The optimality of loss leading in multi-product retail pricing - a rationale for repealing the 1987 Groceries Order in Ireland

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The Optimality of Loss Leading in Multi-Product Retail Pricing - A Rationale for Repealing the 1987 Groceries Order in Ireland

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Abstract
The Competition Act in 1991 repealed all legally binding Orders in Ireland except for the 1987 Groceries Order. Article 11 of this Order categorically prohibits retail pricing in the grocery sector below the net invoice price of the wholesaler or manufacturer. The vast range of products retailed through outlets and the convenience of 'one stop' shopping result in imperfect consumer information and consumer switching costs. This enables retailers to price below cost on Known-Value-Items (KVI's) to attract customer entry and subsequently impose higher price-cost mark-ups on other non-KVI's, a practice defined as loss leading. This practice was deemed to be essentially predatory in effect by the Fair Trade Commission (FTC) in 1987. In this paper we examine the potential legitimacy of below cost selling by modeling the optimal pricing of a multi-product retailer in a game-theoretic framework. We show that loss leading is an equilibrium outcome that is socially desirable in an imperfectly competitive market. We also model the repercussions of introducing the ban for equilibrium profits, corresponding services and concentration levels in the market. Our analysis suggests that a removal of the ban in favour of the 1991 Competition Act would be welfare improving.

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Introduction

The Competition Act in 1991 repealed all legally binding Orders in Ireland except for the 1987 Groceries Order. Article 11 of this Order categorically prohibits retail pricing below the net invoice price of the wholesaler or manufacturer. The rationale for such prohibitive legislation, as shown in fig.1 and table 1, can be attributed to the concern over the historical evolution of the market structure of the grocery sector. Grocery products are retailed through a variety of different outlets which may be broadly categorised as consisting of Multiples, Symbols, and Independents. The persistent movement towards fewer and larger outlets, influenced the Fair Trade Commission (FTC) decision to introduce the ban in 1987 and retain it in 1991 under the conviction that pricing below cost in the years up to 1987 by larger retailers had "distorting and anti-competitive effects" (FTC Report, 1991: p.101) on market structure.

The FTC concedes that "below cost selling is essentially a promotional device" (RPC Report, 1986, p.45) in the grocery sector, but still considers it "an artifice, a trick, or a gimmick...the purpose [of which] is essentially to mislead the customer" (FTC Report, 1991, p.117-118). It is stated in the 1991 report that the

1 With the exception of "best before" and "seasonal goods", article 11 applies to all grocery products that fall within the scope of the Order. This consist of (i) all goods for human consumption excluding fruit and vegetables, fresh and frozen meats, fresh and unprocessed frozen fish; (ii) intoxicating liquor for consumption off the premises and (iii) other household necessities usually purchased in a grocer.

2 Multiples describe larger supermarkets with several branches operating on both a national or regional basis, including Dunnes Stores, Quinnsworth, and Superquinn. These target the "one stop" trolley shopper. Symbol groups define a subset of independent retailers operating under a common name with typically smaller outlets and longer opening hours than multiples. Examples include Centra, Supervalu, Mace, and Spar. Independents incorporate all remaining grocery retail outlets which focus on convenience "top up" shopping.
inherent features of a modern supermarket make it possible to successfully engage in below cost selling that is predatory in effect. The vast range of products retailed through multiple outlets and the convenience of ‘one stop’ shopping result in imperfect consumer information and consumer switching costs. This enables retailers to price below cost on Known-Value Items (KVI’s) to attract customer entry and subsequently impose higher price-cost mark-ups on other non-KVI’s, a practice defined as loss leading. Given that “the norm in any market is for the seller to add a percentage or an amount to each product to cover the seller’s costs” (FTC Report, 1991, p.118), loss leading is considered an abnormal pricing strategy. Hence it is argued that “interference is necessary to achieve the same conduct in grocery which is normal in all other activities” (FTC Report, 1991, p.100) and that a ban on loss leading would be beneficial to consumers. Consumers would thereby be offered a wider range of goods priced closer to marginal cost which will enhance customer information since observed prices will more accurately reflect the true value for money. This will prevent multiple retailers from utilising price to manipulate market conditions to the detriment of competing rivals or potential entrants.

