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Toward an understanding of price wars: Their nature and how they erupt

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Abstract

This paper aims to improve our understanding of the unique phenomenon of market competition, called price wars, as little is known about their nature and how they erupt. More precisely, we offer selected illustrations of the reality of price wars, identify key attributes of price wars, propose a definition of price wars, and offer a conceptual framework in which early warning signals (EWSs) of price wars are distilled and linked to the likelihood and the intensity of such wars. Also, initial empirical findings on some of the effects of price wars are offered, showing that price wars inflict substantial damage on the companies involved. Implications for researchers entail that numerous research opportunities exist to better understand price wars and to eventually develop a theory of price wars that may become a vital part of a firm's portfolio of competitive pricing strategies. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

Price wars represent one of the most severe forms of competitive interplay in the market place, causing great losses. Companies suffer losses in terms of margins, consumer equity, and ability to innovate. Industries may forego their competitive advantage, fall victim to substitutes, and even face bankruptcy (Bhattacharya, 1996; Busse, 2000). Consumers, although benefiting initially from lower prices, may develop unrealistic reference prices and suffer from lower quality products in the long term. Society as a

whole may suffer from suboptimal allocation of resources. The battleground for price wars extends far beyond the classic examples involving the airline and energy businesses (Busse, 2000; Slade, 1992) as price wars are seen to break out in all kinds of markets and businesses (Rao et al., 2000). In Table 1 we offer a selection of price wars to illustrate the wide variety of products, markets, and industries in which price wars have erupted. We will discuss this table in more detail in the next section.

Damages due to price wars can occur, at least in part, since firms often seem to lack an understanding of the market and industry conditions leading to a price war such as market growth, concentration of market shares, and over-competing (Ramaswamy et al., 1994; Leeflang and Wittink, 1996; Griffith and

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Table 1
Examples of price wars

Business	Location	Players	Nature	Market structure	Impact
(1) Bus rides	New York to Washington	Greyhound vs. Peter Pan Trailways (I)	US\$25 fare lowered to US\$5 in 3 weeks	Oligopoly	Travel quadrupled Losses Revenues less than half Break even
(2) Grocery	Houston	Incumbent grocery (I) vs. H.F.B. & Food Lion (entrants)	Food prices 2% below last year's	ms1 = 21% ms2 = 19.4%	One exit One grocer under Ch.11
(3) PC-Software	US	Borland (CI), Lotus, Microsoft	Deep discounts (competitive upgrades)	ms1 = 70%	Corporate image eroded
(4) Salty snacks	US	Frito Lay vs. Eagle Snacks	Retail prices 10–20% below last year's	ms1 = 40.6% ms2 = 8.6% ms3 = 4.8%	Profit decline Pressure on small firms Brand loyalty erosion
(5) Pizza chains	US	Pizza Hut, Little Caesar's (I)	2-for-1 deals Heavy couponing	ms1 = 45% ms2 = 32% ms3 = 4.8%	Poorer quality Market share gains for top 3 firms Others lose
(6) Notebook PC	Worldwide	Toshiba	Price erosion (30–40%)	Highly fragmented	
(7) Mutual funds	US	Fidelity vs. Dreyfus (I)	Heavy fee cutting	Oligopoly	Slim margins Expansion in volume
(8) Laser printers	US	Hewlett-Packard (I), Apple	Prices cut by up to 14%	Growth = 33%	Change channel structure
(9) Greeting cards	US	Hallmark, American greetings (ribbon greetings (CI))	Concessions to retailers (e.g., payment terms)	ms1 = 54% ms2 = 28% ms3 = 10%	No share gains Profit erosion Increased marketing costs
(10) Minivans (I)	US	GM vs. Chrysler	Cash rebates	Oligopoly	
(11) Tires	Europe	Michelin, Goodyear, Pirelli	Price cuts up to 17% (less than vs. cost)	ms1 = 24% ms2 = 19% ms3 = 17% Growth = 2%	Lower margins (23%)
(12) Video games	US	Nintendo vs. Sega	Unit prices cut by about US\$50	ms1 = 70% ms2 = 20%	Margins squeezed
(13) Contact lenses	US	Bausch and Lomb (I) vs. Cooper Vision	Heavy cutting of wholesale prices (US\$10–50)	ms1 = 37%	
(14) Food grocers	UK	Tesco (I), Asda	Price cuts on own labels	ms1 = 16% ms2 = 15.3% ms3 = 11%	Nimbling share prices
(15) Beer	US	Coors (I) & Miller (I) vs. Stroh, Heilman, A-Busch	Heavy discounting	ms1 = 43% ms2 = 23% ms3 = 10%	Dwindling shares Losses for Heilman

Table 1 (continued)

Business	Location	Players	Nature	Market structure	Impact
(16) Hamburgers	Japan	McDonald's (I) vs. local chains	Discounting of value sets		Squeezed profit margins
(17) Car rentals	US	Hertz, Avis, Budget, National	Heavy note cutting		Decline in service quality

Rust, 1997). We will refer to these conditions as early warning signals (EWSs) in the following. Being knowledgeable about the relationships between EWSs and price wars can allow firms to reduce the likelihood that price wars occur. More precisely, knowledge about the EWS–price war relationship enables firms to avoid contributing to the establishment of EWSs or, at a minimum, to be able to anticipate and prepare for a price war.

In this paper, we discuss the scope and reality of price wars, provide a comprehensive definition of the phenomenon, distill a set of EWSs that precede price wars, and propose a framework that links EWSs to the likelihood that a price war erupts in a certain industry and to the possible intensity of that war. We conclude by suggesting an agenda for future research as well as offering several managerial implications. Research about the termination of price wars and the precise long-term effects of price wars on all stakeholders of a firm are beyond the scope of this paper due to extensive data requirements. We also point out that this paper does not focus on pricing strategies in general nor does it attempt to develop a complete theory of firms' pricing behavior.

