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Abstract: In order to encourage entry into network-based industries such as telecommunications, some jurisdictions have adopted regulatory rules which prevent the incumbent service provider from selectively cutting retail prices in response to entry. Under such uniform-pricing rules, the incumbent cannot selectively lower its prices on a regional basis, but has to maintain the same price over the entire service area. This paper analyzes the welfare effects of such rules for both one-way networks (access model) and two-way networks (interconnection model). We find that, even though uniform-pricing rules can induce inefficient entry for a range of parameter constellations, there are also cases where uniform-pricing rules induce efficient market entry. This is the more likely to be the case the higher the fixed costs of entry.

JEL classification: D40, L41, L96, L97

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1. Introduction

In April 1998, Saturn Communications became the second telecommunications service provider to offer residential local telephony in the Hutt Valley, a suburban area of Wellington, New Zealand. Nine years after New Zealand's telecommunications market was completely deregulated, the Hutt Valley was the first residential area to see wire-network facilities-based local telephone competition to emerge; Saturn has been the first company other than the incumbent operator, Telecom New Zealand (TCNZ), to provide wire-network facilities-based residential local telephone services in any part of New Zealand at all.

Within days after Saturn connected its first customers, TCNZ dropped its prices for local telephone services in the areas where Saturn is active to almost completely match Saturn's discounted rates. Saturn alleged to the Commerce Commission, New Zealand's competition watchdog and antitrust enforcement agency, that TCNZ's price reaction was anti-competitive and that TCNZ was engaging in predatory pricing. In July 1998, the Commerce Commission ruled that TCNZ's pricing strategy in the Hutt Valley would not constitute anti-competitive behavior, as TCNZ's charges were not below its incremental costs of providing services in the Hutt Valley. Saturn announced that, as a consequence of the Commerce Commission's ruling, it would not realize its plans to lay cable and provide local telephone services in New Zealand's two other major cities, Auckland and Christchurch, unless TCNZ was prevented from selectively cutting prices in response to market entry.

In a similar situation, Sweden Post announced in 1996 that it wished to apply geographical price differentiation, mainly to lower its prices in areas where its two main competitors, CityMail and SDR-Group, were active. In contrast to New Zealand's Commerce Commission, the Swedish Competition Authority ruled that these targeted selective regional price cuts constituted an abuse of Sweden Post's dominant position and were in breach of the Swedish Competition Act - unless the price cuts would not only be applied selectively to only those areas where Sweden Post faces competition, but to all customers in service areas with similar cost characteristics (see Konkurrensverket 1999; OECD 1999).[1]

At least at a first glance, the situation seems to be an example for what has been labeled the Chain

[1] However, this decision was partially overturned in the Swedish City Court and the Market Court.

Store Paradox (see Selten 1978). The Chain Store Paradox describes a situation, in which an incumbent monopolist fights regional market entry in order to build a reputation to be a tough competitor and to deter entry in other regional markets. The paradox is that, while this sort of behavior seems to occur in reality, it is irrational from a pure theoretical point of view under most circumstances (see Adolph & Wolfstetter 1996).

And while the theory of predatory or entry deterring pricing is reasonably well developed in general (see Tirole 1988; Viscusi, Vernon & Harrington 1995), there has been little research on what may constitute predatory or entry preventing pricing in network industries where firms have to purchase inputs from a (vertically integrated) competitor and consumers have switching costs - as is typically the case in network industries. While Saturn has duplicated parts of TCNZ's network, namely in the Wellington region, it still has to interconnect to TCNZ's network in Wellington and the rest of New Zealand to provide retail telephony services, as consumers expect to be able call anybody else in the country who has a telephone.[2] Without interconnection, which is usually considered to be an essential facility service, retailers can effectively not provide services.[3] Similarly, Sweden Post's competitors have to buy some delivery services from Sweden Post. Another example which has been vigorously debated in many jurisdictions is competition between Internet services providers (ISPs) which often compete with a vertically-integrated telecommunications operator who at the same time offers Internet services *and* owns the local loop which is essential to access the Internet.

[2] In telecommunications, interconnection to an incumbent's network or access to the so-called local loop is usually considered essential for effective competition, as telecommunications services are subject to so-called network effects (see Katz & Shapiro 1985). In general, a consumer's utility from telecommunications services is increasing in the number of other consumers connected to the network. In order to terminate telephone calls on rival networks and to receive calls from rival networks, telecommunications networks have to be interconnected. A stand-alone telecommunications network, which is not connected to rival networks, is usually of very limited value to most consumers and unlikely to be sustainable under most circumstances. While there is a divergence of opinions about the nature of network effects - for example, Liebowitz & Margolis (1994) argue that the key issue is the natural monopoly cost structure and that network effects can be incorporated into the costs of building a network - we do not want to focus on this debate, but simply assume that access or interconnection is essential for competition.

[3] More generally, production facilities, which exhibit natural monopoly cost conditions and the output of which is in itself an essential input for another production process, have been labelled essential facilities. That means, an essential facility involves two distinct characteristics: First, it must involve a natural monopoly technology, and second, the good or service produced by the facility must be an input for further production (see King 1997, p.273). For a further discussion of the essential facility concept see Lang (1994) and Lipsky and Sidak (1999).

In order to encourage entry into network-based industries such as telecommunications, some jurisdictions not only regulate access and interconnection charges, but they have also adopted regulatory rules which prevent the incumbent service provider from selectively cutting retail prices in response to entry. Under such uniform-pricing rules, the incumbent cannot selectively lower its prices on a regional basis, but has to maintain the same price over the entire service area.

This paper firstly aims at shedding some light on the questions of what pricing behavior prevents entry in network industries and under what circumstances this behavior may be welfare reducing, not only in this special situation, but more generally in industries, where producers have to purchase essential inputs from competitors and consumers have switching costs. Starting from that analysis we will examine the welfare effects of regulatory rules, which prohibit selective regional price cuts. These questions are not only relevant for the TCNZ-Saturn case, but more generally, as concerns about the effects of selective price cuts have recently been voiced in many deregulated network industries.

In order to analyze these questions we will develop two simple models, which illustrate the basic features of entry and competition in network industries. First, we will examine entry in a model with one-way access, where entrants have to purchase an essential facility service from the incumbent. This so-called *access* problem is usually a competition policy issue where competing firms provide their services without facility based entry. Examples are the provision of Internet services over a local telephone network or transmission and distribution services for electricity, gas, and water. In a second step, we will extend the model to two-way networks, where entrants have to purchase services from the incumbent, but the incumbent also has to purchase services from the entrant. This is the case with facility-based entry where networks are interconnected. The classical example is telephone call origination and termination, but the model may also be applied to to postal services markets where firms may not compete *on* but *for* different regional markets and exchange mail at both ends. This is usually referred to as the *interconnection* problem.