Although price competition on KVI’s is restricted where loss leading is forbidden, it is the opinion of the FTC that the overall level of competition in the market does not degenerate given the consequent shift towards non-price competition. Since the implementation of the ban, the “emphasis has switched from deep-price cuts as a competitive weapon to finding out what else would attract the customer” (FTC Report, 1991, p.104) which has resulted in a significant increase in the average quality of individual premises and the services offered to consumers.

The motivation for the introduction of a ban on below cost selling was based on the assumption that the impact of loss leading on market structure was essentially predatory. In the presence of imperfect information and switching costs, the FTC deemed that multi-product retailers with price setting powers could potentially utilise a strategy of loss leading on KVI’s to manipulate the evolution of the market. On this basis, a ban on below cost selling was considered desirable. In this paper we examine whether such a belief is justified within a game theoretic framework.

We begin in section I with an overview of existing theories of predatory pricing. In section II we model the optimal pricing of a multi-product retailer under imperfect information and switching costs in a game-theoretic framework. The basic framework adopted is similar to that used in Sutton (1991) where the evolution of industrial structure in the presence of both exogenous and endogenous sunk costs is investigated. The concluding section of this paper considers the merits of removing the 1987 Groceries in favour of the 1991 Competition Act.

Section I: Theories of Predatory Pricing

Predatory pricing is defined as the use of a temporary price reduction by a firm with the intent of altering the evolution of market structure to increase longer term profits. This is achieved through inducing exit, deterring entry, or restricting rivals to relatively small market shares. The conventional, and in anti-trust cases the most prevalent, test of the existence predatory pricing was developed by Areeda and Turner (1975). Accordingly, prices below marginal cost (usually proxied by average variable cost) indicate predatory pricing. This test is clearly motivated by Pareto efficiency considerations and competitive equilibrium analysis. As pointed out in McGee (1980), in a competitive equilibrium analysis where there is free entry, exit and full information, a theoretical rationale for optimal predatory pricing is difficult to derive. The search for an economic theory that justifies the use of pricing as an instrument for manipulating market structure subsequently moved towards a game-theoretic framework which allows important inter-temporal and strategic issues to be modeled. In what follows we overview the new theories of predatory pricing and outline some of their implications for Anti-Trust Authorities.

Inter-temporal Demand Linkage Models
Farrell and Saloner (1986) and Katz and Shapiro (1986) outline the incentives for predatory practices when firms can create endogenous inter-temporal demand linkages through technological incompatibility. By assuming that the incumbent has first mover advantage and the existence of an endogenous barrier to entry in the form of technological incompatibility, temporary price reductions extract the consumers’ willingness to pay while simultaneously increasing the consumer base. Over the long run, as more consumers become locked in to their purchasing behaviour, the price is allowed to converge back towards its monopoly level. Endogenous barriers to entry in the form of technological incompatibility, distribution networks, or advertising expenditure, can create switching costs for consumers. Price may be used in conjunction with such choice variables to manipulate consumer switching costs and therefore can successfully determine the long run evolution of market structure.

The implications of the intertemporal demand linkage models for anti-trust actions are twofold. Firstly, pricing below marginal or average costs may not be a necessary condition for the existence of predatory pricing. Secondly, it is the ability of firms to create endogenous barriers to entry that drives a more concentrated market structure. Strategic pricing serves only as a supplemental device to increase the effectiveness of endogenous entry barriers. Hence, in such a case, anti-trust action targeted at the endogenous barriers to entry may be more successful at inducing competition in to markets.

In contrast, Cabral and Riordan (1994) introduce a model where pricing is used to exploit endogenous learning economics. In a setting of a imperfectly competitive market they demonstrate that pricing below marginal cost may be legitimately motivated by the desire to speed up a socially desirable learning process.

Imperfect Capital Markets Models

In imperfect capital market models prices are used to manipulate an endogenous capital market imperfection. Telser (1966) argues that multi-market firms can finance periods of temporary predatory pricing in one market using a ‘war chest’ from other markets. If those preyed upon can finance temporary losses in the capital market no predatory action will be undertaken. However, as in Bolton and Scharfstein (1988), if the financial lender has imperfect information regarding the extent of predation in the market, then persistently low profits will gradually reduce the prey’s access to capital. Thus imperfections in the capital market can lead predatory pricing to be an equilibrium outcome. Again, equilibrium predatory pricing may be above marginal cost. Moreover, it must be realised that strategic pricing is not the only means by which to gain an advantage over competitors in the presence of imperfect access to capital. Non-price variables, such as advertising or technology, financed by a ‘war chest’, can be used in a similar way.