2. The reality of price wars: A few insights

Price wars represent a unique phenomenon of market competition. Their effects are most often disastrous and seemingly unsurpassed by any other form of competitive exchange. During a price war, the competitive exchange seems of unique speed and intensity. To illustrate the reality of the price war phenomenon, we provide a number of illustrations and stylized findings. A review of business press articles covering around 1000 price wars provides some very interesting initial insights.

2.1. Scope and breadth of price war competition

Table 1 provides some evidence about the scope and breadth of price war-type competitive interactions. This table shows the diversity of industries in which price wars erupt, the various levels at which price wars take place (e.g., manufacturer, retailers), their wide geographic scope, the nature of price warfares, and the mechanisms that are used (e.g., discounting of retail prices vs. wholesale prices).

Further, Table 1 illustrates the fundamental consequences to which price wars may lead. Affected parties do not just encompass the company itself but also its stakeholders such as suppliers, distribution channels, shareholders, and customers. Typically, in the short-run, price battles appear to lead to profit erosion. In the longer term, such warfares may also tarnish the corporate image and even cause the firm to go bankrupt (Busse, 2000; Bhattacharya, 1996). For instance, when pizza chains engaged in a discounting war (see entry #5 in Table 1), some critics charged that the promotional costs would be balanced by chiseling quality. Heavy price-cutting may also bite into brand allegiance. As consumers get used to low prices, their reference price for the brands involved lowers. As a result, they often become unwilling to pay higher prices later on (Blattberg et al., 1995). Also, the key purchase criterion may become price rather than quality or the brand name. In several instances, price warfares have spelled turmoil for resellers. For example, a Pepsi-bottler noted that: "The shoot-out between the two big ones (Pepsi and Coke) has wreaked havoc on the (bottling) industry" (Business Week, December 11, 1989).

In extreme cases, price warfare may lead to a restructuring of distribution channels. For instance, in the laser printer industry, a price war stimulated a

shift in distribution channels from traditional resellers to superstores and consumer electronic stores (Electronic Business, May 20, 1991, see Table 1). Further, shareholders holding stocks of companies engaged in price battles will often see the value of their stocks dwindle. For example, after one price war in the personal computer industry market value losses ranged from 13% for Compaq Computer up to 33% for Dell (New York Times, June 21, 1992).

2.2. Frequency, speed of competitive interactions during price wars

The bus-ride warfare example in Table 1 (entry #1) provides an illustration of the speed and magnitude of interactions during a price war: Peter Pan Trailways, after acquiring a new Washington–New York City route from US\$25 to US\$9.95. Greyhound responded by lowering its fare to US\$7 (from US\$25). Peter Pan countered with a US\$6.95 fare. Greyhound pushed its fare to US\$5 (which was less than Greyhound had charged 40 years ago!), which Peter Pan immediately matched.¹ All of this happened in less than 3 weeks. In interplay with the relative size of price cuts and the duration time of an ongoing price war, speed and frequency of interactions constitute the intensity of a price war.

2.3. Market share effects of price wars

To illustrate market share effects of price wars, we turn to a personal care product that was involved in a price war.² The dataset for this example is somewhat unique since it is based on an UPC-scanner store database. The product class is mature with no expansion of the category and very little product differentiation. The market is highly fragmented (Brands A and E are made by the same company)

¹ There were some subtle differences between the two fares. The US\$5 fare was available for all seats at Greyhound. However, Peter Pan Trailways limited its bargain fare to the first 20 passengers, the other passengers paying US\$25.

² Since we have to disguise the dataset, certain details have to be left out.

Table 2
Price war example

(a) Average prices before and after entry				
Brand	Mean 1: pre-entry	Mean 2: post-entry	Std. dev.: post-entry	Std. dev.: pre-entry
A	0.350	0.282	0.034	0.050
B	0.345	0.309	0.022	0.046
C	0.351	0.305	0.025	0.034
D	n.a.	0.290	n.a.	0.053
E	0.353	0.285	0.022	0.048

(b) Pre- vs. post-entry price sensitivities

Brand	Pre-entry (Std.) ^a	Post-entry (Std.) ^a
A	–3.08 (0.58)	–3.30 (1.77)
B	–4.41 (1.06)	–4.90 (1.30)
C	–7.68 (1.10)	–7.91 (1.03)
D	n.a.	–9.55 (1.72)
E	–9.19 (1.40)	–3.98 (1.93)

^a Standard errors between parentheses.

with no clearly dominating brand. Table 2 suggests that most consumers may buy the product predominantly on price. A major change took place in week 24 when a new brand (“Brand D”) was introduced in the market. We note that the new brand is a brand extension of a parent brand, which is one of the leading brands in a related category. The brand’s fairly aggressive marketing launch may have triggered the price warfare that occurred shortly after the introduction.

Note that in our example all of the brands are engaged in the price war. As a result, the price warfare dramatically lowered the plateau for the shelf prices. This is underlined by Table 2, which contrasts the pre- and post-entry mean shelf prices.³ Note also that price sensitivities increased substantially for most of the incumbent brands following the price war (Table 2, panel (b)). We argue that these descriptive statistics illustrate the importance and scope of price war phenomena and add that, obviously, more rigorous empirical research is needed.

³ Note that the mean pre-entry prices reported in Table 2(a) include a larger period than the one in Table 2(b). Thus, the shift in prices is even more remarkable since the mean prices shifted slightly over time due to inflation.

