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Multimarket Competition and Business Strategy

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Abstract. Multimarket competition abounds in the real world. Globalization of competition (triad rivalry) and economic integration of communities (European integration) contribute to the intensification of multimarket competition. The fact that firms meet in many markets has implications for rivalry. This paper introduces five key elements of multimarket competition and illustrates their working and influence by applying game-theoretic reasoning. By way of illustration the case of the artificial sweetening industry is discussed.

Key words. Multimarket competition, entry, collusion, strategy.

I. Multimarket Competition

The key feature of multimarket competition is that *inside* (that is, from within the set of related markets) rivals are able to (relatively quickly) overcome barriers which are insurmountable to *outside* (that is, from outside the set of related markets) entrants (Gorecki, 1975; Lambkin, 1988; van Witteloostuijn and van Wegberg, 1991a). An example of multimarket competition "is firms competing against each other in different geographical markets for the same product" (Karnani and Wernerfelt, 1985, p. 87). Another case in point is substitute competition of rivals with products that are located close to one another in product space. Multimarket competition can be both actual and potential. The importance of multimarket competition increases as the globalization of rivalry (Porter, 1986) and economic integration (van Witteloostuijn and van Wegberg, 1991a) implies that firms have (relatively) easy access to many markets.

Multimarket competition introduces new elements into strategy choice. This paper illustrates the implications of multimarket competition for business strategy by developing exemplary game models. Moreover, the argument reviews relevant literature and puts dispersed contributions into a unifying perspective. Specific sources of inspiration are the literature on diversification (Lecraw, 1984), integration (Caves and Bradburd, 1988), multiproduct firms (Teece, 1982), multinational enterprise (Caves, 1982), interbrand competition (Scherer, 1980), competitive analysis (Porter, 1980), transaction costs (Teece, 1980), multimarket oligopoly (Bulow *et al.*, 1985) and international trade (Venables, 1990). Since the literature is immense, reference is only made to exemplary contributions.

Five key features drive multimarket competition (van Witteloostuijn and van Wegberg, 1991b):

(1) focus of rivalry (Section 2);
(2) economizing on entry cost (Section 3);
(3) multimarket spillovers (Section 4);
(4) reciprocal entry (Section 5); and
(5) multimarket collusion (Section 6).

This paper illustrates the implications of multimarket competition for rivalry and business strategy by explaining the five elements (Sections II–VI) with the help of an exemplary set of easy-to-understand games that permit a careful expression of ideas that are applicable to real-world problems. The rules of the game are non-cooperative, although cooperative outcomes can occur. For the sake of the argument, three simplifications are introduced. First, different strategies are assumed to give strictly different payoffs. Second, the argument focuses on two-firm rivalry in one or two markets. Third, symmetry is assumed in the sense that markets and firms are taken to be of equal size. Fourth, mixed strategy equilibria are ignored. Section VII illustrates multimarket competition by briefly describing the case of NutraSweet in the artificial sweetening industry. Section VIII concludes the paper by offering other real-world cases and an appraisal.

II. Focus of Rivalry

1. THREE CATEGORIES

Competition can be associated with *three* categories of *games* which are characterized by the *focus of rivalry* that dominates competition: (i) actual rivalry (Subsection 2.1.1); (ii) potential rivalry (Subsection 2.1.2); and (iii) entry rivalry (Subsection 2.1.3). The distinguishing characteristic of the games is the identity of the firms involved in competition.

2. ACTUAL RIVALRY

The incumbents against incumbents game is studied in the well-established theories of (im)perfect competition without (free) entry (Shapiro, 1989): only internal market conditions determine competition. *Actual* rivalry drives competition (Shepherd, 1984). Table I depicts the payoff matrix of the actual rivalry game.

Strategy denotes an action which improves the competitive position of the firm (for example, advertising, R&D, quality improvement, price decrease, capacity expansion, etc.). That is, $L < N$ and $L, N, R < H$, since L and H imply a competitive disadvantage and advantage respectively, whereas both N and R assume (relative) parity. Three sets of outcomes can be obtained.

Table I. Actual rivalry

		Incumbent firm 2	
		Passive strategy	Active strategy
Incumbert firm 1	Passive strategy	(N, N)	(L, H)
	Active strategy	(H, L)	(R, R)

N = Nonrivalry profit
L = Leeway profit
H = Headstart profit
R = Rivalry profit.

(A) Strategy Prisoners' Dilemma: $L < R < N < H$. The non-cooperative equilibrium outcome is (R, R), whereas the cooperative equilibrium outcome is (N, N) for $H + L < 2N$. The latter equilibrium does only occur if cheating can be precluded. The point is that both rivals prefer (N, N) to (R, R), which indicates a Prisoners' Dilemma. With $H + L > 2N$ coordination (for instance, *via* side payments) can give the joint profit maximizing position where only one firm opts for the active strategy.