Signaling and Reputation Models

Finally we turn to the models of asymmetric information based on signaling and reputation building. In signaling models the theoretical rationale for predatory pricing is based on a firm having an informational advantage via informational asymmetries relating to costs of production as in Milgrom and Roberts (1982a) or prevailing demand conditions as in Roberts (1986) and Saloner (1987). Under these assumptions a firm has the option of using price as a means of manipulating existing or potential rivals’ perceptions of the market. In the reputation models, Kreps and Wilson (1982) and Milgrom and Roberts (1982b), a firm operating in many markets with asymmetric information has the option of using price as an instrument to establish a reputation of toughness. In these class of models informational asymmetries present a firm with the option of using price as an instrument to influence entry, exit, and merger decisions in the market.

The equilibrium properties of the asymmetric information models suggest that firms can not exploit informational advantages if observed price changes are interpreted as attempts to manipulate perceptions in the market. The optimal
response of rivals, incumbents and potential entrants, is to set price on just this basis. These strategic rival reactions in turn force the firm with the predatory option to increase the toughness of short run price competition\(^1\) in the market. As outlined in Sutton (1991) in the presence of exogenous sunk cost this will drive the industry to a more concentrated structure, but can be welfare improving in both the short and long run. In such a case, no intervention in the form of price controls is warranted.

**Implications of the New Predatory Pricing Theories**

There are a number of lessons to be taken from the game-theoretic models described above. Firstly, they produce no simple rule for the detection of predatory pricing. As argued by Klevorick (1993), this is one of the primary reasons why the new theories of predatory pricing have had so little impact on the development of anti-trust law in the United States. However, it does highlight the lack of predictive power and the incorrect inferences that can be drawn from the Areeda-Turner test. Secondly, predatory options may be socially desirable in imperfectly competitive markets as the threat of predation induces more competition to the market via strategic reactions of rivals. Finally, the new theories suggest that predatory pricing can only influence the evolution of market structure to the extent that price can manipulate an endogenous barrier to entry. Hence, anti-trust action may be more successful if attention is focused on the detrimental effect that competition in non-price variables can have, rather than implementing price controls.

**Section II: A Theoretical Rationale for Loss Leading**

Holton (1957) and Nelson and Hike (1991) have already argued the potential legitimacy of loss leading in the grocery market. Competition in certain known items that act as ‘traffic builders’ for retail outlets can be beneficial to consumers with imperfect information. Multi-product retailers can use loss leading as a strategy to entice consumer entry to the store where the benefits of ‘one stop’ shopping results in the inevitable purchase of other goods. This involves the sale of a number of Known-Value-Items (KVI’s) below cost to attract a consumer base and subsequent higher price-cost mark-ups being levied on non-KVI’s. This option is open to all retailers and can lead to intense price competition between retailers on KVI’s. As a result the overall rent that can be extracted from consumers with imperfection information is reduced in the presence of loss leading.

In this section we present a formal model of multi-product retail pricing that firmly embeds these arguments into a theoretical framework. The optimal behavior of multi-product retailers who compete both in terms of price and in the level of services offered\(^4\) is modeled in a three-stage game using Sutton’s (1991) framework. In the third stage we model price competition between multi-product retailers for a pre-determined level of services and a given number of outlets in the market. In the second stage we model the equilibrium level of services and derive the associated endogenous sunk cost outlay for a given number of outlets in the market and in full anticipation of the price competition that takes place in stage three. In the first stage of the game we model the entry decision of potential entrants to the market. The potential entrants are assumed to anticipate both the post-entry irrecoverable fixed set-up costs, which include exogenous and endogenous elements, and the post entry profit. The sub-game perfect equilibrium solutions are derived in a process of backward induction.

\(^1\) This phrase is taken from Sutton (1991).

