4M(1-\gamma^2)]^2}
\]  

(17)

The denominator in the first part of (17) is clearly positive, as is the term \( DM \) on the numerator. The sign of the expression thus hinges on the sign of the other two terms in square brackets, which can be positive or negative.

Note first that by substituting \( \gamma = 0 \) into (17), the whole expression reduces to \( 4DM(1-\alpha)^2/(D+M) \) which is clearly positive if \( \alpha \neq 1 \) and equal to zero when \( \alpha = 1 \). If the competing retailers are viewed as being demand independent, i.e. \( \gamma = 0 \), then the chain-store will only be indifferent between using local pricing and national pricing when the demand functions are
identical across all markets, i.e. when \( \alpha = 1 \). Otherwise it strictly prefers to use local pricing (i.e. for \( \alpha \neq 1 \)).

The intuition behind this result is immediate. When \( \gamma = 0 \), the demand independency between the firms means that in essence the chain-store is free to behave as if it were a monopolist in all the markets. In such circumstances, and with no competition concerns to consider, it would always price discriminate given demand differences between local markets. The only exception is where the local demand across all markets is identical, i.e. \( \alpha = 1 \), as here there is no difference in the prices set, and the resulting profit, under uniform and local pricing.

In general, of course, \( \gamma \neq 0 \). Our key result is the following:

**Proposition 1.** For \( \alpha \in (0,1) \) there exists a zone in \((\alpha, \gamma)\) space for which the chain-store retailer prefers national pricing. This zone has two boundaries. The first boundary is given by the condition that the monopoly market price is equal to the duopoly market price, i.e. \( p^m = p^d \). The other boundary lies above (i.e. outside) the first in \((\alpha, \gamma)\) space.

**Proof.** As noted above, the sign of the equation in (17) rests on two terms. These can be re-expressed to yield two conditions, relating \( \alpha \) and \( \gamma \), such that when either holds the value of (17) is zero. Specifically \( \Pi^L_C = \Pi^U_C \) if \( \alpha = 2(1-\gamma)/(2-\gamma) \) or \( \alpha = [2(1-\gamma)/(2-\gamma)]Z_C \), where \( Z_C = [D(16-\gamma^4)+16M(1-\gamma^2)质押/D(4-\gamma^2)^2+8M(1-\gamma^2)(2-\gamma^2)] \). Note that the first condition then amounts to \( p^m = p^d \) while the second is \( p^m = p^dZ_C \). Next, observe that \( Z_C \) takes a value strictly greater than unity as long as \( \gamma \in (0,1) \). This follows since \((16-\gamma^4)D > (4-\gamma^2)^2D \) and \(2(1-\gamma^2)M > (1-\gamma^2)(2-\gamma^2)M \). Thus these two loci divide the profit space in dimensions \((\alpha, \gamma)\) into three segments. Expression (17) must take on either a positive or a negative value in each of these segments. Further, by simple substitution, of \((\alpha, \gamma)\) values \((0,0)\) and \((1,1)\), we see that in the lowest and uppermost segments, the expression is positive. Next note that the expression is strictly convex with respect to \( \alpha \) since \( \partial^2(\Pi^L_C - \Pi^U_C)/\partial \alpha^2 = DM[D(4-\gamma^2)^2+8M(1-\gamma^2)(2-\gamma^2)]/[2(D(4-\gamma^2)+4M(1-\gamma^2))^2] > 0 \). Hence in the middle section, the expression is negative. \( Q.E.D. \)
The immediate implication of Proposition 1 is that there are competitive conditions under which uniform pricing could be preferred by the chain-store.

The precise nature, shape and extent of the zones where uniform pricing or local pricing might be preferred by the chain-store is informed by the following corollaries which build on Proposition 1:

**Corollary 1.** The lower, inner boundary, where \( p^m = p^c \), is strictly downward sloping in \((\alpha, \gamma)\) space and strictly concave to the origin (\(\alpha = \gamma = 0\)). The upper, outer boundary is also strictly downward sloping. Both boundaries converge at opposite extreme values of \(\alpha\) and \(\gamma\), i.e. in the limit where \(\alpha \to 1, \gamma \to 0\) and \(\alpha \to 0, \gamma \to 1\).

**Proof.** A sufficient condition for the downward slope and concavity of the inner boundary is that the first-order and second-order derivatives of \( p^d \) with respect to \(\gamma\) are negatively signed. This is satisfied since \( \partial p^d / \partial \gamma = -2/(2-\gamma)^2 < 0 \) and \( \partial^2 p^d / \partial \gamma^2 = -4/(2-\gamma)^3 < 0 \). In regard to the downward slope of the upper boundary, partial differentiation with respect to \(\gamma\) reveals that \(\partial (p^d Z_I) / \partial \gamma = -2[D^2 X_1 + 8DM(1-\gamma)X_2 + 128(1-\gamma)M^2 X_3]/[(2-\gamma)(4-\gamma^2 + 8M(1-\gamma)^2(2-\gamma))]^2\). With all other terms positive, aside from the front negative sign, the overall sign of the expression rests on the signs of the identities \(X_1, X_2\) and \(X_3\). These in fact are all signed positively as \(X_1 \equiv 256(1-\gamma)^2 + 384\gamma(1-\gamma)^2 + 56\gamma^2 - \gamma^3 > 0\), \(X_2 \equiv (2-\gamma)^3 [16 + 36\gamma^2 + 15\gamma^3 + \gamma^4] > 0\) and \(X_3 \equiv (1-\gamma)^2 [2(1-\gamma)^2 + \gamma^2 (3-2\gamma)] > 0\). Accordingly, \(\partial (p^d Z_I) / \partial \gamma < 0\) and thus the second boundary is also strictly downward sloping. Finally, convergence of the boundaries at opposite extreme points is shown by evaluation at these extremes. **Q.E.D.**