(B) Strategy preference: $L < N < R < H$. The dominant equilibrium outcome is (R, R), where both rivals are active. A passive strategy gives a lower payoff $(L < N < R)$. Both rivals preclude leeway by undertaking the strategy. With $H + L < 2R$ this is the preferred position. Only if $H + L > 2R$, selection of the joint profit maximizing equilibrium (where only one firm undertakes an active strategy) cannot be obtained without coordination.

(C) Strategy monopoly Chicken game: $R < L < N < H$. If both firms adopt the active strategy, intense rivalry drops profit below the leeway level. Both (H, L) and (L, H) indicate equilibrium positions. This is a Chicken game where the selection of the active firm requires coordination. If $R < L < 0$, the equilibrium is even associated with monopoly.

An example of equilibrium set (A) is symmetric Bertrand competition without capacity restrictions. In the non-cooperative equilibrium position both rivals set minimum average cost prices: $R = 0$. The cooperative outcome follows from sharing the monopoly profit: $N = M/2$. Headstart and leeway occur if one firm underprices the rival: $H = M$ and $L = 0$. A case in equilibrium set (B) is duopoly competition with constructive advertising. If both rivals undertake advertising, market demand is increased such that $R > N$. Asymmetric advertising attracts customers to the active firm: $L < H$. Equilibrium set (C) corresponds, for example, to the scenario where anticipation to market growth (by, for instance, installing productive capacity) is only cost effective if undertaken by one firm. If both firms install capacity and fight for market share, profit is negative: $R < 0$. Both firms refraining from anticipation gives a normal profit, although market potential is not fully exploited: $R < 0 < L < N < H$.

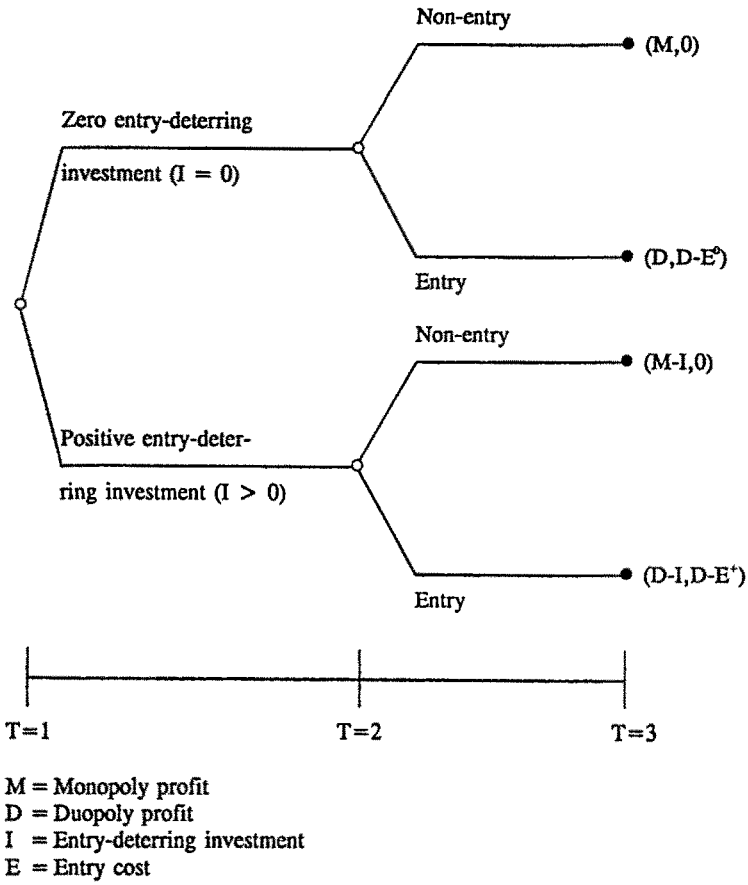

Fig. 1. Potential rivalry.

3. POTENTIAL RIVALRY

The entry deterrence literature focuses on the incumbents against entrants game (Gilbert, 1989): external conditions dominate over internal competition. Entry-deterring strategies can range from investment in overcapacity and technology to intensive advertising and signaling devices. The key point is that *potential* rivalry dominates competition (Bain, 1956). The natural assumption is sequential decision making, since the established firm can benefit from the first-mover advantage that is associated with incumbency. That is, in the first stage the incumbent firm decides on entry-deterring investment ($T = 1$), whereas in the second stage the potential entrant decides on entry after observing the incumbent firm's strategy ($T = 2$). Payoffs accrue afterwards ($T = 3$). Therefore, Figure 1 summarizes the strategies and payoffs of the potential rivalry game in extensive form (Dixit, 1982).