Our analysis is related to the work of Klemperer (1987, 1988) who analyzes entry and competition on markets with consumer switching costs. We confirm Klemperer's (1988) result that entry into markets with switching costs *can* be socially inefficient even if the entrant uses an efficient low-cost technology. This is because, even though consumers who switch to a cheaper competitor gain in consumer surplus, they also incurr switching costs which represent a welfare loss. In contrast to Klemperer (1988) we also show, however, that the converse result *can* also hold, namely that efficient entry does not occur if there are fixed costs of entry and consumers differ in switching costs. This because the private benefit of switching may be lower than the social benefit if the post-entry price difference may be smaller than the cost difference between an efficient entrant and an inefficient incumbent. Furthermore, we will analyze the welfare effects of uniform pricing rules in this context.

The rest of the paper is organized as follows: Section 2 introduces and analyzes the access model and explores welfare effects of entry and uniform pricing rules. In Section 3 we conduct the same analysis for two-way networks within an interconnection model. Section 4 compares the two models and their results before Section 5 concludes.

2. The Model

Let us consider a model with *n* regional markets, which we will analyze in a simple two-stage game. First, a potential entrant firm decides about market entry, before it eventually competes with an incumbent in the second stage of the game. As benchmark case, we will first analyze a situation where the incumbent is free to set its prices and, accordingly, to price-discriminate between markets with and without entry. We then turn our attention to an institutional environment with uniform pricing rules that require the incumbent to maintain the same uniform price over all *n* regional markets.

For the sake of simplicity, let us also assume that there is just one regional entrant to any given regional market and that all regional markets are identical with respect to their size and the costs of servicing them. This assumption simplifies our analysis and allows us to isolate the competition effects of uniform pricing rules without entering into discussions about cherry picking. However, the qualitative results of our model do not change when we allow for markets to differ in size and costs, and the model can be easily adapted.

2.1 The Basic Model with Access

We assume that consumers have unit demand for a particular service; i.e. each consumer buys either one or zero units of the service. Each consumer derives a surplus from consumption equal to $\bar{R}$. Let us also assume that in an initial situation all consumers purchase the service from an incumbent firm, T, for a legal maximum price of p_T^K with $p_T^K \leq \bar{R}$.[4] Furthermore, consumers are assumed to face switching costs, s, if they switch from the incumbent to another service provider, once a second service provider has entered the market. Switching costs can, for example, arise from a lack of full number portability in local telecommunications, from changing their email address when switching ISPs, or they may simply reflect the hassle of changing providers. Consumers are assumed to be heterogeneous in their switching costs, and s is assumed to be uniformly distributed between $\mu-\beta$ and $\mu+\beta$; i.e., $s \in [\mu-\beta; \mu+\beta]$.[5]

2.1.1 Post-Entry Equilibrium

We will now solve the game by backward induction and first analyze the market equilibrium on any given regional market in the post-entry stage. Consumers will switch from the incumbent firm T to a new firm S if $p_S + s \leq p_T$, where p_T and p_S denominate the prices of firm T and S, respectively. If we normalize the market size to 1 and, the firms' respective demand functions are given by

$$x_S(p_S, p_T) = \frac{1}{2\beta}(p_T - p_S - (\mu - \beta)) \tag{1}$$

and

$$x_T(p_T, p_S) = \frac{1}{2\beta}(\mu + \beta - (p_T - p_S)), \tag{2}$$

for $\mu-\beta \leq p_T - p_S \leq \mu+\beta$ and $p_T \leq p_T^K$, with c_S and c_T denoting the respective firm's unit costs of providing the retail service. Put differently, the two firms' respective market shares are $\alpha_S = \sigma(p_T - p_S - (\mu-\beta))$ and $\alpha_T = \sigma(\mu+\beta-(p_T - p_S))$ with $\sigma = \frac{1}{2\beta}$.

Let us also assume that firm S has to purchase an essential input from firm T in order to provide

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[4] In New Zealand, the incumbent telecommunications service provider, Telecom New Zealand, is, under the so-called Kiwi Share arrangement, not allowed to raise its price for residential local telephone services (including free local calls) above the 1989 price in real terms. Essentially, this is a special form of CPI-X regulation, where X is determined through the growth in local calling traffic.

[5] This assumption also allows switching costs to be negative for some (or even all) consumers. Negative switching costs may be explained by some intrinsic utility consumers derive from switching from a former monopolist to a new entrant or by a natural preference some consumers may have for firm S.

its services, as it is the case in the absence of facility-based entry in local telecommunications or in electricity, gas or water markets. With the incumbent being the only supplier of the essential facility service, the two firms' profit functions are given by:

$$\Pi_S(p_S, p_T) = \alpha_S(p_S - c_S - p_e) - F_S \tag{3}$$

and

$$\Pi_T(p_T, p_S) = \alpha_T(p_T - c_T - c_e) + \alpha_S(p_e - c_e) - F_T, \tag{4}$$

where p_e denominates the (regulated or unregulated) price charged by firm T for the essential facility service, c_e the respective costs of producing the essential facility service, and F_i firm i's fixed costs.

The first-order conditions can be formulated as

$$p_S = \frac{1}{2}(c_S + p_T + p_e - (\mu - \beta)) \tag{5}$$

and

$$p_T = \frac{1}{2}(c_T + p_S + p_e + (\mu + \beta)). \tag{6}$$

As we see, the access costs, c_e, do not affect equilibrium retail prices in this model, as long as $p_S, p_T \leq \bar{R}$. Only the access price, p_e, is relevant for equilibrium prices. The reason is that access to firm T's network is an essential input for both firms, and for that very reason firm T earns at least $p_e - c_e$ from every single consumer, independent of the retail price level (given $p_S, p_T \leq \bar{R}$). Hence, the relevant opportunity cost for firm T is always p_e.