\(^4\) Services is a collective term describing retailer facilities designed to enhance the convenience of customer entry to the store. It includes factors such as parking availability and aesthetic surroundings.
The Benchmark Case: Perfect Consumer Information and Optimal Multi-Product Retail Pricing

The product market is modeled through application of Salop's (1979) circular road model. We assume that N identical multi-product retailers each sell M different products at an average price of \( P_l \) and earn a payoff of \( \pi_i \). Consumers are located uniformly on a circle with a circumference equal to one where the density of consumers is assumed to be unitary around the circle. The outlets are located symmetrically around the circle and the corresponding distance between outlets is thus equal to \( 1/N \). Consumers are modeled to have a transport cost, \( t \), per unit of distance traveled, \( d \), to each outlet located on the circle. Once a customer has selected an outlet they commit to purchasing one unit of each of the M goods sold.

A consumer with full information chooses an outlet based on the relative levels of expenditure on the basket of M goods, transport costs, and services, \( S_i \), provided in each outlet. The consumer becomes indifferent in her/his choice of outlet when the sum of these factors are equal. The equation of the indifferent consumer is given by:

\[
P_l M + td - S_i = PM + \left( \frac{1}{N} - d \right) - S
\]

The number of consumers that enter each outlet is equal to 2d. This will include all consumers located close to an outlet up to the indifferent consumer either side of the outlet. Hence the number of consumers, \( E_i \), that enter an outlet can be solved from equation (1), and is given by:

\[
2d = \frac{E_i}{N} = 1 + \frac{M(P-P_l)}{t} - \frac{(S-S_i)}{t}
\]

Equation (2) represents the demand function for a representative outlet. For simplicity we set the variable cost of production equal to zero. The payoff for outlet, \( \pi_i \), can thus be written as:

\[
\pi_i = P_l M E_i
\]

(3)

Price setting takes place in all outlets on the circle simultaneously. Given \( S \) and \( S_i \), holding the average price, \( P_l \), in all other outlets constant, an outlet selects \( P_l \) to maximise (3). The first order condition may be written as the following:

\[
\pi'_i \left( P_l \right) = P_l ME_i + E_i M = 0
\]

(4)

In a symmetric equilibrium \( P'_i = P \) and \( S_i = S \). The solution function for the optimal average price charged for the M goods is derived from (4) and is given by:

\[
P^0_l = \left( \frac{t}{N} \right) \frac{M}{M + S}
\]

(5)

Since N identical outlets are located symmetrically on the circle, each has an equal share of the consumers, 1/N, and the average price-cost mark-up on the M goods is the same in every outlet\(^5\). Retailers extract a price-cost mark-up over the entire basket of M goods. In this model of full information the transport cost in moving from one outlet to another, \( t/N \), defines the level of switching costs for each consumer and hence the total premium which may be extracted in equilibrium. This in turn is allocated between the M goods. Thus, the overall rent that can be earned from the 1/N consumers in each outlet is independent of the number of products sold.

\[
\pi_i^0 = \left( \frac{t}{N^2} \right)
\]

(6)

In the second stage we model the level of services assuming that forward looking outlets have full information on the nature of competition in stage three. It is assumed that a fixed outlay \( \sigma^* \), is sunk by outlets in setting up services. The

\(^5\) It is possible that the individual mark-up on each of the M goods can vary. Under perfect information, Bliss (1989) predicts constrained price discrimination based on Ramsey pricing rules. In our framework cross-price elasticities dominate due to threats of price undercutting and hence the overall rent that can be earned is bounded by customer switching costs.
relationship between the level of services and sunk cost expenditure is represented by the following function:

$$\sigma^*_i = \frac{M}{2} \frac{S_i}{N}$$  \hspace{1cm} (7)

Services increase at a diminishing rate with fixed outlays. To derive the marginal benefit of increasing services we examine the additional profits of increasing services by one unit in stage three of the game given that all the other identical outlets keep their service level constant. Outlet, is a deviant retailer which considers setting its service levels above the other outlets in an effort to attract consumers. Using equation (4) we re-express equation (3) as the following:

$$\pi_i = \left(\frac{1}{N} - \frac{(S - S_i)}{M}\right) \left(\frac{1}{N} - \frac{(S - S_j)}{M}\right)$$  \hspace{1cm} (8)