An incumbent firm may or may not decide to undertake an entry-deterring investment ($I > 0$ and $I = 0$ respectively). In the former case the potential entrant's entry cost exceeds the cost of entry in the latter case ($E^+ > E^0$): the objective of

an entry-deterring investment is to erect an entry barrier, which in turn implies an entry cost disadvantage for the potential entrant (Stigler, 1968). The literature generally assumes the potential entrant's payoff of non-entry to be zero. So, $D - E^+ < D - E^0$, $D - I < M - I$ and $D < M$. Satisfying a feasibility condition implies that $D, M > 0$. Four sets of equilibria can be calculated.

(D) Blockaded entry: $D - E^0 < 0$. Entry is blockaded: irrespective of the incumbent firm's strategy entry gives a negative payoff. Since of course $M - I < M$ for $I > 0$, the equilibrium outcome is $(M, 0)$.

(E) Unprofitable entry deterrence: $D - I < M - I < D < M$ and $D - E^0 > 0$. Entry deterrence is not profitable. Therefore, the incumbent firm refrains from undertaking the entry-deterring investment: $I = 0$. $D - E^0 > 0$ gives the duopoly outcome $(D, D - E^0)$, since entry is profitable. With $M > 2D - E^0$ joint profit maximization requires coordination.

(F) Unfeasible entry deterrence: $0 < D - E^+ < D - E^0$. Even if the incumbent firm undertakes the investment $(I > 0)$, entry is profitable $(D - E^+ > 0)$: entry cannot be deterred. Therefore, the equilibrium outcome is $(D, D - E^0)$. The incumbent firm refrains from undertaking the investment (as $D - I < D$) and both rivals share the market. Again, if $M > 2D - E^0$ joint profit maximization cannot be obtained without coordination.

(G) Feasible and profitable entry deterrence: $D < M - I$ and $D - E^+ < 0 < D - E^0$. With zero entry-deterring investment $(I = 0)$, entry would occur (since $D - E^0 > 0$). However, if the incumbent firm has invested in entry deterrence $(I > 0)$, entry is unprofitable $(D - E^+ < 0)$. The equilibrium outcome is $(M - I, 0)$, since $D < M - I$. As before, joint profit maximization (for example, $M > M - I$) requires coordination.

Equilibrium set (D) indicates monopoly with insurmountable entry barriers (as a result of, for instance, government protection). The single incumbent firm can distract monopoly profits without attracting entry (Bain, 1956). Equilibrium set (E) corresponds, for example, with unsustainable contestability (Baumol, 1982). Contestability assumes the absence of strategic investment and zero entry cost: $I = 0$ and $E^0 = 0$. Unsustainability implies that entry cannot be deterred. An example of equilibrium set (F) is entry by an equally-equipped firm from a related market (Cairns and Mahabir, 1988). For instance, entry with low cost from a nearby country by a firm offering a perfect substitute (Calem, 1988) explains $D - E^0 > D - E^+ > 0$. Equilibrium set (G) summarizes the literature on strategic investment (Salop, 1979). The entry-deterring investment blocks entry which would otherwise occur by raising entry cost to an effective level: $E^+ \gg E^0$.

4. ENTRY RIVALRY

The entrants against entrants game is explored only sporadically (Nti, 1989): multiple potential entrants have to coordinate (implicitly or explicitly) simultaneous entry decisions. *Entry* rivalry may negate the force of potential competition:

Table II. Entry rivalry

		Potential entrant 2	
		Non-entry	Entry
Potential entrant 1	Non-entry	(0, 0)	(0, S)
	Entry	(S, 0)	(B. B)

S = Single entry profit
B = Profit if both rivals enter.

"the probability of independent entry as well as the probability of at least one entry decline with the number of potential entrants" (Nti, 1989, p. 48). Table II presents the payoff matrix of the entry rivalry game.

Rivalrous entry reduces entry profit: $B < S$. Non-entry yields a zero payoff. Three sets of equilibrium outcomes can be identified if simultaneity of decision making is assumed.

(H) Blockaded entry: S, $B < 0$. Entry is blocked. Both single and simultaneous entry give a negative payoff. Hence, the equilibrium outcome is (0, 0): entry does not occur.

(I) Single entry: $B < 0 < S$. The market leaves room for just one profitable entrant. The selection of the entrant is not determined. Both $(0, S)$ and $(S, 0)$ are equilibrium outcomes, which indicates a Chicken Dilemma. A coordination mechanism (for example, convention, deliberation or sequential entry) is needed to avoid insufficient or excessive entry. Otherwise, the fear for loss-making entry can trigger outcome (0, 0).

(J) Simultaneous entry: $0 < B < S$. Simultaneous entry is profitable. The equilibrium outcome is (B, B), where both firms decide to enter. This equilibrium also maximizes joint profit if $S < 2B$. With $S > 2B$ single entry (and so joint profit maximization) cannot be triggered without coordination.

Equilibrium set (H) repeats the argument underlying the blockaded entry scenario in the actual rivalry game. Only a few contributions in the literature describe the conditions for and implications of equilibrium set (I), notably Sherman and Willett (1967). Equilibrium set (J) is described in models which endogenize market structure, a well-established example being the work of Novshek and Sonnenschein on Cournot competition and Walrasian equilibrium (1987).