With $\Delta c \equiv c_T - c_S$, equilibrium prices and profits can be written as

$$p_S^E = \beta + p_e + c_S + \frac{1}{3}(\Delta c - \mu), \tag{7}$$

$$p_T^E = \beta + p_e + c_T + \frac{1}{3}(\mu - \Delta c), \tag{8}$$

$$\Pi_S^E = \sigma\left(\beta + \frac{1}{3}(\Delta c - \mu)\right)^2 - F_S \tag{9}$$

and

$$\pi_T^E = \sigma\left(\beta - \frac{1}{3}(\Delta c - \mu)\right)^2 + (p_e - c_e) - F_T, \tag{10}$$

where we assume that $p_T^E \leq p_T^K$. Accordingly, market shares are given by

$$\alpha_S^E = \sigma\left(\beta + \tfrac{1}{3}(\Delta c - \mu)\right) \tag{11}$$

and

$$\alpha_T^E = \sigma\left(\beta - \tfrac{1}{3}(\Delta c - \mu)\right). \tag{12}$$

As noted above, this (interior) solution is only valid for $\mu - \beta \leq p_T - p_S \leq \mu + \beta$, or using equilibrium values, $\Delta c \in [\mu - 3\beta; \mu + 3\beta]$. If, however, $\Delta c \notin [\mu - 3\beta; \mu + 3\beta]$, there is no interior solution, and we obtain corner solutions instead. For $\Delta c \leq \mu - 3\beta$, any cost advantage the entrant may have is too small for him to gain any market share, and we obtain a corner solution with $\alpha_S = 0, \alpha_T = 1$, while for $\Delta c \geq \mu + 3\beta$ the entrant gains the entire market with $\alpha_T = 0, \alpha_S = 1$.

2.2 The Entry Decision

Let us now turn to the entrant's market entry decision in the first stage of the game. For this purpose, a price p_T^P will be defined as entry preventing if firm S cannot earn a non-negative profit, given p_T and p_e. That means, a price p_T^P is entry preventing if $p_T^P \in P_T^P$ where $P_T^P = \{p_T | \pi_S \leq 0 \; \forall p_S\}$. The unit costs of firm S are covered, if $p_S(p_T, p_e) - c_S - p_e \geq 0$ or, using (5), if $p_T \geq c_S + p_e + (\mu - \beta)$. With fixed costs of entry, firm S's profits turn negative if

$$p_T \leq c_S + p_e + (\mu - \beta) + 2\sqrt{F_S / \sigma}. \tag{13}$$

If (13) holds, not a single consumer is willing to switch from firm T to firm S unless firm S prices its services below its total long-run average costs. Obviously, the access price, p_e, is crucial in determining whether a retail price p_T is entry deterring for firm S or not. A retail price, which exceeds firm T's incremental costs of $c_T + c_e$ may well prevent entry ($p_T^P > c_T + c_e$), as entry becomes unprofitable in terms of p_e if $p_e \geq p_e^P$ with

$$p_e^P = p_T - c_S - (\mu - \beta) - 2\sqrt{F_S / \sigma} \tag{14}$$

If the access price, p_e, is unregulated or not constrained through competition law the incumbent can foreclose the market by raising the access price p_e to the entry preventing level p_e^P. However, for the rest of the paper let us assume that the maximum access price is constrained through either regulation or competion law to a level below p_e^P.[6]

Given p_e, the range of post-entry prices p_T, which prevent market entry, but which are not predatory in the sense that prices are not below the incumbent's own incremental costs of provision, $c_T + c_e$, is given by:

$$p_T \in \left[c_T + c_e ; c_S + p_e + (\mu - \beta) + 2\sqrt{F_S/\sigma} \right] \tag{15}$$

As can be easily seen, the scope for entry preventing pricing is increasing in the difference between p_e and c_e, in the entrant's fixed and variable costs and in consumers' average switching costs, μ. The effect of a variation in β is ambiguous as $\sigma = \frac{1}{2\beta}$. However, the scope for entry preventing pricing is increasing in β for $F_S \geq \frac{1}{8}\beta$.

Lemma 1: Even for positive (monopoly) profits and with the entrant enjoying an absolute cost advantage ($c_T \geq c_S$ and $F_T \geq F_S$) entry will not occur for $\Delta c \leq \Delta \bar{c}$ where

$$\Delta \bar{c} \equiv \mu - 3\beta + 3\sqrt{F_S/\sigma}\,. \tag{16}$$

Proof: Follows directly from (9).

For $\Delta c \leq \Delta \bar{c}$ the market can be characterized as a sustainable natural monopoly, as entry is not profitable even though the incumbent may earn non-negative profits at its pre-entry price level of p_T^K.[7] Entry only occurs if $\Delta c \geq \Delta \bar{c}$. As can be easily seen, entry becomes the more likely the smaller the entrant's fixed costs F_S, the larger the entrant's variable cost advantage Δc, the

[6] Even in New Zealand where access and interconnection charges are not subject to ex ante price regulation, competition law and the Government's explicit threat of regulation mean that the incumbent operator, TCNZ, cannot abuse its dominant position to raise the access price to an entry-preventing level. The same is true for the German electricty industry. Hence, a lack of ex ante price regulation does not automatically imply monopoly pricing.

[7] Furthermore, even if condition (16) does not hold, potential entants will still refrain from entering the market, if the incumbent's cost, c_T, is private information and entrants' beliefs about the incumbent's costs are sufficiently pessimistic.

smaller the average switching costs μ are and the smaller the spread in switching costs β is, assuming $F_S \geq \frac{1}{2}\beta$ holds. The intuition for entry become less likely with an increase in β is that the entrant's market share is decreasing in β so that the fixed costs have to be covered by a smaller customer base.

2.3 Welfare Effects of Entry

Before we turn our attentition to uniform pricing-rules let us briefly analyze the welfare effects of market entry, i.e. changes to producer and consumer surplus. Since demand is perfectly inelastic as long as $p_T \leq \bar{R}$, the retail price p_T only serves as a transfer parameter which splits the total surplus between consumers and producers; prices do not affect allocative efficiency and total welfare. Under these conditions a monopoly may be efficient as it avoids both duplication of fixed costs and consumer switching costs. Hence, market entry can only be efficient if the incumbent monopolist is at a cost disadvantage or if at least some consumers have a natural preference for firm S, i.e. negative switching costs (or net switching benefits). More specifically, entry is only welfare enhancing in this model if the total welfare under monopoly (W^M) is smaller than the total welfare with market entry (W^E), i.e. $W^E \geq W^M$ with