Note that uniform pricing can be relatively attractive to the chain-store when there is essentially a tradeoff between the similarities in market sizes (captured by \(\alpha\)) and similarities in competing products (captured by \(\gamma\)). Specifically, as the markets become more similar (i.e. as \(\alpha\) grows), then the requirement for uniform pricing to be more profitable for the chain-store is that competitive intensity reduces (i.e. \(\gamma\) declines), and vice versa. Yet, as clear from
the Corollary in regard to the shape and position of the boundaries, the greatest scope for uniform pricing being preferred by the chain-store is when both parameter values are mid-to-high. These circumstances can mean that with uniform pricing the chain-store does not lower the uncontested market price too significantly below the monopoly level, and so does not lose too much profit from these markets, while at the same time the practice allows for higher prices and so higher profits in the duopoly markets, allowing for an overall net increase in profits.

**Corollary 2.** Irrespective of the value of $\mu$, if the monopoly price is lower than the duopoly market price then the chain-store strictly prefers local pricing.

**Proof.** This follows directly from Proposition 1, where the condition $p^m < p^d$ is independent of the values of $D$ and $M$, and thus of $\mu$ as well. Q.E.D.

This result arises from the averaging effect involved in uniform pricing. Here it serves to raise the price in the monopoly markets while lowering that in the contested markets. Both of these moves lower the chain-store’s profits irrespective of how many monopoly or contested markets there are. In the case of the duopoly markets, competition is intensified with the chain-store’s more aggressive pricing encouraging the local independent retailer to respond in kind. Thus when $p^m < p^d$ it can never be in the chain-store’s interest to adopt uniform pricing.

**Corollary 3.** As the proportion of monopoly markets relative to contested markets increases (i.e. as $\mu$ increases) the outer boundary extends out in $(\alpha, \gamma)$ space, extending the zone for which uniform pricing might be preferred.

**Proof.** Observe that $p^d$ and, therefore, the first boundary, are independent of $M$ and $D$, and thus $\mu$. The effect on the second boundary relates to the effect of $\mu$ on $Z_C$. Letting $M = \mu N$ and $D = (1-\mu)N$ and rearranging, we can re-express $Z_C$ as a function of $\mu$; specifically $Z_C \equiv \{(16-\gamma^4) - \mu \gamma^2(16-\gamma^2)\}/\{(4-\gamma^2)^2 - \mu \gamma^2(16-7\gamma^2)\}$. Partial differentiation of $Z_C$ with respect to $\mu$ reveals $\partial Z_C/\partial \mu = [8\gamma^4(1-\gamma^2)(4-\gamma^2)/\{(4-\gamma^2)^2 - \mu \gamma^2(16-7\gamma^2)\}] > 0$. An increase in $\mu$ increases the value of $Z_C$, thereby extending out the upper boundary in $(\alpha, \gamma)$ space, and thus extending
the zone for which the uniform pricing equilibrium offers the chain-store higher profits than the local pricing equilibrium. *Q.E.D.*

The intuition is that as the number of monopoly markets increases then to raise price in the duopoly markets it requires proportionately less of a decrease in price in the monopoly markets. Observe that in the limit as \( \mu \to 1 \), then \( Z_C \to 2/(2-\gamma^2) \) which takes on a maximum value of 2 when \( \gamma = 0 \). Conversely, as the proportion of monopoly markets decreases, then to raise price in the duopoly markets means dropping monopoly market prices relatively more. In the limit as \( \mu \to 0 \) then \( Z_C \to (4+\gamma^2)/(4-\gamma^2) \), which only has a maximum of \( 5/3 \) when \( \gamma = 0 \).

This corollary has interesting implications for what happens as a chain-store grows in size. If it grows by expanding into "virgin territory", then it becomes more likely that uniform pricing is maintained. However, if as it grows it comes into increasing contact with other firms’ outlets, then uniform pricing is less likely to be maintained. This latter possibility is perhaps the more likely, since the overall density of outlets is increasing.

Moving further away from the modelling, as the chain expands it is also likely to encounter a greater diversity of market situations, for example a greater range of \( a \) values across markets. As a result, there will be a tension between maintaining a uniform pricing policy and pricing more nearly in accord with local demand conditions, leading to pressure to relax the policy.

To get a better feel for the results set out in the Propositions and Corollaries above, it is perhaps instructive to consider them in a diagrammatic form, as in Figure 1. Here, represented in \((\alpha, \gamma)\) space, and showing the case where \( \mu = 1/2 \) (i.e. \( M = D \)), the two boundaries from Proposition 1 divide the area into three zones, L1, U and L2. In region L1, the chains-store’s profits are greater under local pricing, in area U they are greater under uniform pricing equilibrium, and in area L2 greater under local pricing again.