3. Literature on price wars

Marketing and related business disciplines treat the phenomenon of price wars primarily at the textbook level (e.g., Urban and Star, 1991; Scherer and Ross, 1990; Ries and Trout 1986). The rich work on pricing in marketing offers, however, a number of conceptual, descriptive, and directional insights about price wars. More precisely, we mean work such as pricing and “over-competing” (Griffith and Rust, 1997), pricing and fairness (Campbell, 1999), pricing and learning curve effects (Rao and Bass, 1985), predatory pricing (e.g., Tellis, 1987), tit-for-tat pricing reactions (Rao et al., 2000), everyday low pricing (Lal and Rao, 1997), pricing and cooperative vs. retaliatory reactions (Ramaswamy et al., 1994). Direct research on price wars in marketing is lacking as such research is predominantly situated in the area of non-cooperative game theory (Slade, 1989, 1990, 1992; Fudenberg and Tirole, 1989; Shapiro, 1986; Tirole, 1990). Regarding a price war, game theoretic work makes several assumptions. A standard assumption is that firms obey a tacit collusive agreement. Under this basic scenario, the competing firms implicitly agree to charge a certain price, typically close to the monopoly price. A price war is triggered whenever one of the firms cuts its price in an attempt to lure customers away from its competitors. Other firms will punish the maverick (Slade, 1990) by charging the competitive (zero-profit) “Bertrand price” for the remainder of the game (Friedman, 1983). Such strategies are known in the literature as trigger strategies because a price cut can end the tacit collusion and “trigger” a price war when the market price goes below a certain previously established trigger price (Tirole, 1990).

More recent work refines the basic model and offers several new paradigms. The most prominent ones are (1) imperfect-monitoring models, (2) cyclical models, and (3) learning models. We summarize these models below.⁴

⁴ For a more detailed description of these models, see, for instance, Slade (1990).

3.1. Imperfect monitoring models

This type of model starts from the premise that firms can only observe their own outputs; they cannot observe the outputs of their rivals. A classical example of this thinking is the Green and Porter (1984) model. In their model, firms decide on the output and observe an industry-wide price that depends on the overall industry output and a random variable θ . Tacit collusion among the firms is supported by a trigger price strategy. Each firm selects a collusive output level, $q_i = q^*$, a trigger price \bar{p} , and a punishment period T . When an unusually low price is observed, it is hard to distinguish between two scenarios: (1) one of the rivals cheated, or (2) the price dropped because of an unexpectedly low demand shock. The authors prove that cheating in this model can be deterred by the players threatening to produce at Cournot–Nash levels for the duration of T periods and then resume to collusion. Their model predicts that prices will alternate between a collusive phase and a punishment phase. Moreover, price wars will be triggered by surprisingly bad demand shocks. Thus, in their model, price wars can only occur during economic downturns.

3.2. Cyclical models

Cyclical models focus on the difficulty of sustaining tacit collusion in the face of cyclical macro-economic conditions. In stark contrast to the class of imperfect monitoring models, players here can observe all variables. Uncertainty is not critical here. The Rotemberg and Saloner (1986) model exemplifies this approach. In their model, rival firms choose price. A key assumption is that in their model, the demand shocks (θ_t) are observable to all players. When demand is high ($\theta_t > 0$), the benefit from undercutting the agreed-upon price is tempting. By cheating during economic boom-times, the firm can capture a large chunk of the market when demand is high. On the other hand, punishments are meted out in the future, when demand returns to its normal level. Thus, this model predicts that price cuts most likely occur in good times.

3.3. Learning models

A third class of refinements centers on uncertainty about structural demand or cost parameters. A good

example of this group of models is Slade's (1989) model in which unknown demand parameters are random variables. These unknown parameters remain constant for a while but then shift. Such shifts are permanent. As a result, strategies played in the previous period, prior to the shift, are not optimal anymore. The players adjust their prices and these price movements trigger a price war. Therefore, in this class of models, price wars are "information-gathering devices" (Slade, 1990). Similar to the first group of models, price wars are triggered when demand slumps.

Finally, we briefly summarize some of empirical findings in the area of non-cooperative games. Slade (1990, 1992) analyzes two datasets. Her results suggest that unanticipated economic downturns are likely to trigger price wars. Other empirical research has been done by Green and Porter (1984), Bresnahan (1987), Rotemberg and Saloner (1986), and, more recently, Levenstein (1997). The insights derived from these studies may be limited as they focus on a few industries (cement, automobiles) and since the data employed were collected at a time when data collection procedures were less well-defined (e.g., railroad data from the second half of the 19th century in Porter, 1983; pre-World War I bromine industry data in Levenstein, 1997).

In short, game theoretical models offer important insights about price wars, e.g., the relevance of industry-wide events such as demand shifts or a worsening of financial conditions. When developing our framework, we build on such insights and draw also on research on warfare and rivalry in political science and related sciences to arrive at managerially relevant, behavioral issues to explain the likelihood and intensity of price wars. Before we develop our framework, we offer necessary clarifications of what the term "price war" entails. Such a definitional effort is in order, as no standard seems to exist.

4. A definition of price wars

In the business literature, the term appears mainly in textbooks and is typically descriptive in nature. Assael (1990) maintains that price wars are marked by competing firms struggling to undercut each other. Urban and Star (1991, p. 198) note that a price war

occurs if one company lowers its price and competitors match the price. Cassady (1963, p. 2) suggests that price warfare can be viewed as "an engagement involving two or more vendors seeking to achieve a goal that each is determined to attain and in which the rival vendors (...) make successive moves and countermoves in an attempt to gain an advantage or to resist any advantage gained by the other". In their article on price competition, Urbany and Dickson (1991) suggest that price wars typically start with one firm trying to grab market share. Such a price cut may lead to downward price pressure—which they refer to as "price-cutting momentum"—that ultimately drives other competitors to follow the initial move. In the IO-literature, Besanko et al. (1996, p. 426) point out that price wars are examples of wars of attrition: "In a war of attrition, two or more parties expend resources battling with each other." Similarly, Busse (2000) maintains that a "price war is a period in which the firms set prices that are significantly below" the prices typically charged in the industry. Slade (1989) suggests that a price war entails that one competitor cuts price to punish another competitor for violating a rule of competitive conduct. The firm to be punished reacts through another price cut, prompting further such cuts by the competitor, and so on. Similarly, Thomas and Soldow state that if a price cut violates industry rules, competitive turmoil may result (Thomas and Soldow, 1988, p. 67).