$$W^M = \bar{R} - c_T - c_e - F_T. \tag{17}$$

and

$$W^E = \bar{R} - c_T - c_e + \alpha_S \Delta c - F_T - F_S - SC \tag{18}$$

where SC are the consumers' switching costs given by

$$SC = \frac{\sigma}{2}\int_{\mu-\beta}^{p_T^E - p_S^E} s\,ds = \frac{\sigma}{2}\left((\Delta p^E)^2 - (\mu-\beta)^2\right) = \frac{\sigma}{2}\left(\frac{1}{9}(\Delta c + 2\mu)^2 - (\mu-\beta)^2\right) \tag{19}$$

and $\Delta p^E \equiv p_T^E - p_S^E = \frac{1}{3}\Delta c + \frac{2}{3}\mu$. Comparing W^M and W^E entry is socially efficient if

$$\alpha_S \Delta c \geq SC + F_S\ . \tag{20}$$

That means, entry is only welfare enhancing if the new entrant has a cost advantage that is sufficiently high to make up for consumer switching costs and the duplication of fixed costs. Otherwise, a monopoly situation is efficient. Solving for Δc, (20) can also be rewritten as:

$$\Delta c \geq \Delta \underline{c} = \mu - 1.8\beta + \sqrt{1.44\beta^2 + 3.6F_S/\sigma}\,. \tag{21}$$

From Lemma 1 we know that entry will not occur if condition (16) holds. Comparing (16) and (21) reveals that for a range of cost parameters Δc entry will not occur even though entry would be socially beneficial. More specifically, socially desirable entry does not occur for

$$\Delta c \in \left[\mu - 1.8\beta + \sqrt{1.44\beta^2 + 3.6F_S/\sigma}\,;\, \mu - 3\beta + 3\sqrt{F_S/\sigma}\,\right] \tag{22}$$

Lemma 2: There exists a positive range of cost parameters, for which socially desirable market entry does not occur, if $F_S > \frac{8}{9}\beta$.

Proof. A positive range of cost parameters, for which socially desirable market entry does not occur, exists if $\Delta \bar{c} - \Delta \underline{c} > 0$, which can be rewritten as $\sqrt{F_S/\sigma} - 0.4\beta > \sqrt{0.16\beta^2 + 0.4F_S/\sigma}$. Since $\sigma = \frac{1}{2\beta}$, this reduces to $F_S > \frac{8}{9}\beta$ after some rearrangements, which guarantees the existence of a positive range of cost parameters, for which socially desirable market entry does not occur. Q.E.D.

Hence, as long as $F_S > \frac{8}{9}\beta$ holds and $\Delta \bar{c} \geq \Delta c > \Delta \underline{c}$, a monopoly situation without entry is sustainable, but inefficient. The intuition is that, from a social welfare point of view, not enough consumers switch to the new entrant in this case, because their private benefit (being the price difference, Δp^E, minus their individual switching costs, s_i) is smaller than the cost savings to the economy as a whole (note that the price difference $\Delta p^E = \frac{1}{3}\Delta c + \frac{2}{3}\mu$ may be smaller than Δc). This is the converse case to Klemperer (1988) where the private benefits of switching exceed the social costs, leading to inefficient market entry.

2.4 Uniform-Pricing Rules

In order to encourage entry (and sometimes also for social policy purposes) many jurisdictions have adopted uniform-pricing rules for network industries. According to these rules, incumbents are either not allowed at all to selectively cut prices in reaction to market entry, or at least they have to obtain ex ante authorization from regulatory authorities for price reductions in response to market entry.[8]

[8] In Germany, for example, the *Regulatory Office for Telecommunications and Post (RegTP)* has repeatedly bared the incumbent, *Deutsche Telekom*, from lowering its retail prices for certain services in order to make it

What are the effects of these uniform-pricing rules? Can a uniform-pricing rule induce efficient market entry? In order to provide answers to these questions, we first have to analyze how post-entry behavior is affected under a uniform-pricing rule. Hence, let us consider a situation where an incumbent is active on a number of regional markets, the aggregate market size of which is *n*.[9] Also, let *k* be a measure for the size of those markets where entry has occured and, consequently, *n*-*k* a measure for the size of those markets on which the incumbent still has its monopoly position. With a uniform-pricing rule, the incumbent has to maintain the same price across all markets; its objective function now is to maximize $k\Pi_T(p_T,p_S)+(n-k)\Pi_T^M(p_T)$ or

$$\max_{p_T} k[\alpha_T(p_T-c_T-c_e)+\alpha_S(p_e-c_e)]+(n-k)(p_T-c_T-c_e)-nF_T, \tag{23}$$

and the incumbent's first-order condition (or reaction function) is given by

$$p_T=\frac{1}{2}(c_T+p_S+p_e+(\mu+\beta)+\tfrac{n-k}{k\sigma}), \tag{24}$$

as long as $p_T\leq p_T^K$ holds. Equilibrium prices and profits for the *k* markets with entry are

$$p_S^E=\beta+p_e+c_S+\frac{1}{3}(\Delta c-\mu+\tfrac{n-k}{k\sigma}), \tag{25}$$

$$p_T^E=\beta+p_e+c_T+\frac{n-k}{k\sigma}-\frac{1}{3}(\Delta c-\mu+\tfrac{n-k}{k\sigma}), \tag{26}$$

$$\Pi_S^E=\sigma(\beta+\frac{1}{3}(\Delta c-\mu+\tfrac{n-k}{k\sigma}))^2-F_S \tag{27}$$

and

$$\Pi_T^E=\sigma(\beta-\frac{1}{3}(\Delta c-\mu+\tfrac{n-k}{k\sigma}))^2+\frac{n-k}{k}(\beta-\frac{1}{3}(\Delta c-\mu+\tfrac{n-k}{k\sigma}))+(p_e-c_e)-F_T. \tag{28}$$

Accordingly, market shares are given by

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easier for entrants to gain market share. Similarly, the German Monopolies Commission (*Monopolkommission*) has recently argued that retail price regulation was still needed for telecommunications, because otherwise the incumbent might lower its prices so that entrants would consequently lose market share (see Monopolkommission, 1999). In the New Zealand case, the entrant, Saturn, also actively lobbied for a similar uniform pricing-rule in order to prohibit selective price cuts by TCNZ.