[Figure 1 about here]
Yet, as can be seen in Figure 1, the area for where uniform pricing offers the chain-store the prospect of higher profits is quite limited. For much of \((\alpha, \gamma)\) space, local pricing offers the chain-store higher aggregate profits. This applies first to the large area below the lower boundary, where \(p^m < p^d\). This area is fixed in size since the lower boundary is unaffected by the number of monopoly or contested markets. The second area where local pricing is preferred is where \(p^m > p^dZ_c\). In this region, uniform pricing, when compared to local pricing, has the effect of lowering the monopoly market price to the extent that the gain in profits from duopoly markets would not sufficiently outweigh the loss of profits from monopoly market profits. However, the size of this second zone is affected by the relative composition of the different market types. From Corollary 3, the upper boundary extends out in \((\alpha, \gamma)\) space as the proportion of monopoly markets increases (i.e. as \(\mu\) increases). The illustration in Figure 1 is for the case where \(\mu = \frac{1}{2}\), with higher (respectively, lower) values of \(\mu\) the second area where local pricing offers higher profits shrinks (expands) slightly.

3.4. Profit Comparison for the Independent Retailers

Having observed the chain-store’s possible preferences over pricing policy according to different local market conditions, we now turn to consider briefly the independents’ position. Let us consider how the choice of the chain-store’s pricing policy affects competition for the independent retailers. The difference in profits for each independent according to whether the chain-store practises local pricing as opposed to uniform pricing is as follows:

\[
\pi^L_{ih} - \pi^U_{ih} = \frac{M(1-\gamma)[2(1-\gamma)-\alpha(2-\gamma)]}{[(2-\gamma)(D(4-\gamma^2)+4M(1-\gamma^2))]^2} \\
\times [2(D(4-\gamma^2)+16M(4-\gamma)(1-\gamma^2))+M\gamma\alpha(1+\gamma)(2-\gamma)] \quad \forall h
\]

**Proposition 2.** Each independent retailer prefers the chain-store to price locally if \(p^m < p^d\) and price uniformly if \(p^m > p^d\) for \(\gamma \in (0,1)\), otherwise it is indifferent over the chain-store’s price policy.

**Proof.** Observe that all terms in (18) are strictly positive for \(\gamma \in (0,1)\) with the exception of the square bracketed term on the numerator in the first part of (18). This term, which is independent of \(D\) and \(M\), is positive (respectively, negative), so the whole expression is
positive (negative), if $p^m < (>) p^d$. When $\alpha = 1$ or $p^m = p^d$ then the whole expression equals zero. \textit{Q.E.D.}

The preferences of each independent retailer, based on this profit comparison, can also be represented in diagrammatic form in Figure 1. It is interesting to make comparisons across the zones. First, in region L1, $\Pi_C > \Pi_U$ and $\pi_{ih} > \pi_{jh}$ so the preferences of all firms are aligned in favour of local pricing. Since $p^m < p^d$, uniform pricing by the chain-store would intensify competition in duopoly markets, to the detriment of both the independents and the chain-store. However, when $p^m > p^d$, the alignment in preferences is only partial. In this situation, the independent retailers would always prefer the chain-store to adopt uniform pricing as this dampens competition and raises their profits in the duopoly markets. But since the chain-store would only gain from uniform pricing if the loss of profits from its monopoly markets was not too great, then for high values of $\alpha$ and/or $\gamma$, specifically in zone L2, the preferences of the chain-store and the independent retailers are likely to be at variance.

3.5. Further analysis of the results

To make sense of all the above results, let us provide some general intuition. At the point where $\alpha = 2(1-\gamma)/(2-\gamma)$ all prices are the same. As $\alpha$ increases above this, the Individual Monopoly price ($p^m$) increases most rapidly ($\partial p^m / \partial \alpha = 1/2$), followed by the Uniform price set by the chain-store, then the corresponding price set by an independent. The Individual Duopoly price ($p^d$) does not increase at all (being independent of $\alpha$). Thus the benefit to the chain-store of setting an individual price in each type of market is that price is tailored more exactly to the market conditions. In the absence of competition (in either market), this would be the only effect, so that profits would be no lower under individual pricing than under uniform pricing. However, where there is competition in the market, there is an additional strategic effect. Raising the price in the contested market through binding oneself to uniform pricing induces a rise in the independent’s price through a softening of competition (notice that the independent’s price rises although the impact of $\alpha$ is solely indirect). This strategic effect is sufficient to raise profits for both players, at least for a range of parameters. In the case of the chain-store, since there is always a trade-off involved in uniform pricing, the area where profits are raised is substantially limited. But in the case of the independent retailer,
softening of competition is always beneficial, so that we would expect a much larger area over which the independent retailer would prefer uniform pricing.\textsuperscript{16}

Of course, if each monopoly market is sufficiently smaller than each contested duopoly market, price is lower in the former. In this case, the logic works in reverse – lowering price in the duopoly market induces a more competitive response by the independent retailer, reducing profits. Hence under these circumstances, both the chain and the independent will strictly prefer individual market pricing.

A legitimate question is whether the results derived above are special to the assumptions of either a monopoly or a duopoly in the markets and disappear for greater firm numbers. Without attempting a complete exploration of the various multi-firm cases, which would be beyond the scope of the paper, we can show that the results are not special in this sense.