The additional costs and benefits to the deviant firm of increasing services can be obtained by taking the derivative of (7) and (8) with respect to $S_i$. Equating these and setting $S = S$, we solve for the equilibrium level of services and associated sunks as the following:

$$S_i^e = \frac{M}{aN_i} \Rightarrow \sigma^*_i = \frac{2}{aN_i^2}$$  \hspace{1cm} (9)

If the deviant firm finds a departure from the other firms level of services profitable, all firms will have an equal incentive to increase service expenditure until no profitable deviation exists and $S = S_i$. This cost outlay exists to protect each retailer's position in attracting consumers to their outlet. No additional consumers or profits are gained in equilibrium. The overall profit level remains as in (6).

In the first stage of the game we solve for the equilibrium number of outlets where the entry decision is made in full anticipation of the post-entry equilibrium expenditure on services and profit received. The last entrant into the market will be indifferent between entering and not entering as the post-entry profits, $\pi_e$, will just cover the exogenous sunk cost, $\sigma$, and endogenous sunk cost $\sigma^*$ of entering the market. With this condition and using (6) and (9) we can solve for the equilibrium number of outlets that will exist on the circle in the long run as the following:

$$N = \sqrt{\frac{t - 2}{\sigma}}$$  \hspace{1cm} (10)

The larger the per unit transport cost, $t$, the more post-entry equilibrium profit and hence the more fragmented the industry becomes over the long run. The exogenous sunk cost, $\sigma$, and the endogenous sunk cost $\sigma^*$ act as barriers to entry in the market. The larger $\sigma$ and the larger $2/a$, the latter implying services are highly responsive to the fixed cost outlay, the more concentrated the industry becomes.

In the above three stage game there was an explicit assumption that consumers had full information on the average price of the $M$ goods in each outlet when making their optimal outlet choice. The desire to maximise market share ensures that total rent earned on the basket of $M$ goods purchased by each consumer will not exceed the switching costs of traveling to another outlet. In the next section we examine the equilibrium outcomes when consumers are assumed to have imperfect information in making an outlet choice.

The Loss leading Case: Imperfect Consumer Information and Optimal of Multi-Product Retail Pricing

Imperfect information is an inherent feature of the groceries retail market. The capacity of consumers to have knowledge of the full range of prices before entering an outlet is limited to a subset of Known-Value-Items (KVI's). Holton (1957) was one of the first to consider the economic rationale behind below cost selling under conditions of imperfect information. Price discrimination was predicted to be in favour of KVI's. His arguments were fundamentally based on the importance of the cross-price elasticity of demand which reflects the shoppers sensitivity to prices.
The average price of KVI's will be less than marginal cost providing total expenditure on non-KVI's exceeds that on KVI's. Given the vast range of non-KVI's products sold, and the potential for higher prices, on average, for non-KVI's, this seems likely. Thus loss leading on KVI's is a possible equilibrium outcome. The presence of imperfect information at first sight appears to give retailers an opportunity to extract higher premiums in equilibrium. However competition on the average price of KVI's, fueled with the rent from non-KVI's, ensures that the overall rent that can be extracted from each consumer remains at $\pi^N$ and hence the overall rent earned by each outlet remains equivalent to the full information benchmark case. Competition on KVI's dissipates any additional rent earned from non-KVI expenditure in an effort to protect market share. Loss leading is a signaling device used to convey information to the consumer on the overall value for money to be obtained from the total basket of M goods.\footnote{An alternative mechanism available to retailers to process information involves the conversion of non-KVI's to KVI's through expenditure on promotions or advertising. This would lead to an increase in sunk costs and a more concentrated market structure in the long run. The equilibrium outcome in the final stage of the game would be unaffected however as profits remain bounded to (6) for any value of $\Phi$. Since loss leading can achieve the same outcome at no additional cost to the retailer the conversion of non-KVI's into KVI's by retailers would not be an equilibrium outcome.}

In Katz (1984), the consumer market is segmented according to degree of information regarding a purchase and price discrimination is predicted in favour of informed consumers. In our model products are segmented according to the degree of information and price discrimination is predicted in favour of the KVI's. Goods are segmented on the basis of the impact of their cross-price elasticity. Hence, in the terminology of Borenstein and Rose (1994), price discrimination is competitive rather than monopolistic. Price dispersion between KVI's and non-KVI's increases with the level of competition in the market.