[9] The figure *n* can also be thought of as the number of regional markets of equal size.

$$\alpha_T^E = \sigma\left(\beta - \frac{1}{3}\left(\Delta c - \mu + \frac{n-k}{k\sigma}\right)\right) \tag{29}$$

and

$$\alpha_S^E = \sigma\left(\beta + \frac{1}{3}\left(\Delta c - \mu + \frac{n-k}{k\sigma}\right)\right).^{10} \tag{30}$$

As can be easily seen, a uniform-pricing rule softens price competition in the entry markets. The incumbent's entry market price is increasing in *n* and decreasing in *k* while his market share and profit are decreasing in *n* and increasing in *k*. The reverse holds for the entrant who now receives a higher retail price than without a uniform-pricing rule.

Having analyzed the post-entry stage, let us now turn our attention to the question of how a uniform-pricing rule affects potential entrants' market entry decision. From (27) it follows that market entry will only occur for

$$\Delta c \geq \mu - 3\beta + 3\sqrt{F_S/\sigma} - \frac{n-k}{\sigma k}. \tag{31}$$

Since $\frac{n-k}{\sigma k}$ approaches infinity as *k* approaches *0*, there will be some *k* that is sufficiently small to make market entry profitable iff $\Delta c \geq -(p_T^K - c_T - p_e - (\mu - \beta))$.[11] However, as the entrants' profits are continuously decreasing in *k*, entry will just occur up to the point where the no-profit-condition $\Pi_S^E(k^*) = 0$ holds, if the potential entrants on the various regional markets act independently from each other.[12] In terms of *k* this means entry occurs until

$$k = k^* = \frac{n}{\sigma(\mu - \beta - \Delta c + 3\sqrt{F_S/\sigma})}. \tag{32}$$

As can be easily verified, the number of entry markets is decreasing in F_S and μ, but increasing in β and Δc. The intuition is that a relatively small F_S and a relatively large Δc give the entrant

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[10] In order for an interior solution to exist with $0 \leq \alpha_j^E \leq 1$ for $j = S, T$, $-3/2 + \sigma(\mu - \Delta c) \leq (n-k)/k \leq 3/2 + \sigma(\mu - \Delta c)$ has to hold. If $(n-k)/k$ exceeds $3/2 + \sigma(\mu - \Delta c)$, entrants will reap the entire demand on the *k* local markets (with $\alpha_S = 1$), while the incumbent will only provide services to the $n-k$ markets, where no entry has occurred (i.e. $\alpha_T = 0$ for the *k* local markets). If, however, $(n-k)/k \leq -3/2 + \sigma(\mu - \Delta c)$, the entrant will not gain any market share at all (i.e. $\alpha_S = 0$).

[11] Otherwise, if $\Delta c \leq -(p_T^K - c_T - p_e - (\mu - \beta) - 2\sqrt{F_S/\sigma})$ holds, the incumbent's retail price cap is too low to make even small scale entry profitable as the entrant would not cover its costs even if the incumbent did not adjust its retail price in response to entry.

[12] Obviously, k^* cannot exceed *n* though.

a cost advantage over the incumbent, while a large μ and a small β make entry less profitable as it is more difficult to induce consumers to switch. The effects of a uniform-pricing rule on entry are summarized in the following proposition.

Proposition 1: (a) For $\Delta c \geq \mu - 3\beta + 3\sqrt{F_S/\sigma}$ *a uniform-pricing rule has no effects on market outcomes as entry occurs on all regional markets even in the absence of the uniform-pricing requirement. (b) For* $-(p_T^K - c_T - p_e - (\mu - \beta) - 2\sqrt{F_S/\sigma}) \leq \Delta c < \mu - 3\beta + 3\sqrt{F_S/\sigma}$ *a uniform pricing rule induces entry. (c) For* $-(p_T^K - c_T - p_e - (\mu - \beta) - 2\sqrt{F_S/\sigma}) \geq \Delta c$*, the entrant is at too large a cost disadvantage for entry to be profitable.*

Proof. Let us first prove part (a) of the proposition. If $\Delta c = \mu - 3\beta + 3\sqrt{F_S/\sigma}$, it follows from (32) that $k^* = n$. If entrants enter into all n markets, however, a uniform-price rule has no effect on the incumbent's price setting, as stated in part (a). To prove part (c), suppose that entry occurs on such a small scale ($k \to 0$) that the incumbent's optimal price, p_T, as given by (26) would exceed p_T^K. In this case, the incumbent's "optimal" price is $p_T = p_T^K$ and an entrant's reaction function is given by $p_S = \frac{1}{2}(c_S + p_T^K + p_e - (\mu - \beta))$. Now it is straightforward to show that the entrant's profit turns negative if $\Delta c \leq -(p_T^K - c_T - p_e - (\mu - \beta) - 2\sqrt{F_S/\sigma})$. Hence, a uniform pricing rule can only induce entry iff $-(p_T^K - c_T - p_e - (\mu - \beta) - 2\sqrt{F_S/\sigma}) \leq \Delta c < \mu - 3\beta + 3\sqrt{F_S/\sigma}$, as stated in part (b) of the proposition. Q.E.D.

Under scenario (b) and with $k = k^*$, equilibrium prices, profits and market shares are given by

$$p_S^E(k^*) = p_e + c_S + \sqrt{F_S/\sigma}, \tag{33}$$

$$p_T^E(k^*) = p_e + c_S + \mu - \beta + 2\sqrt{\frac{F_S}{\sigma}}, \tag{34}$$

$$\Pi_S^E = 0, \tag{35}$$

$$\Pi_T^E = (1 - \sqrt{\sigma F_S})(p_e + \mu - \beta - \Delta c + 2\sqrt{\frac{F_S}{\sigma}}) + (p_e - c_e) - F_T, \tag{36}$$

$$\alpha_S^E(k^*) = \sqrt{\sigma F_S}, \tag{37}$$

and

$$\alpha_T^E(k^*) = 1 - \sqrt{\sigma F_S}. \tag{38}$$

Since k^* is a function of the entrant's costs and consumer switching costs, this translates into according market outcomes. As can be easily checked, the entrant's market share in the entry markets is increasing in F_S, but decreasing in β. The reason is that high values of F_S and low values of β lead to entry on only relatively few markets, which makes the incumbent less responsive in the entry markets. Also note that the resulting entry market price difference is now increasing in F_S and, for $F_S \geq \frac{1}{2}\beta$, also in β.

While we have shown now that a uniform pricing rule can induce entry, we have not analyzed the efficiency of entry under a uniform-pricing rule. Entry may actually be inefficient, as part (b) of Proposition 1 does not imply that the condition for entry to be efficient ($F_S > \frac{8}{9}\beta$) holds. In an extreme case, the entrant can even operate at a cost disadvantage with $\Delta c < 0$ and still profitably enter. Hence, let us explore the welfare effects of entry under a uniform-pricing rule in more detail.