Take first the case of more than one chain and consider the following scenario (following a suggestion by an anonymous referee). There are three independent markets and two chain stores, A and B. A and B compete in market 1, A is a monopolist in market 2 and B a monopolist in market 3. Markets 2 and 3 are identical. Consider only symmetric equilibria. We have the following further Corollary to Proposition 1:

\textit{Corollary 4.} The situation described above has a symmetric equilibrium in which both A and B commit to uniform prices, or a symmetric equilibrium in which both practice local pricing, dependent upon parameters in precisely the manner of Proposition 1.

\textit{Proof.} All markets, by assumption, are independent, so we may separate them into groups. A and B in market 1 are in precisely the same position as our chain store and the independent are in a duopoly market in Proposition 1. Therefore, examining markets 1 and 2 together, A finds itself in duopoly competition in market 1 and a monopolist in market 2. This is the outcome described in Figure 1. Similarly, examining markets 1 and 3 together, B finds itself in duopoly competition in market 1 and a monopolist in market 3. This is also the outcome depicted in Figure 1. Hence there will be equilibria as described in the Corollary. \textit{Q.E.D.}
Alternatively, if we assume that the chain store faces two independents in some markets and is a monopolist in others, our key propositions hold but in this case it can be shown that the boundary lines are straighter (indeed, the lower boundary is completely straight since the competitive market price under local pricing is \((1-\gamma)/2\)). The consequence is that the area where uniform pricing is preferred by the chain-store is smaller and involves slightly lower values of \(\alpha\) and \(\gamma\) than when there is just one independent retailer. The smaller area is explained by the extra cost to the chain-store of using uniform pricing policy to support higher prices for all participants in the competitive markets when this is paid for by reduced profits in its monopoly markets.

Apart from the number of players having an impact on the outcomes, we expect that any differences in the competitive position of the chain-store compared to the independent retailers might also have in impact on the market conditions favouring uniform pricing. For example, the chain-store might benefit from economies of scope by operating across different markets allowing it to operate at a lower unit cost than independent retailers. Further (unreported) analysis of this case shows that our propositions hold but the effect of the independents facing higher costs is that uniform pricing is preferred by the chain-store under relatively higher values of \(\alpha\). The reason is that any cost disadvantage faced by the independents only affects the duopoly prices under local pricing and not the monopoly level. Higher costs for the independents translate into higher duopoly prices which means that higher \(\alpha\) is required for the boundary conditions to apply (i.e. \(p^m = p^d\) and \(p^m = p^d Z_C\)), resulting in both boundaries swinging upwards in \((\alpha, \gamma)\) space, with the effect of increasing zones L1 and U at the expense of shrinking L2.

4. Pricing Policy Commitments

While Proposition 1 above shows the conditions under which the chain-store’s profits are higher when it forsakes price discrimination in favour of a uniform pricing policy, this will not necessarily be the preferred choice by the chain-store. Indeed, on an individual basis, for the chain-store, price discrimination is unilaterally profit improving whatever price the chain
anticipates the independent retailers setting. Of course recognising this, the independents would not set prices anticipating the chain-store uses uniform pricing, rather their best response would be to stick to the assumption that the chain-store will use local pricing. The result would be that jointly the firms are worse off. The only solution is if the chain-store can visibly pre-commit to uniform pricing in such a fashion that the independent retailers can be certain that the chain-store’s hands are tied when it comes to actual determination of prices. This section considers the possible means by which this might be achieved in practice.

A simple example illustrates the problem. Let us take a case where total profits for the chain-store are greater under uniform pricing. Drawing on Figure 1, take the case where \( \alpha = \frac{1}{2}, \gamma = \frac{3}{4}, D = 1 \) and \( M = 1 \). Then, under local pricing, from (7), the price set by each firm in the duopoly market is \( p^d = \frac{1}{3} \), while the chain-store sets \( p^m = \frac{3}{8} = 0.375 \) in the monopoly market. Under uniform pricing, from (12a) the chain-store sets \( p^{UC} = \frac{19}{54} \approx 0.35185 \), while from (12b) the independent retailer optimally sets \( p^{UI} = \frac{73}{216} \approx 0.33796 \). Inputting these values into the relevant profit functions, respectively (8) and (9) for local pricing and (15) and (16) for uniform pricing, reveals the payoffs for the chain-store and the independent for the four possible cases. These payoffs associated with the respective prices are shown (to five decimal places) in Table 1 (with the first in each box being the chain-store’s payoff).

<table>
<thead>
<tr>
<th>Chain-store</th>
<th>Independent retailer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“Uniform” (0. 33796)</td>
</tr>
<tr>
<td>Uniform (0.35185)</td>
<td>(0.28887, 0.15229)</td>
</tr>
<tr>
<td>Local (0.33333)</td>
<td>(0.25086, 0.15226)</td>
</tr>
</tbody>
</table>

Here we see the deviation problem since when the independent plays “uniform” (i.e. sets price on the assumption that the chain-store is uniform pricing), but the chain itself plays
“local”, the chain makes more profits than if it sets uniform prices. Of course, anticipating that the chain-store’s incentive is to “deviate” to “local”, the independent would have the same incentive. However, it is important to note that the independent does not have a unilateral incentive to deviate from the “uniform” outcome.