All outlets would benefit from co-operative restraints on loss leading. As in the models outlined in section II based on asymmetric information, the option to utilise price to manipulate imperfect information induces a strategic rival response which in turn increases short-run competition in an imperfectly competitive market. This turns out to be beneficial as the overall payoff that an outlet can extract in equilibrium, even in the presence of imperfect information, remains bounded to the level extracted under perfect consumer information.

The expenditure on services and the equilibrium number of outlets that exist on the circle, determined by forward looking outlets, in the presence of imperfect consumer information and loss leading in stage three, remain respectively as in (9) and (10), the full information endogenous outcomes. Loss leading on KVI's, in the presence of imperfect information, is an equilibrium outcome that mimics the full information equilibrium outcome.

**Proposition One:** In the optimal pricing of multi-product retailers under conditions of imperfect consumer information, loss leading on KVI's is an equilibrium outcome that processes information for the consumer and leaves retailer surplus, service expenditure and the long run structure of the market at full consumer information levels.

**The Interventionist Case: Imperfect Consumer Information and Optimal Multi-Product Retail Pricing**

In this section we consider a blanket prohibition on below cost selling and the repercussions this has for equilibrium profits and corresponding service and concentration levels in the market. In stage three the analysis is augmented by restricting the multi-product retailer to pricing KVI's at or above marginal cost. The entry decision by a consumer is still determined by relative expenditures on the KVI's, transport costs, and services provided in alternative outlets. The price of non-
KVI's is now endogenous to explicitly incorporate the threat of consumers ex-post entry to switch outlets. We assume that switching costs include both transport and information costs and are proportional to the transport cost of moving from one outlet to another, \( \delta (t/N) \). Higher values of \( \delta \) reflect higher information costs for the consumer. In the case that \( \delta = 1 \) there are no informational costs to the consumer and switching costs are equivalent to those incurred in the benchmark case.

In the symmetric case the average price of KVI’s will be driven to marginal cost through competition for market share. Outlets can extract premiums on non-KVI’s from consumers willingness to pay for the locational convenience and their desire to avoid information costs associated with further shopping around. Expenditure on non-KVI’s by each consumer will not exceed this switching cost in equilibrium. In the symmetric case setting \( S = S_0 \), \( P = P \), and \( P^* = P^*_0 \), the average price of KVI's and non-KVI's in each outlet may be expressed as the following:

\[
P_i = 0, \quad P_i^* = \left( \frac{\delta t}{N} - \frac{1}{1-\Phi} + \frac{1}{M} \right)
\]

The total rent earned from consumer expenditure is expressed as follows:

\[
\pi_i = \left( \frac{\delta t}{N} \right) \left( \frac{1}{1-\Phi} \right) M
\]

(16)

Restricting competition on KVI's at the pre-entry stage allows retailers to exploit the market failure of imperfect information. Both in the benchmark and loss leading cases premiums could only be extracted for consumer willingness to pay for locational convenience. Rents were bounded to (6), or (17) where \( \delta = 1 \). Restricting competition on KVI's results in a higher equilibrium payoff since price cuts on KVI's no longer absorb all rent earned from the expenditure on non-KVI's. Although a ban on below cost selling will result in a higher average number of products being priced closer to marginal cost, the overall level of total consumer expenditure will rise in the short run.

In stage two the optimal level of services is determined in full anticipation of the outcome in stage three. The marginal benefit is derived as before where outlet i is the deviant outlet which considers increasing its level of services above its rivals in a bid to attract a higher level of customer entry. Using equation (16) we can re-express equation (17) as the following:

\[
\pi_i = \left( \frac{\delta t}{N} - \frac{1}{1-\Phi} + \frac{1}{M} \right) \left( \frac{1}{1-\Phi} \right) M = \frac{1}{N} \left( \frac{S - S^*}{t} \right)
\]

(18)

To calculate the additional benefit from increasing services given the service levels of all other outlets we take a derivative of (18) with respect to \( S \). We solve for the equilibrium level of services in the symmetric equilibrium and the associated sunk costs as follows:

\[
S_i^{(0)} = \frac{(1+\delta)}{4N_i} \Rightarrow \sigma_i = \frac{(1+\delta)^2}{4} \left( \frac{2}{a} \right)
\]

(19)

The level of services increase with a prohibition on loss leading. Higher information costs, \( \delta \), result in higher levels of services. While the level of services rise at a constant rate with \( \delta \), service expenditure rises at an increasing rate with \( \delta \) as given in (19). This is due to the fact that sunk costs rise at an increasing rate with service levels.