III. Economizing on Entry Cost

Inside entrants can *economize* on *resources*. An inside entrant can divert resources from home to entry market, which, on the one hand, economizes on entry cost but gives an (opportunity) cost of entry on the other. Economized entry cost follow from using (excess) resources in order to supply an entry market. Entry is associated with either adjustment cost in production, if the entry market good is a technical substitute, or transport cost in exporting, if the product is transferred

from the home base to another region or country. Entry is easy if the entry costs are low (Calem, 1988: p. 171). If firms have to operate at full capacity in order to satisfy demand in the home market, entry gives an opportunity cost in the sense of home market profit foregone by withdrawing capacity from the home market (Bulow *et al.*, 1985: p. 172). The entry opportunity cost is zero if excess resources are employed (Cairns and Mahabir, 1988) or if the resources have a public good character. Intangible assets (such as knowhow, consumer goodwill and management skills) have this characteristic (Teece, 1980 and 1982). The literature generally assumes a zero opportunity cost of entry.

In terms of game theory the opportunity to economize on entry cost introduces a differentiation of the E-term in Figure 1 (assuming one-sided entry). To be precise, two categories of potential rivalry games can be distinguished. A potential entrant from a related market faces E_R^+ and E_R^0 which gives a related potential rivalry game. A potential entrant from an unrelated market has to incur E_U^+ and E_U^0 after entry, which indicates an unrelated potential rivalry game. The key point is that $E_R^+ \neq E_U^+$ and $E_R^0 \neq E_U^0$: the payoff matrices of both games are different. The difference can run both ways, depending on whether resource economizing entry or opportunity cost of entry dominates. Take, for example, the case where related entry is easier: $E_R^+ < E_U^+$ and $E_R^0 < E_U^0$. Comparatively speaking, the game of related potential rivalry favors equilibrium outcomes with beneficial conditions for potential entrants. In particular, the condition that $0 < D - E_R^+ < D - E_R^0$ is easier fulfilled than $0 < D - E_U^+ < D - E_U^0$: with related potential rivalry entry is more likely to be profitable and entry deterrence is less likely to be feasible (Cairns and Mahabir, 1988).

IV. Multimarket Spillovers

Inside firms can exploit *multimarket spillovers* – or industry drivers (for example, Yip, 1989). Multimarket spillovers are defined as externalities between two or more markets: that is, the payoffs in market A have an impact on the payoffs in market B and *vice versa*. Bulow *et al.* (1985) distinguish supply from demand spillovers. The former include joint (dis)economies of scale or scope. Operating in two or more markets has an impact on the cost of production and selling. Vertical integration (dis)advantages are a third example (Brunner, 1961). Multimarket demand spillovers cover goodwill in the home market which carries over to the entry market (Margolis, 1989). The strategy of firms in market A influences the scale of demand in market B (and *vice versa*). Caves (1982) summarizes spillovers in the context of multinational enterprise, whereas Teece (1982) lists multimarket externalities which diversified firms can exploit. A key argument in this literature is that (excess) fungible but intangible assets can be exploited by multimarket operation.

Multimarket spillovers introduce an *extra* profit (or loss) from operating in (or entry into) a second market. Suppose that S denotes the gain (or loss) from

exploiting (or bearing) multimarket spillovers. The key argument is that related entry gives payoff $D - E + S$, whereas unrelated entry only yields profit $D - E$. Again, this influences the potential rivalry game (Figure 1) by modifying the potential entrant's payoffs (assuming one-sided entry). The effect of positive multimarket spillovers is equivalent to the impact of entry cost economizing (negative multimarket spillovers give opposite predictions). For example, the condition $0 < D - E^{+} < D - E^{0}$ changes into $0 < D - E^{+} + S < D - E^{0} + S$, which favors the entry strategy if multimarket spillovers are positive ($S > 0$): the force of potential rivalry is intensified.

V. Reciprocal Entry

1. ONE-SIDED VERSUS RECIPROCAL ENTRY

Sections 2–4 present games with one-sided entry. One-sided entry is the usual (and implicit) assumption in the literature (van Witteloostuijn, 1990a, and 1990b). Calem (1988) explicitly offers two economic rationales for one-sided entry. First, the incumbent firm's entry cost is sufficiently large to trigger refraining from entering the potential entrant's market (Calem, 1988: p. 175). Second, legal or regulatory barriers exist which prevent incumbent firms from being potential entrant into the rival's market (Calem, 1988: p. 182, note 5). However, one-sided entry is far from the only plausible case.