In sum, although a number of statements pertaining to the price war phenomenon can be found, a precise definition is lacking. This definitional gap needs to be filled since price wars can eliminate a firm's profits, reduce a firm's ability to innovate, and damage a firm's customer loyalty. Price wars also damage a firm's overall market value as they adversely affect its stock price. Additionally, fewer innovations per firm can weaken an industry as a whole. A definition of price wars is challenging since price competition and price war competition are located on the same continuum. One needs, therefore, to identify criteria to decipher whether a competitive pricing interaction has evolved or "degenerated" into a price war. To arrive at such a definition, we searched various literatures, including political science, industrial organization, history, business, biology, and social psychology. We also

asked executives, academics, and journalists reporting on the phenomenon for their perceptions and explanations of the term. There appear several unique aspects of price wars.

Unlike any other form of competition including intense price competition (Schunk, 1999), price wars entail “market-death,” which suggests as a main or necessary condition that price war-type competition is not sustainable over time. The lack of sustainability may arise for a number of reasons, ranging from a firm’s anticipation of an insufficient, i.e., below average ROI, to pricing below cost.

Further, price wars can emerge without intent seemingly present (unlike predatory pricing). That is, price wars may be the result of events that escape the concrete awareness of the companies involved. For example, price wars may be due to competitive misunderstandings, especially during periods of market entry, overheating/emotionally driven competitive interaction (Schunk, 1999), or noise in the competitive interaction (Axelrod, 1997). In other words, the evolution of the competitive interaction or the evolution of the market conditions may provide a fertile breeding ground for price wars. To illustrate, managers may decide to add capacity since the error to have no capacity when demand is strong is expected to outweigh the error of having too much capacity in case of weak demand. As a result, companies often face an incentive to invest in overcapacity.⁵ What is important to point out here is that excess capacity is likely to prompt one company sooner or later to cut prices. Other companies with overcapacity are likely to follow; thus, a price war spiral can be ignited. While adding capacity, none of the companies was probably unaware that each contributed to the ignition of a price war. Additionally, price wars do not obey the “3 Cs-framework” as actions and reactions during price wars focus practically solely on the competitor and not on the consumer.

⁵ The asymmetry of these two errors is due to the following: lack of capacity when demand is strong is perceived to lead to losses in profits, current market share, and future market share (since consumers may switch their purchase and it may be difficult to get them to switch back). Too much capacity when demand is weak is expected to force the company only to drop prices a bit.

We also comment briefly on the uniqueness of the price variable for war-type competitive interactions. Compared to all other marketing mix instruments, the price variable offers unique advantages for a war-type competitive interaction. More precisely, price can be used rapidly; that is, it can be changed easily via issuing new prices to the trade, the retailers, or the sales force (e.g., Stigler, 1987). The price variable is also the most flexible, that is, prices can easily be changed downwards or upwards. Further, this flexibility includes that the changes can vary by consumer segments or even by stores. The price variable also leads to immediate results that are easily measurable in the form of (short-term) sales changes and competitive reactions as opposed to other marketing mix variables where results are often much more difficult to assess (Ramaswamy et al., 1994; Kalra et al., 1998) and also often take considerable time (e.g., advertising trying to build up customer awareness or to generate brand loyalty). These unique attributes of the price variable explain why it is a preferred candidate for a war-type competitive interaction where the frequency of interaction is high and degree of interaction varies greatly (Kotler and Achrol, 1981). It seems worth noting that by far the most frequent war-type competitive interaction occurs in the form of price wars although several other forms of cut-throat competition occur, such as warranty wars, product wars, and distribution coverage wars (Ries and Trout, 1986).

Our efforts resulted in a set of definitional statements allowing to identify a price war. We define a price war to require one or more of the following conditions:

1. The actions and reactions focus almost exclusively on the competitor instead of the consumer.
2. The pricing interaction as a whole is undesirable to the competitors.
3. The competitors did neither intend nor expect to ignite the price war through their preceding competitive behavior.
4. The competitive interaction violates industry norms.
5. The pricing interaction occurs at a much faster rate than previous such interactions.

6. The direction of the pricing is “downward”.
7. Mainly: the pricing interplay is not *sustainable*.⁶

Next, we offer a framework to explain the emergence and intensity of price wars. We note the relationship between price wars and EWSs: EWSs reflect the conditions that “facilitate” the eruption of price wars.

5. A framework to explain the emergence of price wars

Marketing research offers a number of directional insights into the price war phenomenon (e.g., Campbell, 1999; Putsis and Dhar, 1998; Lal and Rao, 1997; Griffith and Rust, 1997; Guiltinan and Gundlach, 1996; Bowman and Gatignon, 1995; Ramaswamy et al., 1994; Leeflang and Wittink, 1996; Carpenter and Nakamoto, 1989; Nagle, 1987; Dolan and Jeuland, 1981; Monroe and Della Bitta, 1978). For example, empirical work by Putsis and Dhar (1998) shows that the type of competitive interaction varies significantly across categories depending on the demand and competitive characteristics of the category. Also, certain market conditions (e.g., market growth) and product conditions (e.g., importance/market share) conditions are used to evaluate the attractiveness of markets (e.g., portfolio planning) and thereby might determine the efforts firms are willing to invest in those product/market combinations for, e.g., defense purposes (Ramaswamy et al., 1994).