The deviation problem may be solved in one of two ways. First, the chain-store may pre-commit to uniform pricing so that the independent retailer would price optimally based upon that commitment and both players would be better off as a result. Visible commitment would be a necessary requirement to ensure that the chain achieves the higher profits offered by uniform pricing in circumstances where they are greater than those offered by local pricing equilibrium.

In order to overcome cheap talk problems the chain would need some expensive commitment mechanism that would render its position worse were it not to adopt uniform pricing than if it did so. In the case of some retailers this comes about by publishing all prices in a catalogue which then applies across the whole country, e.g. IKEA in furniture and furnishings or Argos in the UK for general merchandise, with no scope for local price deviations. An alternative commitment can arise through national advertising to inform consumers about prices, such as practised in UK electrical goods retailing or burger chains, or through use of integral price tags standard across a country (such as used by Marks & Spencer). Further evidence that many chains commit to uniform pricing comes from the special treatment accorded to deviations from that commitment. Thus in a store carrying hundreds if not thousands of lines of, say, electrical or household goods, it is quite common to see a small set, of maybe 5-10 items marked as “manager’s special”. These are clearly designated as the only goods over which local pricing has been sanctioned.

The second (connected) way to ensure commitment to uniform prices is to render deviations from uniform pricing transparent. The independent retailer is also worse off through local pricing and therefore has an incentive to punish a tacit agreement to maintain uniform prices by itself reverting to local prices. If it is clear that the independent can quickly move to local price responses when such a tacit agreement is broken, the incentive for the chain-store to
choose uniform prices is much enhanced. Thus if the independent commits, say, to not being undersold, this will assist in maintaining a tacit agreement that the chain-store sets uniform prices.21

An alternative to “solving” the deviation problem is to find a way of avoiding it entirely. One possibility would be if the chain-store could break down local market boundaries to create essentially a national market for its own goods by removing the geographical restrictions facing consumers. For example, this might be possible if consumers were allowed full access to the store network regardless of their location (i.e. no restrictions on passive sales), with orders taken from any part of the country then backed with either home delivery or delivery to the nearest available store (as offered for example by a number of UK clothing retailers including Marks & Spencer). A similar effect could arise through a retailer developing an Internet operation to run alongside its store operations, i.e. become a “clicks and bricks” retailer, making a commitment to offering online prices equal to the lowest store-level prices. In the case of the UK’s largest retailer, Tesco plc, its online facility (Tesco.com) is backed up by an extensive price comparison website providing prices on several thousand grocery products available at its supermarkets, serving to promote uniform prices across these stores.

5. Consumer Welfare Analysis

Thus far we have only considered the preferences of the firms competing in the market. Clearly, the choice of pricing policy, which can alter the balance of prices in the markets, may have an impact on consumers and thereby social welfare. To consider the welfare effects of the chain-store’s choice over pricing policy, we focus here on consumers’ interests, assessing the effects on (aggregate) consumer surplus and commenting briefly on the impact on net economic welfare.

Given that choice is fixed, consumers would naturally prefer the lowest possible prices in their respective markets. In the present setting, consumers in the different markets may be expected to have divergent interests over the chain-store’s pricing policy. As \( p^m \) rises above \( p^d \), the uniform price becomes lower than the monopoly market price but higher than the duopoly market price. Thus, in small/poor markets, consumers are worse off with local
pricing, whereas in large/affluent markets they are better off with local pricing. Clearly, whichever policy the chain-store ultimately decides on, consumers in those markets where price is lowered (compared to what would emerge under the alternative pricing regime) would benefit, while the other consumers would lose out. Accordingly, there is unlikely to be unanimity of preferences amongst consumers.22

To consider the overall impact on consumers we can consider the respective levels of aggregate consumer surplus under each pricing regime, recognising that different consumer groups will likely have different preferences but looking at the net difference. Here we define this in terms of an unweighted aggregation of the different consumer utility functions. Specifically, aggregate consumer surplus, $S$, is taken as the aggregation of the (constrained) representative consumer utility functions over the various contested and monopoly markets (i.e. respectively over $V_h(q_{lh},q_{eh}) \forall h$ and $V_k(q_{lk}) \forall k$):

$$S = \sum_{h=1}^{D}(q_{ch} + q_{lh} - \frac{1}{2}[(q_{ch})^2 + 2\gamma q_{ch}q_{lh} + (q_{lh})^2] + m_h - p_{ch}q_{ch} - p_{lh}q_{lh})$$

$$+ \sum_{k=1}^{N}(\alpha q_{ck} - \frac{1}{2}(q_{ck})^2 + m_k - p_{ck}q_{ck})$$

(Equation 19)

Evaluating the terms with respect to the different equilibrium values under local and uniform pricing to identify aggregate consumer surplus under each regime, i.e. respectively $S^L$ and $S^U$, while abstracting from any income effects, shows

$$S^L = D/[(1 + \gamma)(2 - \gamma)^2] + (M\alpha^2)/8$$

(Equation 20)

$$S^U = [D(2D^2(2 + \gamma)^2 + 2DM(2 + \gamma)(1 - \gamma^2)(2(3 + \gamma) - \alpha(2 + \gamma))$$

$$+ M^2(1 + \gamma)(1 - \gamma^2)(4(1 - \gamma)(5 + 3\gamma) - 4\alpha(1 - \gamma)(4 + 3\gamma) + \alpha^2(4 - 3\gamma^2)))$$

$$+ M(1 + \gamma)(D(2 + \gamma)(1 - \gamma - \alpha(2 - \gamma)) + 2\alpha M(1 - \gamma^2))^2]$$

$$\div [2(1 + \gamma)(D(4 - \gamma^2) + 4M(1 - \gamma^2))^2]$$

(Equation 21)