In the first stage of the game we solve for the equilibrium number of outlets where the entry decision is made in full anticipation of the ex-post entry expenditure on services and profit received. Using (17) and (19) we can solve for the equilibrium number of outlets:

\[
N_i^{(0)} = \left( \frac{\delta t - \frac{(1+\delta)^2}{4}}{\sigma} \right)
\]

(20)

Equation (20) is equivalent to the equilibrium number of firms that exist in the benchmark case if \( \delta = 1 \) or if there is loss leading in the presence of imperfect
Up to this point, upstream suppliers have been excluded from our discussion. Due to the Groceries Order's definition of cost as a net-invoice price, suppliers may be able to control the additional profits that retailers earn due to the restrictions on price competition. Invoice manipulation through the increased use of off-invoice discounts will have the effect of inflating the retail floor price below which retailers may not sell. Thus a legislation designed to enhance competition may have the perverse effect of implementing minimum resale price maintenance. This may result in a large proportion of the increased consumer expenditure being appropriated upstream to suppliers, a party never intended to benefit from the 1987 legislation. The impact of supplier power in our analysis in section II would be to reduce the additional rents that retailers earn in stage three and hence reduce the escalation of competition in services in the preceding stage. Over the long run, in the aftermath of the ban, this will ensure that the additional profit earned by retailers is more likely to be outweighed by the additional sunk cost expenditure on services. This would increase the likelihood of the market becoming more concentrated in the long run.

In the case where the fraction of M goods classified as KVI's is endogenous to the retailer the impact of a ban on below cost selling may be to increase the proportion of KVI's sold at marginal cost relative to non-KVI's. This is done through an increase in the level of promotions or advertising. In a situation analogous to stage two of the game where retailers compete in services, the threat of a deviation induces all outlets to increase endogenous cost outlays incurred in the provision of information to consumers. In addition to increasing service expenditure, the ban would also induce an escalation of advertising by retailers in an effort to enhance consumer information and hence market share. This would also guarantee a more concentrated market structure in the long run.

The rise in the overall quality of service and convenience provided by larger retailers since implementation of the ban is well documented (FTC report 1991). Once also observes, in table 1, a 17.45% reduction in the number of independent outlets over the 1988-1993 period. Rather than moving towards a more fragmented structure, concentration has continued to rise. Given our theoretical framework there is the possibility that this evolution may be attributed to the introduction of the 1987 Groceries Order. We feel that the removal of the ban on below cost selling and exposure of the groceries retail market to the disciplines of the 1991 Competition Act would be beneficial for overall welfare. Under the Act, loss leading would be allowed to prevail unless this has as its "object or effect the prevention, restriction, or distortion of competition", in which case liability under section 4 would render this practice undesirable. We argue that the Competition Act is the preferred legislation given the possibility that loss leading can be a legitimate reflection of the competitive process. Furthermore, predation in non-price variables would fall within the scope of the Competition Act. This is desirable given the possible anti-competitive effects of non-price competition which are currently neglected (and enhanced) under the 1987 Groceries Order.

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8 The use of off-invoice discounts is believed to have increased substantially since the introduction of the ban on below-cost selling, according to the views expressed in the FTC report (1991).

9 Section 4 (1) of the Competition Act prohibits and renders void "all agreements between undertakings, decisions by associations of undertakings, and concerted practices which have as their object or effect the prevention, restriction, or distortion of competition in trade in any goods or services in the State, or any part of the State".
Table 1: Total Number of Grocery Outlets by Type of Retailer

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<td>11570</td>
<td>9669</td>
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Source: AC Nielsen Retail Census 1994

Fig. 1: Retail Food Concentration

Source: AC Nielsen Retail Census 1994
References