Inside firms can exert a *reciprocal entry* threat (Porter, 1980; Calem, 1988). This means that firms in market A are potential entrants into market B and *vice versa*. Three examples illustrate reciprocal entry (threats). First, incumbent firms in the entry market may decide to retaliate in the entrant's home market (Calem, 1988). This strategy of counter-attack is a parry to the potential entrant's entry attack (Yip, 1989). Second, Watson (1982) identifies counter-competitive strategies which anticipate the potential rivals' entry move: counter-competition entails actions (for example, entry into the potential entrants' home market) that force the potential entrant to tie resources to her home market. Third, hostage or foothold strategies can be employed so as to keep potential entrants in check. A local subsidiary disciplines the potential entrants' entry ambitions (Caves, 1982). A foothold in the potential entrants' home market signals the ability to immediately respond to the potential entrants' entry strategy by retaliation in her home market (Karnani and Wernerfelt, 1985).

2. RECIPROCAL ENTRY GAME

The key point is that incumbent firms in a set of related markets are potential entrants into each other's domain. For the sake of convenience, the argument focuses on the symmetric case where both (equally-sized) rivals are incumbent in

Table III. Reciprocal entry

		Potential entrant 2	
		Non-entry	Entry
Potential entrant 1	Non-entry	(M, M)	$(D, M + D - E + S)$
	Entry	$(M + D - E + S, D)$	$(2D - E + S, 2D - E + S)$

markets of equal size. The payoff matrix of the symmetric reciprocal entry game is depicted in Table III.

If none of the firms undertakes entry, both rivals earn the monopoly profit in their home market (M). If a firm enters the rival's market, market sharing gives a duopoly profit minus entry cost plus multimarket spillover gain ($D - E + S$). The feasibility condition implies that $M > 0$. For the sake of simplicity, assume positive and symmetric multimarket spillovers which are, first, independent of the scale of operation and, second, such that $0 < 2D - E + S < M + D - E + S$. This case resembles the actual rivalry game (Table I). Two sets of equilibrium outcomes can occur.

(K) Reciprocal entry Prisoners' Dilemma: $D < 2D - E + S < M < M + D - E + S$. The non-cooperative equilibrium outcome is $(2D - E + S, 2D - E + S)$, since both firms are willing to avoid the rival's one-sided entry $(D < 2D - E + S)$. However, the cooperative equilibrium (without side payments) where both firms refrain from entry (M, M) is preferred $(2D - E + S < M)$. However, the cooperative equilibrium is only obtained if cheating can be precluded.

(L) Reciprocal entry preference: $D < M < 2D - E + S < M + D - E + S$. The non-cooperative equilibrium outcome is reciprocal entry $(2D - E + S, 2D - E + S)$. This equilibrium is dominant, since $M < 2D - E + S$.

Both equilibrium sets (K) and (L) are studied in models of international trade, notably Pinto (1986), Calem, (1988) and Venables (1990).

VI. Multimarket Collusion

1. MULTIMARKET CONTACT

Multimarket contact among inside firms facilitates *multimarket collusion* (Bernheim and Whinston, 1990). The outcome of multimarket competition (after, for example, a series of entry and reciprocal entry moves) may well be a reduction in competition (Caves, 1982). Edwards (1955) proposed the hypothesis that firms meeting in several markets recognize their interdependence and therefore may decide to tune down competition. Companies with multimarket encounters are inclined to facilitate collusion (Feinberg, 1985), since the payoff of the cooperative outcome exceeds the competitive profit (Kantarelis and Veendorp, 1988). This phenomenon is also recognized in the literature on international trade (Jacquemin,

Table IV. Multimarket collusion

		Incumbent firm 2		
		$P-P$	$A-P$	$A-A$
Incumbent firm 1	$P-P$	$(M-E+S, M-E+S)$	$(M/2, 1.5M-E+S)$	$(0, 2M-E+S)$
	$A-P$	$(1.5M-E+S, M/2)$	(M, M)	$(0, M)$
	$A-A$	$(2M-E+S, 0)$	$(M, 0)$	$(0, 0)$

$P-P$ = Peaceful strategy in both markets
$A-P$ = Aggressive strategy in one market and a peaceful strategy in the other market
$A-A$ = Aggressive strategy in both markets.

1989). For example, reciprocal dumping is the worst of both worlds (or, to be precise, four worlds in a Prisoners' Dilemma): if both parties agree upon refraining from dumping, joint profit is maximized (Pinto, 1986).

The key argument is that multimarket encounters increase the benefit from the cooperative outcome (or increase the loss of non-cooperative rivalry). However, this result is only valid in the case where multimarket spillovers are not dominant. This is clear from the reciprocal entry game, which implies that both firms are *potential* entrants into the rival's market. On the one hand, if $D < M < 2D - E + S < M + D - E + S$, both rivals prefer reciprocal entry. On the other hand, with $D < 2D - E + S < M < M + D - E + S$ both rivals benefit from multimarket collusion. In the latter case a well-established result is that repetition of the (reciprocal entry) game may facilitate (tacit) collusion (Friedman, 1986).