2.5 Welfare Effects of Entry under a Uniform-Pricing Rule

To analyze the welfare effects of a uniform-pricing rule, we have to distinguish between the three scenarios outlined in Proposition 1. Firstly, with $-(p_T^K - c_T - p_e - (\mu - \beta) - 2\sqrt{F_S/\sigma}) \geq \Delta c$, a uniform pricing rule does not induce entry, as the entrants' cost disadvantage is too large to make even small-scale entry profitable. Secondly, for $\Delta c \geq \mu - 3\beta + 3\sqrt{F_S/\sigma}$ entry occurs on all *n* markets independent from a uniform-pricing rule. The equilibrium described through (7) to (10) prevails with the incumbent's uniform price being p_T^E, as given by (8). Hence, a uniform pricing rule has no effect on welfare in these two cases. Finally, for $-(p_T^K - c_T - p_e - (\mu - \beta) - 2\sqrt{F_S/\sigma}) \leq \Delta c \leq \mu - 3\beta + 3\sqrt{F_S/\sigma}$ entry will occur on exactly k^* markets as given by (32) and total welfare is given by:

$$W^E(k^*) = \bar{R} - c_T - c_e + \alpha_S(k^*)\Delta c - F_T - F_S - SC(k^*) \tag{39}$$

Compared to welfare under a monopoly situation without entry as given by (17), a uniform-pricing rule is welfare enhancing if $W^E(k^*) \geq W^M$.[13] After some rearrangements this can also be expressed as

$$\Delta c \geq \mu - \beta + \frac{3}{2}\sqrt{F_S/\sigma}. \qquad (40)$$

If the entrants' cost advantage is smaller than $\mu - \beta + 1.5\sqrt{F_S/\sigma}$ entry induced through a uniform-pricing rule is inefficient.

Proposition 2: A uniform-pricing rule is welfare enhancing for

$$\Delta c \in \left[\mu - \beta + \tfrac{3}{2}\sqrt{F_S/\sigma}\,;\, \mu - 3\beta + 3\sqrt{F_S/\sigma}\right], \qquad (41)$$

and inefficient for

$$\Delta c \in \left[-\left(p_T^K - c_T - p_e - (\mu - \beta) - 2\sqrt{F_S/\sigma}\right);\, \mu - \beta + \tfrac{3}{2}\sqrt{F_S/\sigma}\right], \qquad (42)$$

Proof: Follows directly from Proposition 1 and (32).

As one can easily verify, the scope, for which a uniform-pricing rule induces efficient entry, is increasing in the entrant's fixed costs, F_S, and also in β if the efficient-entry condition ($F_S \geq \frac{8}{9}\beta$) holds. Similarly, the scope, for which a uniform-pricing rule only induces inefficient entry, is the smaller the larger F_S, β, p_e and c_T, and the smaller p_T^K.

3. Interconnection Model

3.1 Basic Analysis

Having analyzed the access model, let us now turn our attention to the interconnection problem in two-way networks. If both the incumbent and the entrant buy services from each other such as telephone call termination services the model slightly changes. While an access model is appropriate for the analysis of the market for Internet service provision where providers buy local loop services from an incumbent or for service-based competition in local telephony, an interconnection model can be used to analyze facility-based entry in telecommunications markets.

[13] As explained above, the retail price simply splits welfare between consumers and producers, but does not induce allocative inefficiencies under monopoly, as demand is assumed to be perfectly inelastic and the market covered with $p_T^K \leq \bar{R}$. Hence, the price reduction in the *n*-*k** markets where no entry occurs does not affect total welfare in these markets.

If we assume balanced calling patterns,[14] the respective profit functions are

$$\Pi_S(p_S,p_T) = \alpha_S(p_S - c_S - c_c - \alpha_T a) - F_S \tag{43}$$

and

$$\Pi_T(p_T,p_S) = \alpha_T(p_T - c_T - c_c + \alpha_S a) - F_T, \tag{44}$$

where c_c are the costs of terminating a call and a is the difference between the interconnection charge that the entrant pays to the incumbent and the charge which it receives from the incumbent for terminating calls. That means $a \equiv a_T - a_S$, where a_T is the charge the entrants pays to the incumbent for terminating a call on the incumbent's network, and a_S is the charge the incumbent pays to the entrant for terminanting a call on the entrant's network. If these charges are symmetric, a equals zero. However, in reality these charges are often asymmetric for a variety of reasons - for example, in order to allow the incumbent to recover stranded assets, higher common costs or, as is the case in New Zealand, because the incumbent has greater bargaining power when interconnection charges are not regulated, but privately negotiated.[15] Proceeding from these assumptions, the first-order conditions (or reaction functions) can be written as

$$p_S = \frac{1}{2-2\sigma a}(c_S + c_c - (\mu - \beta) + 2\sigma\mu a) + \frac{1-2\sigma a}{2-2\sigma a}p_T \tag{45}$$

and

$$p_T = \frac{1}{2+2\sigma a}(c_T + c_c + \mu + \beta + 2\sigma\mu a) + \frac{1+2\sigma a}{2+2\sigma a}p_S. \tag{46}$$

Substitution now yields the following equilibrium outcome:

$$p_S^E = \beta + c_S + c_c + \frac{1}{3}(1 - 2\sigma a)(\Delta c - \mu), \tag{47}$$

$$p_T^E = \beta + c_T + c_c - \frac{1}{3}(1 + 2\sigma a)(\Delta c - \mu), \tag{48}$$

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[14] The balanced-calling-pattern assumption means that as many users on the first network call users on the second network as users on the second network call the users on the first. Put differently, balanced calling patterns mean that the probability of a user on the first network originating a call to a user on the second network equals the probabilty of her receiving a call from the second network.

[15] For example, TCNZ's local interconnect charges to Clear Communications, the first new entrant into the New Zealand market, have been between 50% and 300% higher than Clear's charges to TCNZ.

$$\Pi_S^E = \sigma(\beta + \frac{1}{3}(\Delta c - \mu))^2(1 - \sigma a) - F_S, \tag{49}$$

$$\Pi_T^E = \sigma(\beta - \frac{1}{3}(\Delta c - \mu))^2(1 + \sigma a) - F_T. \tag{50}$$

And the respective equilibrium market shares are

$$\alpha_S^E = \sigma(\beta + \frac{1}{3}(\Delta c - \mu)) \tag{51}$$

and

$$\alpha_T^E = \sigma(\beta - \frac{1}{3}(\Delta c - \mu)), \tag{52}$$

3.2 Entry

Again, entry will not occur if a potential entrant cannot earn non-negative profits. The entrant's profits turn negative if

$$\Delta c \le \mu - 3\beta + 3\sqrt{\frac{F_S}{\sigma(1-\sigma a)}}. \tag{53}$$

Since $0 \le \sigma a \le 1$, the range of cost parameters for which entry is unprofitable increases in the interconnection model when compared to the access model.