The key contention of our framework is that the presence of certain market conditions and their development make a price war more likely and increases its intensity. We call such conditions or developments EWSs of price wars. It is important to comment on the nature of these EWSs. In a sense, EWSs “linger around” and that way facilitate the ignition of price wars. In other words, EWSs precede price wars and provide fertile conditions for the outbreak of a price war. To illustrate, let us now turn

to a situation with overcapacity: overcapacity is viewed as a condition facilitating the emergence of price wars as sooner or later companies will use the excess capacity to increase sales via price cutting. It is, thus, most important to eliminate or avoid the condition of overcapacity.

Generally, we argue in our framework that the market conditions that facilitate the outbreak of price wars need to be identified. This is since these conditions provide information early on that a price war may erupt, i.e., these conditions provide *early warning signals* of price wars. We note that the approach here is similar to the one used by historians when trying to identify the conditions before the breakout of a war. Wars are often preceded by conditions such as the built-up of arms or fundamental differences in societal orders. Once such conditions prevail, it is often only a matter of time since an often rather insignificant event actually ignites the war. Obviously, managers should pay attention to EWSs, i.e., managers need to be sensitive to the lingering danger once an EWS of price wars exists. This seems especially important since EWSs may be within the control of the practicing manager. As a result, managers need to be sensitive about these EWSs to reduce the likelihood of price wars.

To develop our framework, we borrow insights from political science, history, industrial organization, economics, social psychology, and marketing. The resulting framework centers on four types of EWSs that affect the likelihood and intensity of price wars. In particular, the EWSs reflect (1) market conditions, (2) firm characteristics, (3) product attributes, and (4) consumer behavior (Table 3). These warning signals constitute the pillars of our framework and we contend that such signals can explain variabilities in the likelihood and intensity of price wars.

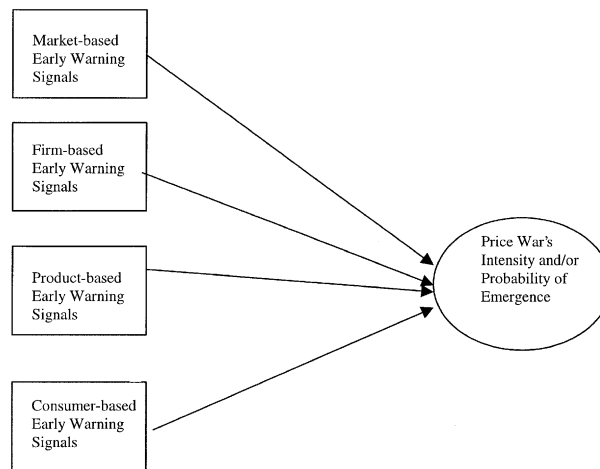
5.1. EWSs due to market conditions

Markets with certain characteristics may be conducive for price wars to erupt. Certain market properties may also drive the intensity of price warfares. Our focus here is on market conditions such as excess capacity, new entry, market growth, and market concentration. Below, we discuss each of these characteristics and link them to the likelihood and intensity of price wars.

⁶ Per suggestion of a reviewer, we explicitly acknowledge that this definition, like most others, is to a degree, subjective.

Table 3

A framework to explain the emergence and intensity of price wars



5.1.1. Competitive entry

General insights on the effect of entry can be derived based on Organski's (1968) "power transition"-paradigm that has been used to explain war escalations. This theory states that changes in the division of power among states underlie wars. To block or counter a rising challenger ("new entrant"), the leading state ("incumbent" firm) may launch a preventive war while it is still powerful. As a new firm infiltrates a market, a growing number of firms will compete for customers and sales in that market and incumbent firms must try harder to maintain their market power and market position (e.g., Robinson, 1988). Also, a potential entrant may set a lower price than the incumbent (Kalra et al., 1998) in order to gain market share, especially in the presence of sizable switching cost (Klemperer, 1989). As a result, competition is likely to grow fiercer and, at the same time, market actions and reactions are more likely to overheat, leading firms to over-compete (Griffith and Rust, 1997), and often decreasing price below the Nash-price predicted by economic theory. For example, when Anheuser Bush with its Eagle Snack division entered the snack food market, a price war broke out shortly after. Likewise, when the Singapore government opened up its telecommunications market in January 2000, a price war escalated between SingTel, the incumbent player, and StarHub, an international consortium. In many instances, a

firm's reactions fierce enough to ignite a price war may originate from the firm's attempt to preserve the current distribution of power and, thus, to deter (other) potential entrants (Kreps and Wilson, 1982). Sometimes, hints of an imminent price war are dropped by incumbent players prior to the actual entry. After Virgin Airlines announced that it would consider starting a no-frills domestic service in Australia, Qantas's chief executive announced that Qantas might consider a price war. The airline was considering launching a low-price airline of its own or much lower prices on its current services.⁷ We propose that a significant positive relationship exists between competitive entry into a market and the emergence of price wars. As a result, we offer the following proposition.

P1a. *As market entry occurs and an entrant gains or is expected to gain a sizable market position, a price war becomes more likely.*

5.1.2. Excess capacity

Investments in capacity are often irreversible and need to be made in chunks. Overcapacity means

⁷ "Qantas Hints At Price War," International Herald Tribune (March 20, 2000), p. 2.

often that companies face a considerable period of time during which a chunk of their capacity sits idle and produces no return. Thus, overcapacity will tempt a firm to undercut its rivals' prices (Scherer and Ross, 1990). Competitors, however, may view such pricing as aggressive and will react fiercely (Heil et al., 1998), especially if they struggle with overcapacity as well. Thus, during periods of industry overcapacity, the industry is much more prone to suffer from an erupting price war. For example, price wars in the transatlantic airline industry and in the auto industry are viewed as having been caused by excess capacity (Heywood, 1991). Based on these points, we offer the following proposition.