2. MULTIMARKET CONTACT GAMES

Assume infinite repetition of the reciprocal entry game (Table III) with discount rate r. Collusion gives payoff $[(1 + r)/r]M$. Defection is punished by returning to the non-cooperative equilibrium one period after cheating has been undertaken. So, defection yields profit $M + D - E + S + [(2D - E + S)/r]$. Collusion is the equilibrium outcome if $[(1 + r)/r]M > M + D - E + S + [(2D - E + S)/r]$, which is satisfied for $r < [(M - D)/(D - E + S)] - 1$. This proves the intuition: positive (negative) multimarket spillovers facilitate defection (collusion).

This conclusion can be retained if both firms are already *incumbent* in both markets: both firms are active in both markets. By way of illustration take the case with Bertrand competition in both markets. Market sharing implies that both firms split the market in two, which gives $D = M/2$ in the home market and $M/2 - E + S$ with entry. With two-market collusion this sums up to $M - E + S$. Defection occurs if one firm underprices the rival in one or both markets in order to appropriate monopoly profit: $1.5M - E + S$ and $2M - E + S$ respectively. Table IV presents the payoff matrix of the two-market actual rivalry game where defection occurs first in the cheater's home market.

Two sets of equilibria with cooperative outcomes can be computed.

(M) Multimarket sharing: $-E + S > 0$. The condition that $-E + S > 0$ implies that entry is profitable. Therefore, the favorable cooperative outcome is $(M - E + S, M - E + S)$: the firms share both markets so as to exploit the dominant gain from multimarket spillovers.

(N) Reciprocal exit: $-E + S < 0$. The preferred cooperative outcome is (M, M), since entry gives an extra cost $-E + S < 0$. Equilibrium (M, M) implies reciprocal exit: each rival specializes in the other market to the benefit of both firms. Both firms create their own sphere of influence.

Both equilibrium sets raise coordination issues. (Tacit) multimarket collusion offers a solution if cheating can be precluded. In a repeated game punishment can be effectuated by returning to the zero-profit Bertrand equilibrium in both markets one period after cheating has occurred (Bernheim and Whinston, 1990). A credible threat of punishment triggers the favorable cooperative outcome.

For the sake of convenience, the Bertrand equilibrium is calculated in terms of profit exclusive entry cost. So, in the home market a firm earns payoff 0, whereas profit in the entry market equals E. Collusion is the equilibrium outcome in the repeated two-market game if $r < 1 - 2E/M$. In accordance with Bernheim and Whinston's (1990) result this means that multimarket collusion occurs if the condition for single-market collusion is satisfied. Single market collusion gives the incumbent's profit $M/2$ and the entrant's payoff $M/2 - E$. Defection yields M (incumbent) or $M - E$ (entrant). With Bertrand punishment the collusion condition in the repeated single-market game is also $r < 1 - 2E/M$.

However, the result that the conditions for multimarket and single market collusion are equal follows from an assumption of symmetry: in the collusive equilibrium both firms capture an equal share in both markets. The game in Table IV assumes the opportunity to specialize: collusion implies that both firms create separate spheres of influence. For example, assume the asymmetry where both firms are cheapest producers in their home market. With symmetric markets, $S = 0$ and $E > 0$ this follows immediately. Then, in a period collusion gives payoff M in the home market of specialization, defection yields profit $2M - E$ over both markets and Bertrand punishment implies payoff E in the entry market (and 0 in the home base). Infinite repetition gives the collusion condition $r < 1$. This means that multimarket competition has an independent effect on collusion if $1 - 2E/M < r < 1$, which holds for any $E > 0$. So, with asymmetry advantages in favor of incumbent firms multimarket competition may facilitate collusion (Bernheim and Whinston, 1990: 11–13)!

VII. The Artificial Sweetening Industry

The artificial sweetening industry is an interesting illustration of multimarket competition (*Chemical Week*, August 10, 1988; *Financial Post*, June 3, 1989; *Delaware State News*, May 19, 1989; *Chemical Marketing Reporter*, June 6, 1989;

New York Times, November 19, 1989; *Financial Times*, November 26 and 30, 1990). In 1981 the U.S. company Searle introduced the sweetening aspartame under the name of NutraSweet. Aspartame is about 200 times as potent as sugar. Of the available intense sweeteners, aspartame is closest to the taste of sugar. The major quality of aspartame is that only fractions of a gram are required to produce the same degree of sweetness as much greater quantities of sugar. This implies that aspartame brings typically less than 1% of the calories of an equivalent amount of sugar.

Aspartame is sold as the tabletop sweetener Equal and under the brand name NutraSweet as an ingredient in 1700 products including soft drinks, puddings, dressings, ice creams and chewing gum. The demand from soft drinks producers (particularly Coca Cola and Pepsi Cola for their light versions) represent 75% of sales. NutraSweet's U.S. market stands for $736 million sales in 1988. The U.S market counts for 90% of the combined North American – European sales in 1988. However, Europe has the growth potential. For example, a realistic assessment predicts a 50% growth by the early to mid-1990s.