What are the welfare effects of entry in two-way network markets? As can be easily verified, the welfare analysis of section 2.3 remains unchanged, as the price difference, Δp, does not change, which also means that market shares are the same as in section 2.1. Hence, entry is efficient if condition (21) holds (i.e., $\alpha_S \Delta c \ge SC + F_S$).

3.3 Uniform-Pricing Rules

Under a uniform pricing requirement, the incumbent's reaction function is given by:

$$p_T = \frac{1}{2+2\sigma a}(c_T + c_c + (\mu + \beta) + \frac{n-k}{k\sigma} + 2\sigma\mu a) + \frac{1+2\sigma a}{2+2\sigma a}p_S. \tag{54}$$

Accordingly, equilibrium outcomes for the *k* entry markets are given by:

$$p_S^E = \beta + c_S + c_c + \frac{1}{3}(1 - 2\sigma a)(\Delta c - \mu + \frac{n-k}{k\sigma}), \tag{55}$$

$$p_T^E \;'\; â\%c_T\%c_c\%\frac{n\&k}{kó}\&\frac{1}{3}(1\%2óa)(Äc\&µ\%\tfrac{n\&k}{kó}), \tag{56}$$

$$Ð_S^E \;'\; ó(â\%\frac{1}{3}(Äc\&µ\%\tfrac{n\&k}{kó}))^2(1\&óa)\&F_S, \tag{57}$$

$$Ð_T^E \;'\; ó(â\&\frac{1}{3}(Äc\&µ\%\tfrac{n\&k}{kó}))^2(1\%óa)\%\frac{n\&k}{k}a(â\&\frac{1}{3}(Äc\&µ\%\tfrac{n\&k}{kó}))\&F_T. \tag{58}$$

And the respective equilibrium market shares are

$$á_T^E \;'\; ó(â\&\frac{1}{3}(Äc\&µ\%\tfrac{n\&k}{kó})) \tag{59}$$

and

$$á_S^E \;'\; ó(â\%\frac{1}{3}(Äc\&µ\%\tfrac{n\&k}{kó})). \tag{60}$$

Again, entry will occur until $Ð_S^E(k^{(})\#0$, which holds at $k\$k^{(}$ with

$$k^{(} \;'\; \frac{n}{ó\left(µ\&â\&Äc\%3\sqrt{\frac{F_S}{ó(1\&óa)}}\right)}. \tag{61}$$

As in the access model, the number of entry markets is decreasing in F_S and $µ$, but increasing in $â$ and $Äc$. However, in contrast to the access model, $k^{(}$ is now also decreasing in the interconnection fee, a. Furthermore, since $óa<1$ the number of entry markets in the interconnection model is strictly smaller than the number of entry markets in the access model for $a>0$ (and, accordingly, larger for $a<0$). The entry inducing effects of a uniform-pricing rule are summarized in Proposition 3.

Proposition 3: (a) For $Äc\$µ\&3â\%3\sqrt{F_S/ó(1\&óa)}$ *a uniform pricing rule has no effects on in the interconnection model, as entry occurs on all regional markets anyway. (b) For* $\&(p_T^K\&c_T\&c_c\&a\&(µ\&â)\&(2\&2óa)\sqrt{F_S/ó(1\&óa)})\#Äc<µ\&3â\%3\sqrt{F_S/ó(1\&óa)}$ *a uniform pricing rule induces entry, and (c) for* $\&(p_T^K\&c_T\&c_c\&a\&(µ\&â)\&(2\&2óa)\sqrt{F_S/ó(1\&óa)})\$Äc$ *the entrant is at too large a cost disadvantage for entry to be profitable; a uniform-pricing rule has no effects.*

Proof. The proof is analogous to the proof of Proposition 1.

For case (b) and with $k = k^*$, equilibrium prices, profits and market shares are given by

$$p_S^E(k^*) = c_S + c_c + a + (1 - 2\sigma a)\sqrt{\frac{F_S}{\sigma(1-\sigma a)}}, \tag{62}$$

$$p_T^E(k^*) = c_S + c_c + a + \mu - \beta + (2 - 2\sigma a)\sqrt{\frac{F_S}{\sigma(1-\sigma a)}}, \tag{63}$$

$$\Pi_S^E = 0, \tag{64}$$

$$\Pi_T^E = \left(1 - \sqrt{\frac{\sigma F_S}{1-\sigma a}}\right)\left(a + \mu - \beta - \Delta c + (2 - \sigma a)\sqrt{\frac{F_S}{\sigma(1-\sigma a}}\right) - F_T, \tag{65}$$

$$\alpha_S^E(k^*) = \sqrt{\frac{\sigma F_S}{1-\sigma a}} \tag{66}$$

and

$$\alpha_T^E(k^*) = 1 - \sqrt{\frac{\sigma F_S}{1-\sigma a}}. \tag{67}$$

Again, since k^* is a function of the entrant's costs and consumer switching costs, this translates into according market outcomes. As can be easily checked, the entrant's market share on the entry markets is increasing in F_S, but decreasing in β. Furthermore, the entrant's market share now also increases in a. While this may seem surprising at first sight, the reason is that an increase in a reduces the number of entry markets, which makes the incumbent less aggressive on these markets. Furthermore, the incumbent's revenues from interconnection also increase in a, which also softens retail price competition, i.e. the price difference $p_T - p_S$ is increasing in a.