P1b. *If an industry possesses excess capacity, the emergence of price wars is more likely. Excess capacity will also stimulate the intensity of price war-fares when they occur.*

5.1.3. Market growth

Choucri and North's (1972) "lateral pressure" paradigm of international conflicts suggests that a growing population and technological advances lead to increasing demands for resources. These demands create "lateral pressure" to get access to natural resources, forcing states to adopt expansionist policies (e.g., in the form of colonies). Such policies are likely to bring states into conflict with one another. Similarly, most companies try to build profits by boosting their sales. As long as the market expands, damaging competitive interplay is less likely (Robinson, 1988). However, when industry growth declines or disappears, competitive interplay basically resembles a zero-sum game (of sales) since a firm can only increase revenues by stealing customers away from rival firms. Empirical results by Ramaswamy et al. (1994) show that market growth increases a firm's tendency to carry out retaliatory price cuts and, thus, also decreases the chance for price cooperation. As a result, price warfare becomes more likely and more intense than in markets with substantial growth. For instance, saturation of the fast-food market forced hamburger and pizza chains into a price war. Thus, we expect an inverse relationship between market

growth and the likelihood of price wars and posit the following proposition.⁸

P1c. *Price wars are more likely to occur and to be more intense in markets with marginal (or negative) growth.*

5.1.4. Market concentration / distribution of market power

Another EWS that can help to explain the emergence of price wars is market concentration. Insights can be gained from the political science literature on international relations. This literature has generated an impressive research stream on the impact of the distribution of power among nations on the emergence of international conflicts (Levy, 1989). Much of the debate revolves around two paradigms: the "balance of power" theory and the "power preponderance" theory (Mansfield, 1992). The first paradigm argues that when power is dispersed, war escalations are unlikely to occur. The idea is that none of the powers is large enough to impose its will, so the costs of war will outweigh the expected benefits. Within our context, these notions imply that price warfares are least likely to emerge in fragmented industries.

The competing "power preponderance" paradigm argues that wars are less likely to emerge when power is highly concentrated. States where most of the power is concentrated supposedly have little interest to provoke one another. There are also fewer potential sources for a conflict. Small states will be deterred from challenging large ones, given the power disparity they face up to. Drawing the parallel here, relatively large firms with "deep pockets" will be

⁸ For completeness, we refer briefly to other work that could lead to an alternative proposition. Since this work appears to be less compelling, we offer our proposition as worded in the text. An empirical finding (Robinson, 1988) suggests that competitive reactions in growth markets could be greater than in declining or mature markets. One possible explanation for this finding is that growth businesses are run differently than mature or declining business units. Products in growing markets sometimes receive more resources and more flexibility in the use of these resources than other product lines. However, these arguments seem less compelling than those used in the development of the proposition.

able to discipline the smaller firms. These assertions can be motivated within the supergame framework by pointing out that punishments for deviating are less severe when profits are highly fragmented (Tirole, 1990). On the other hand, coordination on a cooperative price might be more difficult with asymmetric firms (due to, e.g., cost differences) and, for similar reasons, small firms may prefer to deviate from monopoly prices even if larger firms match (Besanko et al., 1996).

A hybrid version of these paradigms has emerged. Levy (1989, p. 233) argues that: “Both balance of power and power preponderance formulations assume a linear relationship. (...) One could imagine a curvilinear relationship in which equality is destabilizing because it tempts aggression; a moderate level of power concentration is stabilizing because it deters aggression; and an extremely high level of power concentration is destabilizing because it generates fears of hegemony.”

The likelihood of warfare appears, thus, to be higher when power is highly concentrated or fragmented. Interestingly, part of this argument has been used in marketing as the market concentration has been argued to lead to retaliatory behavior (Ramaswamy et al., 1994). For intermediate levels of power distribution, theory in the political sciences expects wars to be unlikely to occur, e.g., Mansfield (1992) found empirical evidence that supports such a non-monotonic relationship. On the other hand, some scholars argue that wars in multipolar systems will be less intense than those that occur in bipolar systems. We can summarize the above reasoning via the following proposition:

P1d. *The incidence of price warfares is relatively high in markets where market power is highly concentrated and fragmented markets and low for markets with intermediate levels of concentration.*

5.2. EWSs due to firm characteristics

Certain characteristics of the firms competing in a market can provide EWSs on the likelihood and intensity of price battles. These characteristics include price leadership, exit costs/barriers and firm reputation. Below, we describe these EWSs and discuss their ramifications for price warfares.

5.2.1. Exit costs / barriers

Exit barriers are costs that a firm must carry if it decides to leave the market place (Gilbert, 1989). The level of exit costs will depend on what alternatives the firm has for its assets when it is forced to leave the industry. According to Caves and Porter (1976), exit barriers arise because of asset specificity, which will constrain capital and factor mobility. Therefore, we anticipate that a firm retaliates more fiercely the fewer alternative it has due to the specificity of its assets. We hypothesize that the higher the exit barriers a firm faces, the higher the likelihood that a price war erupts.

P2a. *As exit barriers increase, the likelihood of price wars grows as well.*

5.2.2. Price leadership

Some firms perform the role of the price leader in their market. For instance, in Europe, during a price war in the tire industry, Michelin was considered to be the price leader and the only one who could bring higher prices back. Several forms of price leadership have been put forward (see Scherer and Ross, 1990, pp. 248–250). One form is the dominant-firm type where the firm with a relatively large market share can discipline the rest of the industry. At the other extreme is “barometric” leadership where the price leader merely functions as a “barometer” for the overall market conditions. The literature in the area of industrial organization has also identified several bases for the price leadership, including share of the customer loyal segment (Deneckere and Kovenock, 1992) and informational advantages (Rotemberg and Saloner, 1986). Since most of these factors are hard to operationalize, a common view seems to focus on the relative size as the primary determinant of price leadership (Deneckere and Kovenock, 1992). In addition, sales of the smaller rivals in the industry are very vulnerable to the pricing policy run by the large firm. Thus, the presence of a price leader who governs the rest of the market would facilitate tacit collusion and, hence, lessen the likelihood of price warfare eruptions. Deneckere and Kovenock (1992) provide a game-theoretical model that shows that price leadership leads to more collusive competitive interplay. Thus, we can formulate the following proposition.