NutraSweet is able to benefit from a secure and extremely profitable home market, since in the U.S. NutraSweet's aspartame (carrying the companies name) is patented up until 1992. NutraSweet's 1988-profit was close to $330 million. During the period 1986–1987 the European patents expired, however. So, the U.S. market and European market show(ed) blockaded entry in the period 1981–1992 and 1981–1986/1987, respectively: NutraSweet's point of departure is protected monopoly (equilibrium set (D)). In defence of this lucrative monopoly position NutraSweet started to erect strategic barriers to entry in light of the European patent expiration: the company's objective was to trigger effective entry deterrence (equilibrium set (G)).

Two entry-deterring strategies worth mentioning are exclusive contracting and branding the ingredient. First, NutraSweet exploited his bargaining position as a monopolist by negotiating long-term contracts with large customers (particularly Coca Cola and Pepsi Cola): for example, NutraSweet guarded 60% of the Canadian market by signing exclusive contracts with Pepsi-Cola Canada Ltd. and T.C.C. Beverages Ltd., the Canadian bottler of Coca Cola. Second, NutraSweet forced his customers to put the company's logo on soft-drink cans, which made the mere ingredient aspartame into a household name NutraSweet.

Notwithstanding NutraSweet's entry-deterring strategies potential competitors started preparing entry into the European market after the expiration of the patents. In particular, the Irish company Angus Fine Chemicals (AFC) and the Dutch-Japanese joint venture Holland Sweetener Company (HSC) installed productive capacity up-front by making use of an innovative cost-reducing technology hoping to trigger a profitable market sharing arrangement in Europe (equilibrium set (F)). HSC, for example, appears to have a good hand as the joint venture could benefit from resource economizing entry ($E_R < E_U$) and multimarket spillovers ($S > 0$) by exploiting the assets and experience of both partners (such as

management skills, knowledge of European markets, R&D knowhow, financial resources and goodwill). Both parties in the joint venture – the chemical companies DSM and Tosoh – were engaged in horizontal diversification into a related market by broadening their product line.

After the expiration of his European patents NutraSweet counterattacked both entrants AFC and HSC in their European home market by an aggressive strategy which reduced price to half the American level: the price in the U.S. market ranged from $55 to $90 a pound in 1989, whereas the European level dropped to $27. NutraSweet's retaliation strategy of intense post-entry competition in Europe was partly successful as AFC decided to exit the market: AFC appeared to be the weak player in the Chicken game (equilibrium set (C)). However, up until the present day HSC has been able to keep up the fight. Probably, NutraSweet's post-entry strategy implies that, *ceteris paribus*, the market only leaves room for single entry (equilibrium set (I)).

HSC's response to NutraSweet's aggressiveness was twofold. First, the firm attacked and attacks NutraSweet's entry-deterring practices (charge: anticompetitive contracting) and post-entry strategy (charge: below-cost dumping) in European courts. The European Commission has declared valid HSC's charge that NutraSweet's exclusive contracting strategy is illegitimate: the contracts had to be dissolved. Recently, the European Commission has, moreover, decided to impose stiff anti-dumping duties (27.55 Ecu per kilo) on NutraSweet's aspartame so as to compensate for the firm's low European prices. The combination of NutraSweet's entry-deterring and retaliation strategies and HSC's aggressive response in court induces toughness in the European market (equilibrium set (A)). Second, HSC attempted and attempts to undertake reciprocal entry by penetrating the North-American market so as to break down NutraSweet's one-sided entry strategy.

On the one hand, HSC has gained a 3% Canadian market share worth $875,000 in 1989 (by selling to, for example, soft-drinks producer Schweppes) since NutraSweet's Canadian patent expired in 1987. Recently, HSC won a case against NutraSweet's exclusive contracting practice in Canadian court. On the other hand, HSC brought NutraSweet to court in the latter's home state Delaware. With the purpose to provoke a trial regarding NutraSweet's patents HSC located an American subsidiary in Delaware. HSC announced the intention to bring a tabletop Sweetmatch (a perfect substitute for NutraSweet's Equal) to the U.S. market. The expectation is that the procedure will take several years. NutraSweet has accepted HSC's challenge by, for example, announcing an intense promotion campaign and the buildup of productive capacity in Europe. Clearly, NutraSweet's moves in Europe and HSC's countermoves in North America are an example of a reciprocal entry game (equilibrium set (K) or (L)).

The outcome of the battle in the artificial sweetening market is a matter of guessing. The case clearly illustrates multimarket competition. Although NutraSweet's objective is to return to the pre-entry monopoly position (equilibrium set (G)) by forcing HSC to exit the aspartame market, multimarket contact may well

trigger (tacit) collusion. Multimarket cooperation can take the form of either multimarket sharing (equilibrium set (M)), both rivals signing a peace agreement in North America and Europe, or reciprocal exit (equilibrium set (N)), both firms creating their own spheres of influence (probably NutraSweet in North America and HSC in Europe). Anyway, HSC clearly intends to stay in the market: K. Dooley, vice president of HSC's Canadian subsidiary, said that "his company is committed to a long battle and is confident the preference of beverage makers for a second source of supply will eventually give them a competitive share of the market" (*Financial Post*, June 3, 1989).