Taking the difference between the two levels reveals

$$S^L - S^U = -\frac{DM[2(1 - \gamma) - \alpha(2 - \gamma)]}{8(2 - \gamma)^2[D(4 - \gamma^2) + 4M(1 - \gamma^2)]}$$

$$\times [D(2 - \gamma)(2 + \gamma)^2(2(6 - \gamma)(1 - \gamma) - 3\alpha(2 - \gamma^2))$$

$$+ 4M(1 - \gamma^2)(2(1 - \gamma)(12 + 4\gamma - 3\gamma^2) - \alpha(2 - \gamma)(12 - 5\gamma))]$$

(Equation 22)
As with the profit comparison for the chain-store, (17), the sign of the above expression rests on the sign of the term in square brackets on the numerator in the first part of the equation and the square bracketed term in the second part of the equation. It can be shown that this expression is negative for \( \alpha = 0, \alpha = 1 \) (for \( \gamma \neq 1 \)) or \( \gamma = 0 \) (for \( \alpha \neq 1 \)), i.e. aggregate consumer surplus is greater under uniform pricing. However, as with the profit comparison, this result is not universal as the following proposition establishes:

**Proposition 3.** For \( \alpha \in (0,1) \) there exists a zone in \((\alpha, \gamma)\) space for which aggregate consumer surplus is greater under local pricing. This zone has two boundaries. The first boundary is given by the condition that the contested market price is equal to the monopoly market price, i.e. \( p_m = p_d \). The other boundary lies strictly above (i.e. outside) the first.

**Proof.** The sign of equation (22) rests on two terms. These two terms can be re-expressed to yield two conditions, relating \( \alpha \) and \( \gamma \), such that when either holds the value of (22) is zero. Specifically, we find that \( S^L = S^U \) if \( \alpha = 2(1-\gamma)/(2-\gamma) \) or \( \alpha = [2(1-\gamma)/(2-\gamma)]Z_S \), where \( Z_S = [D(6-\gamma)(2+\gamma)(4-\gamma^2)+4M(1-\gamma^2)(12+4\gamma-3\gamma^2)]/[3D(4-\gamma^2)^2+4M(1-\gamma^2)(12-5\gamma^2)] \in [1,13/7) \). Note that the first condition then amounts to \( p_m = p_d \) while the second condition is \( p_m = p_d Z_S \). Then, observe that \( Z_S \) takes a value strictly greater than unity as long as \( \gamma \in (0,1) \). This follows since \((6-\gamma)(2+\gamma)D > 3(4-\gamma^2)D \) and \((12+4\gamma-3\gamma^2)M > (12-5\gamma^2)M \). Thus, the second condition requires higher values of \( \alpha \) for it to hold when compared to the first condition. Next, it can be observed that the extreme values of \( \alpha \) and \( \gamma \) do not support \( S^L > S^U \). Also, observe that \( \partial^2(S^L-S^U)/\partial \alpha^2 = -DM[3D(4-\gamma^2)^2+4M(1-\gamma^2)(12-5\gamma^2)]/[4(D(4-\gamma^2)^2+4M(1-\gamma^2))] < 0 \), hence the expression is strictly concave with respect to \( \alpha \). It then follows that the zone which supports \( S^L > S^U \) applies where \( \alpha, \gamma \in (0,1) \) with \( p_m = p_d \) operating as the lower boundary and \( p_m = p_d Z_S \) as the upper boundary. Q.E.D.

As with the chain-store profit comparison, conditions can be readily identified with respect to the nature and shape of these boundaries. The inner boundary is, of course, the same as before where \( p_m = p_d \), i.e. strictly downward sloping and concave in \((\alpha, \gamma)\) space. The outer
boundary can also be shown to be strictly downward sloping and concave. As with the profit comparison, the two boundaries converge at opposite extremes of the parameter space, i.e. as \( \alpha \to 1, \gamma \to 0 \) and \( \alpha \to 0, \gamma \to 1 \).

We may see that the chain-store’s preferred pricing regime is generally at odds with that which offers the highest aggregate consumer welfare. It can be observed that for \( p^m < p^d \) then \( \Pi_{LC}^L > \Pi_{UC}^U \) but \( S^L < S^U \), i.e. strictly divergent preferences. For \( p^m > p^d \) then preferences depend on the respective values of \( Z_C \) and \( Z_S \). For \( p^m < p^d Z_C \) and \( p^m < p^d Z_S \) or \( p^m > p^d Z_C \) and \( p^m > p^d Z_S \) then again preferences are divergent, with respectively \( \Pi_{LC}^L < \Pi_{UC}^U \) but \( S^L > S^U \) and \( \Pi_{LC}^U > \Pi_{UC}^U \) but \( S^L < S^U \). Only when \( p^m < p^d Z_C \) but \( p^m > p^d Z_S \) or \( p^m > p^d Z_C \) but \( p^m < p^d Z_S \) can there be shared interests, respectively over uniform pricing or local pricing. However, the scope for either of the latter conditions holding is very limited given that they have very similar finite ranges with \( Z_C \in [1,2) \) and \( Z_S \in [1,\frac{13}{7}) \). Nevertheless, a small area of shared preferences for uniform pricing can exist when \( \alpha \) takes on high values and \( \gamma \) low values, and similarly an area (but likely to be very small) can exist where preferences are aligned in favour of local pricing when \( \gamma \) is extremely high and \( \alpha \) is low.