Comparing again

$$W^E(k^*) = \bar{R} - c_T - c_c + \alpha_S(k^*)\Delta c - F_T - F_S - SC(k^*) \tag{68}$$

and welfare under monopoly without entry as given by (17), a uniform-pricing rule is welfare enhancing if $W^E(k^*) \geq W^M$, or

$$\Delta c \geq \mu - \beta + \left(\frac{3}{2} - \sigma a\right)\sqrt{\frac{F_S}{\sigma(1-\sigma a)}}. \tag{69}$$

We can now summarize the welfare effects of a uniform-pricing rule for the interconnection model in the following proposition:

Proposition 4: For the interconnection model a uniform-pricing rule is welfare enhancing for

$$\Delta c \in \left[\mu - \beta + \left(\tfrac{3}{2} - \sigma a\right)\sqrt{\frac{F_S}{\sigma(1-\sigma a)}};\ \mu - 3\beta + 3\sqrt{\frac{F_S}{\sigma(1-\sigma a)}}\ \right], \tag{70}$$

and inefficient for

$$\Delta c \in \left[-\left(p_T^K - c_T - c_c - a - (\mu - \beta) - (2 - 2\sigma a)\sqrt{\frac{F_S}{\sigma(1-\sigma a)}}\right); \mu - \beta + \left(\tfrac{3}{2} - \sigma a\right)\sqrt{\frac{F_S}{\sigma(1-\sigma a)}}\right]. \tag{71}$$

Proof: Follows directly from Proposition 3 and (61).

Again, the scope, for which a uniform-pricing rule induces efficient entry, is increasing in the entrant's fixed costs, F_S, and also in β if $F_S \geq [4\beta^2(2\beta - a)]/(3\beta + a)^2$. Similarly, the scope, for which a uniform-pricing rule only induces inefficient entry, is the smaller the larger F_S, β, c_c, a and c_T, and the smaller p_T^K. From a public policy point of view, it may be interesting to not that the risk that a uniform-pricing rule induces inefficient entry is decreasing the more imbalanced the interconnection charges are (the higher a) and the lower the retail price cap, p_T^K.

4. Comparison between one-way and two-way networks

Having analyzed uniform-pricing rules (UPR) in both an access and an interconnection framework, let us briefly compare the main results which are summarized in the following table:

	Access model	Interconnection model
k^*	$\dfrac{n}{\sigma(\mu - \beta - \Delta c + 3\sqrt{F_S/\sigma})}$	$\dfrac{n}{\sigma\left(\mu - \beta - \Delta c + 3\sqrt{F_S/[\sigma(1-\sigma a)]}\right)}$
$\alpha_S^E(k^*)$	$\sqrt{\sigma F_S}$	$\sqrt{\sigma F_S/(1-\sigma a)}$
UPR efficient	$\left[\Delta c^*; \mu - 3\beta + 3\sqrt{F_S/\sigma}\right]$	$\left[\Delta c^*; \mu - 3\beta + 3\sqrt{F_S/[\sigma(1-\sigma a)]}\right]$

UPR inefficient	$\left[-(p_T^K - c_T - p_e - (\mu - \beta) - 2\sqrt{F_S/\sigma}); \Delta c^*\right]$	$\left[-\left(p_T^K - c_T - c_c - a - (\mu - \beta) - (2 - 2\sigma a)\sqrt{F_S/[\sigma(1-\sigma a)]}\right); \Delta c^*\right]$
Δc^*	$\mu - \beta + \frac{3}{2}\sqrt{F_S/\sigma}$	$\mu - \beta + \left(\frac{3}{2} - \sigma a\right)\sqrt{F_S/[\sigma(1-\sigma a)]}$

Since $0 \le \sigma a \le 1$, the number of markets where an UPR induces entry is smaller for the interconnection model while the entrants' market share on these markets is larger. Furthermore, the upper boundary regarding Δc, for which an UPR can induce efficient entry is also higher in the interconnection model while the lower boundary, Δc^*, is smaller than in the access model if $\sigma a \le 3/4$. Finally, the lower bundary for which a UPR induces inefficient entry is always larger in the interconnection model than in the access model. Hence, for $\sigma a \le 3/4$ the risk of introducing inefficient entry through an UPR is clearly lower for two-way networks than for one-way networks. Put differently, for $\sigma a \le 3/4$ the risk that a UPR encourages inefficient facilities-based competition (where interconnection is key) is lower than the risk of introducing inefficient service-based competition (which relies on access).

5. Conclusion

The question of whether uniform pricing rules are welfare enhancing or whether they induce inefficient entry cannot be unambiguously answered, but is highly dependent on exact parameter values. While selective regional price cuts may prevent entry if entrants cannot recover fixed costs, it is not clear whether these price cuts should be prevented by regulatory means in order to encourage entry. However, our analysis has shown that uniform-pricing rules are the less likely to cause inefficient entry the higher the entrant's fixed costs and the more differentiated the products are, i.e. the more consumers differ in their switching costs (higher β).

This paper has shown, however, that on markets with switching there may not only be too much entry as Klemperer (1988) has shown, but in contrast, there can also be too little entry, depending on parameter values. In these cases, a uniform-pricing rule *can* induce efficient entry. However, there are also cases where such a rule leads to inefficient entry. However, it is clear that, if interconnection charges are roughly symmetric (is *a* is small, i.e. $\sigma a \le 3/4$), the risk that a UPR encourages inefficient facilities-based competition is lower than the risk of introducing inefficient service-based competition.

Coming back to Saturn's entry into the local telecommunications market in Wellington, we have shown that, even if an incumbent's retail price is higher than the entrant's price *and* above the incumbent's own incremental costs, the price may still prevent entry into network industries, which are charaterized by switching costs and the necessity for entrants to purchase essential inputs from an incumbent firm. Therefore, it does not suffice to simply look at an incumbent's incremental costs when deciding whether certain pricing behaviour prevents entry or not, as the New Zealand Commerce Commission has done. The paper has also shown, however, that entry is not necessarily welfare enhancing, and accordingly, a lack of entry not necessarily welfare reducing.

Finally, it should also be noted that price matching behaviour can be anticompetitive for other reasons than predation. As Salop (1986) has shown, a guarantee to match prices can have anticompetitive effects as it significantly weakens competitors' incentives reduce prices.[16] Given that TCNZ already signalled that it intends to always match Saturn's prices (see Love 1998), Saturn may be reluctant to trigger a price war, in which prices end up to be comparatively low for both firms. TCNZ's pricing strategy in the Hutt Valley may be aimed at establishing a reputation for matching prices, thereby lowering Saturn's incentives to set low prices in the first place. While we must leave the question of whether this theoretical possibility may be part of TCNZ's strategy unanswered for the moment, we believe that it provides an interesting topic for further research.

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[16] The competitive effects of so-called "meet the competition" or "most favoured customer" clauses are further analysed by Cooper (1986), Belton (1987), Neilson & Winter (1993) and Schnitzer (1994).

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