VIII. Appraisal

The relevance of multimarket competition is increasing as a result of the globalization of rivalry and economic integration of regions. Multimarket competition identifies five elements that are important while deciding on strategy in an environment where related firms are engaged in rivalry: (1) focus of competition, (2) economizing on entry cost, (3) multimarket spillovers, (4) reciprocal entry and (5) multimarket collusion. Game theory can be applied to clarify the working and implications of (the five elements of) multimarket competition. The case of the battle for the aspartame market as well as the other real-world examples referred to below illustrate this. The framework of multimarket competition integrates theories of industrial organization and strategic management and may serve as a good starting point for future research in this area. By way of appraisal, three remarks can conclude the argument.

Firstly, the applicability of the multimarket framework is not restricted to the market for aspartame. Space limitations dictate that, by way of illustration, hinting at three examples of reciprocal entry must suffice. First, Goodyear responded to Michelin's entry into the U.S. tyre market with the help of a counterattack in the latter's European home market (Karnani and Wernerfelt, 1985). In the 1970s Michelin invented the radial tyre technology. Backed by this innovation Michelin challenged Goodyear in the latter's U.S. home market. By 1980 Michelin had captured an 8% market share in the U.S. Goodyear reacted initially in Michelin's home market, Europe, by increasing his market share from 8% to 12% in less than a year, while simultaneously making an effort to catch up with Michelin's radial tyre technology. Second, Eastman Kodak replied to Fuji Photo Film's challenge in the U.S. by penetrating, after a year-long lag, the latter's Japanese home market (*The Economist*, November 10, 1990). In the 1980s Fuji successfully invaded the American (and European) markets where Kodak had dominated for decades. Kodak initially responded by cost-reducing efforts in his home markets. However, by 1984 the trade barriers that protected the Japanese film market were dismantled, which enabled Kodak to enter into Fuji's home market. By 1990

Kodak's sales had grown sixfold to a 15% market share. Third, American computer firms invaded Japan after Japanese rivals moved into the U.S. in the second half of the 1980s (*Wall Street Journal Europe*, July 18, 1991). Japanese companies (notably NEC, Epson and Toshiba) increased their share in the U.S. market for personal computers from almost zero in the mid-1980s to 10% in 1990. Recently, U.S. computer firms (particularly IBM, Apple and Compaq) started to counterattack their Japanese rivals in their home market by exploiting improved technology and consumer acceptance. Apple's strategy, for example, already showed success, as halfway 1991 sales were 60% above the 1990-levels, implying a doubled market share (from close to 2.5% to 5%).

Secondly, an additional element emerges in the NutraSweet case: the role of (patent-protected) innovation. This element is not contradictory to the paper's theoretical argument. NutraSweet's patent-protected monopoly in the first half of 1980s impeded the functioning of multimarket competition. The expiration of the patents plus the efficiency-enhancing innovation of potential rivals did trigger multimarket competition in the second half of the 1980s, however. From then on the theory is applicable. A potential rival's innovation induces multimarket competition by making entry easier. The dynamic nature of multimarket has to be emphasized: it is probably fair to say that changes in the *status quo* are caused by shifts in one of the elements of multimarket competition that affect the easiness of entry for either potential rivals (initial entry) or challenged incumbent firms (reciprocal entry). It is here where the crucial role of innovation, for example, enters in the cases of the aspartame and tyre markets by making initial entry easier for potential rivals (HSC and Michelin, respectively). In the photo film and personal computer markets reciprocal entry (from the U.S. to Japan) became easier for the attacked American incumbents (Kodak and IBM-Apple-Compaq, respectively) as a result of dismantled trade barriers and improved technology, respectively.

Thirdly, the argument in this paper is based on restrictive assumptions on the number of firms (two duopolists) and market parity (symmetric demand schedules). The assumptions may not be so restrictive as they seem to be at first sight, however. The restriction to the duopoly case with symmetric markets may not be essential. To date, the qualitative results of the duopoly argument stand up against extensions to the n-firm case, and the same holds for generalizations to a setting with asymmetric markets: qualitatively, the elements that play a major role in multimarket competition seem to be robust to changes in the number of firms and (a)symmetries of markets. For example, first investigations in the literatures on international intra-industry trade (Venables, 1985) and multimarket collusion (Bernheim and Whinston, 1990) suggest that results for n-firm competition and asymmetric markets are qualitatively equivalent to the patterns that occur in symmetric duopoly cases. However, this observation leaves unchallenged that, where this paper offers useful benchmark propositions, future research can be directed to an investigation into the robustness of the framework explained above.

Note

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