Figure 2 illustrates the point by amending figure 1, again for the case where \( \mu = \frac{1}{2} \), with \((\alpha,\gamma)\) space divided into three zones. Here consumers collectively prefer uniform pricing if \( \alpha \) and \( \gamma \) both take low to moderate values or very high values, represented by zones U1 and U2. Aggregate consumer preferences for local pricing are restricted to a small zone L for other values of \( \alpha \) and \( \gamma \).

To illustrate the general divergence between the chain-store’s preferences and those of consumers in total, we note that the lower boundary is the same as in Figure 1 but involves reversed preferences to each side, while the upper boundary as represented by the solid line generally lies slightly above the upper boundary relating to profit comparisons, shown for convenience by the dashed line in Figure 2. The basic issue is that firms prefer higher prices, consumers lower, so in general there is a conflict between the two views.
Clearly, we could go on from here to identify the sum effect on social welfare, measured for example as the sum of consumer surplus and profit, without regard to distribution. However, since the functional forms used are clearly special, not much purpose will be served by doing so on this occasion. We have shown there will be opposing effects in general, so the sum impact will depend upon the details of the model, rather than there being any general implications. It is very likely that there will be areas where there is a conflict between the chain-store’s preferences and societal preferences, principally when consumer surplus is considerably disadvantaged.23

6. Conclusions

This paper focuses on an apparently innocuous policy decision facing all chain-stores: whether to commit to local pricing or adopt (uniform) national pricing. Our analysis shows that a range of competitive conditions exists where a strategic commitment to uniform pricing can raise the chain-store’s profits over the case where it simply prices according to resulting local competitive conditions and shows that rival retailers are also better off. However, the scope for setting uniform prices in a profitable manner appears limited. The cost of dampening competition in contested markets is lowering prices and thus profits in secure monopoly markets. If the required price drop is too large, strategic behaviour of this type will not be worthwhile and the chain-store would be better off simply setting individual prices to maximise profits in each local market.

Competition authorities might be concerned about any pricing policy that seeks to dampen competition, thereby allowing the firm to raise profits by raising prices. Equally, authorities might be concerned about firms using price discrimination to exploit different geographically constrained consumer groups. This paper considers both of these situations. With uniform pricing there is the possibility that it might be used as a form of strategic behaviour to dampen competition. With local pricing, there is obvious third-degree price discrimination with prices set according to different local competitive conditions. Yet, such behaviour may not necessarily be against societal interests when higher prices in some (i.e. contested)
markets may be compensated for by lower prices in other (i.e. monopoly) markets. From a public policy perspective, uniform pricing should not necessarily be seen as a desirable norm.
ENDNOTES


2 The Competition Commission uses the term “price flexing” whereby supermarkets adapt prices on a number of goods depending on local conditions. Individual product prices were found in some retailers to vary considerably (by as much as 100%), but average prices only differed across each chain by up to 3%. The Commission concluded that the practice was anti-competitive and could be expected to operate against the public interest. However, no action was taken and the practice continues.

3 For some estimates, see Levy et al. (1997).

4 Interestingly, pricing is often consistent across locations for many retailers even when retailing costs vary considerably. An example would be the substantially higher salaries and property costs of operating in central London compared to operating in other cities in the UK.

5 In regard to pricing strategies, there are obviously a number of widely discussed means of softening competition through contractual obligations with customers. These include price-matching promises and retroactive MFC clauses (e.g. Salop (1986) and Cooper (1986)). The former is clearly feasible in the present setting but, as several papers have pointed out, in practice it is not obvious that it will be a profitable strategy (e.g. Logan and Lutter (1989), Corts (1997), Hviid and Shaffer (1999) and Chen et al. (2001)). The latter we avoid considering here on grounds that it involves consideration of multiple (at the very least two) rounds of price competition. Here we restrict our attention to a single-shot pricing game.

6 Winter (1997) focuses on the joint incentive for firms to agree on limiting price discrimination. He shows conditions under which such moves can be jointly profitable and also welfare increasing. His illustration is of retailers agreeing to limit the value of coupon discounts in the context of consumers being distinguished by their degree of price sensitivity. Corts (1998) focuses on “best response asymmetry” where different firms have different strong or focal markets (for example where one firm specialises in high-grade products, another in lower quality goods). Here, unambiguous results may obtain – all prices may rise (or fall) under uniform pricing, for example, so conceivably firms may wish to use the practice to avoid “all-out competition”.

7 Again, there are different emphases. For instance, DeGraba (1987) focuses on government-imposed MFC clauses that make a national firm a weak price competitor against local firms by preventing the national firm setting prices independently in different local markets. The result is that non-price competition is intensified, prices and profits fall but welfare increases by virtue of decreased product differentiation. In contrast, the model developed by Besanko and Lyon (1993) illustrates that private preference for contemporaneous MFC clauses can exist. They show a “bandwagon effect” in which adoption of an MFC clause is more attractive the more firms that have already adopted them in n-firm oligopoly. So that n matters in terms of numbers of adopters.