P2b. *Price wars are less likely to emerge in markets where a single firm is viewed as being the price leader.*

5.2.3. Firm reputation

Several research studies attest to the importance of a firm's competitive reputation and its impact on competitive interplay (e.g., Tirole, 1990; Kreps and Wilson, 1982; Milgrom and Roberts, 1982; Kaul, 1997). An underlying tenet in this research is that past competitive behavior will indicate a firm's future competitive attitude. Firms with a track record for toughness will, in general, deter potential mavericks from breaking the rules of competitive conduct in a market. Such firms may also challenge new entrants to prove their reputation for toughness. Thus, we expect that industries where one or more firms have established a reputation to swiftly penalize competitive deviations will experience less frequent but fiercer price wars. These conceptualizations lead us to state the following proposition.

P2c. *Price wars are less likely to emerge in markets where one (or more) firm(s) have established a strong reputation for toughness by combating past deviations. If price wars emerge in markets with one (or more) high reputation firm(s), the resulting price warfare tends to be more intense than in other markets.*

5.2.4. Financial condition and over-competing

After a period of "too much" emphasis on price competition or an over-competing on price (Griffith and Rust, 1997), firms are likely to face significantly lower profit margins. Such deteriorated financial conditions can lead to new incentives to cut price, possibly in an effort to capitalize on economies of scale (Monroe and Della Bitta, 1978; Dolan and Jeuland, 1981), or too strong a preference for volume-oriented pricing (Urbany and Dickson, 1994) or to shift future sales into the current period (Busse, 2000; Guiltinan and Gundlach, 1996).

Such behavior seems especially likely in case a firm's financial condition has deteriorated to a degree that warrants fears of bankruptcy (Bhattacharya, 1996). The firm has little to lose and will, thus, be

likely to cut price to an extreme degree. In such cases, the price war that is ignited is called a "survival price war" (Bhattacharya, 1996). It is worth noting, that this rather myopic behavior represents a form of over-competing (Griffith and Rust, 1997), which also entails that a company even disregards its competitors' matching capabilities and policies (Busse, 2000; Hess and Gerstner, 1991). Based on these statements, we offer the following propositions.

P2d. *As financial conditions of at least one firm in an industry worsen, price wars are more likely to erupt.*

P2e. *As a firm approaches bankruptcy, the likelihood of price wars in an industry increases.*

5.3. Early product-related warning signals

Certain elements inherent to the nature of a product may increase the likelihood of the incidence of price wars. These elements include the degree of product differentiation, head-to-head products, and the purchase cycle. We discuss their linkage to price warfares below.

5.3.1. Importance of product

Work in the area of war studies points to the importance of the rise of vital issues as a trigger towards international disputes (e.g., Vasquez, 1987, pp. 117–119). Security issues may concern questions of political independence or control of one's own or contiguous territory. Empirical work by Busse (2000) using data from the airline industry's price wars shows that as a firm is more likely to enter a price war, the greater the share on routes served by the price war leader. Along the same lines, we expect that as price warfares are more likely to escalate, the more important the product is to the firm's business. When a product is strategically important to a firm, it is likely that the firm will respond vigorously to any perceived threat to its business. On the other hand, empirical results by Chen et al. (1992) show that competitors who have high stakes in markets under attack react slowly but strongly. This reasoning brings us to the following proposition.

P3a. *The higher a product's strategic importance to a company, the higher the likelihood of a price war.*

5.3.2. Lack of product differentiation and premium products

In markets with a high degree of product heterogeneity, firms can avoid price competition by competing on non-price dimensions. As the product homogeneity in a market increases, the price variable will gain in importance as a device to lure customers. In the extreme case of “commodity-type” products, price tends to become the main competitive weapon (Simon, 1989), which has frequently occurred due to the penetration of every day low pricing (EDLP) strategies (e.g., Lal and Rao, 1997). Thus, aggressive pricing and price-cutting will become more pervasive (Gultinan and Gundlach, 1996), implying that price wars are more likely to erupt in the aforementioned cases. As a special case, we consider the market for premium priced products. One might argue that premium products derive their exclusivity, at least in part, due to their high pricing. For example, Rolex watches command their high prices largely because of their exclusivity rather than due to their ability to show the time more precisely than other watches. Premium priced products, therefore, base their *raison-d'être* largely on their high pricing and price wars would undermine their special cachet. Thus, we offer the following proposition.

P3b. *The more commodity-like the products in a market, the more likely a price war. The more “premium” a product, the lower the likelihood that a price war erupts.*

5.3.3. Head-to-head products

Introduction of a new product that has little or no relative advantage over existing products in the market is likely to leave the incumbent products with little room to maneuver. As a result, the focus of the competitive interaction is likely to shift towards a competitive pricing interaction and competitive advantages may be seen as attainable mainly through lower prices than other marketing dimensions (Hauser and Shugan, 1983). Therefore, the likelihood that a price war will break out increases. We hypothesize the following relationship.

P3c. *The introduction of head-to-head products increases the likelihood of a price war.*

5.4. EWSs based on customer characteristics

Several facets of consumer behavior will affect the likelihood of price war skirmishes. Mainly, these facets include brand loyalty and consumers' overall price sensitivity. Each of these properties will be discussed below and linked to the emergence of price wars.