8 The distinction, for example, may be between large cosmopolitan cities and small rural towns where there is a marked difference in both the number of consumers and their income profiles, and where retail planning restrictions might be less restrictive in the former compared to the latter.

9 Our prime concern here is not with strategies that place rivals at a competitive disadvantage (e.g. tactics to raise rivals’ costs – Salop and Scheffman (1983)), but rather on self-inflicted tactics which affect the firm’s own ability to compete aggressively (e.g. from raising its own costs).

10 The assumption of an independent retail competitor is used simply to make clear that we are focusing here on the choice for one player, the chain-store, between using local and national pricing. The analysis would remain
unchanged if the independent retailers were instead part of a chain themselves given we assume for the most part that there are no demand or cost connections between the local duopoly markets.

11 In practice a chain-store might enjoy cost advantages over an independent retailer at the firm level, if not at the store level, in part due to buying economies - see the discussion at the end of section 3. Yet, even as a single store operator, an independent retailer could feasibly enjoy the buying advantages of a large chain by affiliating to a national buying group, as is common in European food retailing (see Dobson et al, 2003).

12 Of course, if all the markets were identical then the chain-store’s position would be the same across all of them, meaning that local pricing would be identical to national pricing. Through the assumption that markets differ both by size and the amount of competition we ensure that some asymmetry in the set up is present which then allows us to consider whether this produces any tensions in the pricing strategy decision. In addition, the distinction between the markets does appear apposite in view of restrictive planning laws that have often served to limit new entry, in many instances granting incumbent retailers “islands of monopoly”, as discussed below.

13 The assumed link between the extent of consumer demand and the number of competitors might be justified in the context of smaller markets either not encouraging new entry or planners being reluctant to extend retail space when they perceive market demand is already satisfactorily served. This aspect lies at the heart of criticism in the UK of supermarkets being granted “islands of monopoly”, protected from incursion by restrictive planning policy (see Competition Commission, 2000, Ch.12). Similar criticisms have been levelled at the French authorities in view of the 1996 Raffarin law restricting new retail developments, particularly of hypermarkets (Clarke et al, 2002). See also Bresnahan and Reiss (1987) for some general empirical support for the assumption relating to US retail markets.

14 While it might be reasonable to assume demand independence across distinct local markets, the same may not be generally true of costs. Local costs of hiring labour and renting/purchasing sites may be independent, but there are likely to be cost elements such as procurement where the chain-store achieves economies of scope across its local markets. The impact of this is discussed later.

15 Another way of looking at this is to consider the effect of $\mu$ on $p_U^C$. From (12a), we can re-express $p_U^C$ in terms of $\mu$ such that $p_U^C = \left[ \frac{(1-\gamma^2)((2+\gamma)-\mu(2+\gamma)-2\alpha(1+\gamma))}{[4-\gamma^2-3\mu\gamma]} \right]$. Partially differentiating reveals that $\frac{\partial p_U^C}{\partial \mu} = \left[ \frac{2(1-\gamma^2)(2+\gamma)}{[2(1-\gamma^2)(2+\gamma)][2(1-\gamma^2)-\alpha(2-\gamma)][4-\gamma^2-3\mu\gamma]} \right]^2$ which is positively valued if $p^m > p^d$. In other words, the greater the proportion of monopoly markets, the higher will be the uniform price set by the chain-store, ceteris paribus, when the local monopoly price exceeds that of the local duopoly price.

16 In essence, as an anonymous referee has suggested to us, the chain-store with a commitment to a high price under uniform pricing offers the independents a “pricing umbrella”, allowing them to set prices under this umbrella in the duopoly markets and raise their profits in the process.

17 For the sake of brevity, the full analysis is not reported here but is available on request from the authors.

18 Again, full details are available on request from the authors.

19 This example highlights an interesting implication of our model, namely that the independent prices more cheaply than the chain-store. In fact, contrary to some expectations, there are examples where this happens. Delgado and Waterson (2003) document one, car tyres in the UK, where chain-store prices are several percentage points above independent outlet prices. Moreover, in other cases it is common for locally-based stores to have a higher level of service offering (for example, free delivery or favourable credit terms) meaning that the real price charged is lower than the chain’s price.
This representation in normal form with two pairs of prices should be seen as simply illustrative. The underlying dynamic game involves infinite strategy space and not just two discrete choices.

Note that enforcing commitment to uniform pricing is arguably more plausible than enforcing commitment to collusion on joint profit maximizing prices. This is because the gain in profit from cheating is less under commitment to uniform pricing than under collusion. Moreover, it is legal!

This finding fits with Corts’ analysis, principally his Proposition 3 (1998, p. 315).

For the interested reader, the analysis of the effects on net economic welfare, taken as an unweighted sum of producer and consumer surplus, illustrating this point is available on request from the authors.
REFERENCES


Figure 1 – The various regions of equilibrium ($\mu = \frac{1}{2}$)
Figure 2 – Aggregate consumer preferences over chain-store pricing policy ($\mu = \frac{1}{2}$)