5.4.1. Brand loyalty

In situations characterized by low brand loyalty, consumers can easily be lured away from the products they are using, e.g., via price cuts. If, on the other hand, consumers are loyal to their brands, price cuts can become ineffective. Thus, as the brand loyalty declines, price cuts gain in effectiveness and firms will rely more on the price variable (Simon, 1989). An increased brand loyalty is, thus, expected to be inversely related to price war incidence. We therefore posit the following proposition.

P4a. *The lower the brand loyalty in a market, the more likely an outbreak of a price war.*

5.4.2. Price sensitivity

The degree of price sensitivity is typically determined by a broad range of factors including consumers' willingness or ability to carry out price comparisons and consumers' knowledge or awareness of substitute products (Nagle, 1987). Also, consumers' price sensitivities may change over time due to learning or due to exogenous factors. For instance, when a new sales tax on cigarettes was levied, smokers started to get more price sensitive and switched to budget brands. Additionally, markets in which consumers are very price sensitive, market shares are more volatile. Generally, then, in price sensitive markets, managers face a unique temptation to cut price further and further, which leads us to expect that price wars will be more common in markets with high price sensitivity. We pose the following proposition.

P4b. *The higher consumers' price sensitivity, the higher the likelihood and intensity of price warfares.*

In short, our framework argues that the persistence of EWSs affect the likelihood and intensity of price wars. We now turn to implications for researchers and managers.

6. Implications for researchers and managers

6.1. Research implications

Research opportunities are truly fascinating but a general “research-barrier” remains as appropriate data is very difficult to obtain or to produce (e.g., Busse, 2000; Slade, 1992; Klemperer, 1989).

(1) The first and foremost research implication of this paper entails *empirically testing* the framework advocated above.

(2) Of similar importance seems to establish the *relative importance* of the various EWSs put forward in our framework.

(3) Another avenue of price war research refers to analysing and detailing the *competitors' interaction during price wars*. Important questions refer to the criteria for price setting during a price war and to which degree these criteria might be different or even opposed to those used when making competitive pricing decisions and competitive reactions. Especially, research should investigate the speed of the competitive reactions (Bowman and Gatignon, 1995). Related to this is the quest to inquire the quality of decision-making during the “taxing” price wars (we would expect that, due to the increased speed at which reaction decision need to be made during price wars, decision-quality would decline).

(4) Importantly, the notion of *competitive “noise”* (Axelrod, 1997) should be investigated in the context of price wars. The concept of competitive noise implies that price wars are “enabled” by managers being somewhat unclear about the total effects of their market actions. One might, therefore, not exclude the possibility that price wars are, at least in part, ignited due to competitive misunderstandings, which translates into a challenging research opportunity.

(5) A further direction for future research rests in the challenge to develop a framework that explains the cessation or *termination of price wars*. Price wars do ultimately end but it is unclear—conceptually—at which point and why. Aside from using a lack of resources to sustain the price war as an explanation, other reasons are possible as well: for example, a firm may find a better use for its resources elsewhere and terminate its price war engagement. In short, it is unclear what the reasons for the cessation of price wars are and how they affect the length of such a war. In this context, the precise *mechanisms to end a price war* at some point in time should be identified. A promising device may be competitive market signaling (e.g., Heil and Robertson, 1991), since signaling can facilitate communication between competitors. More precisely, we argue that advertising expenditures may be used to signal commitment to a market suffering from a price war, thus increasing others' willingness to increase prices again and terminating the war. Such messages might cause its competitor to reconsider its options (Besanko et al., 1996, p. 427). A key benefit of research about price war termination would be to permit managers to terminate a price war before it becomes devastating to the industry.

(6) Further, it is unclear what the overall *effects of price wars* are. Price wars are often assumed to lead to losses for the firms involved in the battle (see Table 1), for consumers due to lesser product quality (after benefits due to lower prices expired). It is, therefore, important to research how price wars affect the firms in an industry, whether these effects are uniformly distributed, and how such effects persist over the long run (e.g., through lower reference prices).

(7) Only one kind of war-type competitive interaction was considered in the present study, i.e., price wars. *Other war-type competitive interactions* include warranty-wars, promotion-wars, and advertising-wars. It needs to be investigated to which degree price wars represent a truly unique form of competition or if all war-type competitive interactions are alike. We would hope that our EWSs may help to explain the likelihood and intensity of other war-type competitive interactions and would also hope that a signaling approach may facilitate their termination but further work is needed here as well.

(8) Finally, an understanding of price wars may be used to *develop a more general theory of price volatility and competitive volatility*. Such volatility may be due to many factors but price wars or competitive wars are likely to play the role of a special and extreme case in such a general theory.

In short, price war research offers numerous opportunities that eventually can result in a more general theory of competition and pricing in which price wars represent an extreme yet important case of market behavior.

6.2. Managerial implications

The study offers several initial but important implications for the practicing marketing manager. The framework suggests that, in general, paying attention to the EWSs for price wars can allow the manager to, at least, identify changes in the likelihood that a price war may occur. Examples throughout the paper are hoped to illustrate the various EWSs, many of them clearly “in the hands” of the managers. Companies can, in such cases, prepare earlier for a price war and become less vulnerable by it. As a result, a company may save considerable resources, if not its life.

The definition of price wars suggest that managers, when contemplating a competitive move, should carefully assess its “fit” with industry norms. If inconsistent with such norms, the possibility that the move eventually provides a plateau for a price war to erupt should not be ruled out. The same caution should be applied when firms react to competitors’ moves.

A manager should be especially wary about the EWSs that are controllable (e.g., excess capacity, head-to-head product introductions, price leadership, reputation) to manage the likelihood and intensity of price wars to its advantage.

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