Product availability and market share in an oligopolistic market: the Dutch detergent market

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Abstract

The nonlinear distribution and market share curve as well as the push and pull model developed by Farris *et al.* (1989) have been investigated in the Dutch detergent market. The total detergent market as well as some of its market segments were studied: the data supported the push and pull model. The data also revealed that the detergent market is characterized by a specific market share configuration: extensions of the top brands quickly gain maximum distribution which might explain their higher market share. Implications for marketing management and marketing theory are discussed.

Keywords

Market share, brands, Netherlands, detergent market.

Introduction

Many competitive models have been developed to describe the interactions between firms and their competitors (for an overview, see Hanssens *et al.* 1990; Eliashberg and Chatterjee 1985). However, as Eliashberg and Chatterjee (1985) point out, most models have focused on how 'consumer behaviour' conditions the competitive behaviour of firms, while ignoring the 'recursive' role of marketeer decisions, distribution decisions and consumer brand choice. Three notable exceptions to this trend are Farley (1964), Parsons (1974) and Farris *et al.* (1989). To describe how distribution affects market share and vice versa, Farris *et al.* (1989) examined distribution and market share data for convenience goods. After observing the relationship shown in Figure 1, the authors went on to develop a model of distribution and market share consistent with their findings (Farris *et al.* 1989).

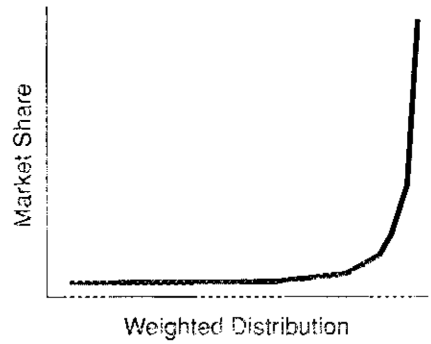

Figure 1 The relationship between distribution and market share according to Farris *et al.* (1989)

The purpose of this study is to determine whether some kind of non-linearity exists in the Dutch white detergent market. It is important to know whether this curve generalizes to other markets for two reasons. First, if the curve is an accurate description of share/distribution relationships, then degrees of freedom in setting distribution objectives for new products are limited. Second, there might be critical levels of distribution below which brands have virtually no chance of obtaining a significant market share. To evaluate the generality of this curve, we first describe in more detail the push and pull model, as developed by Farris *et al.* (1989). Then we will look at the aggregate white detergent market and at some initial indications that might substantiate the model. We then take a look at specific segments within this white detergent market. At the end we will suggest managerial implications and future research topics.

The push and pull model

In their distribution model (the 'push and pull' model), Farris *et al.* (1989) assume that marketing mix variables generate push and pull effects which reinforce each other over time, thus forming a positive feedback loop (Arthur 1990; Leeflang and Platt 1984). In more specific terms, as distribution rises, market share is won; and as more market share is won, distribution rises. A key finding of Farris *et al.* is that incremental returns to distribution will increase under certain circumstances characteristic of many convenience goods markets: the unwillingness of consumers to shop around for unavailable brands, a distribution structure with a few high-volume stores stocking many brands and many low-volume stores stocking only a few leading brands. Under such circumstances, incremental distribution is likely to be found in stores with fewer brands, and, if distribution is already weighted to account for overall store volume, then returns to incremental distribution will be increasing.

This general idea is expressed by Farris *et al.* in the model which is graphically introduced in Figure 2. In that model, Farris *et al.* state that distribution is similar to 'recall' of a brand, in that it is not a part of the marketing mix but rather is affected by the marketing mix. Distribution is an autonomous factor (with its own set of adoption and shelf-space-allocation criteria) which responds to the marketing and performance of manufacturers and rewards those who market and perform well.

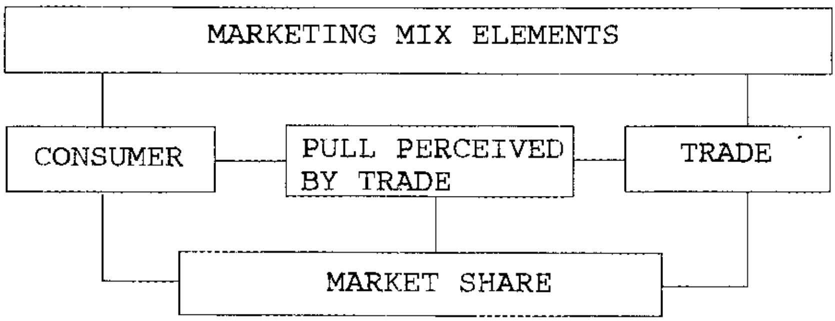

Figure 2 The pictorial representation of the push and pull model according to Farris *et al.* (1989)

Conceptually, the push and pull model consists of three underlying factors:

1) Distribution determines the choice set of the consumer.
2) Consumers are frequently willing to compromise their choice.
3) Consumer demand affects distribution.

The model assumes that a consumer has only one preferred brand, called the 'unmodified preference' (P_i). This measure is obtained by asking consumers to choose their brand in an experimental store which stocks all possible brands with no in-store marketing. The unmodified preference for a brand is defined as the fraction of consumers who prefer that brand. Consequently, with *n* brands in the market, the unmodified preferences for all these brands add up to 1:

$$\sum_{i=1}^{n} P_i = 1$$

In a real world shopping trip by a consumer, brand preferences are modified by the in-store attractiveness (e.g. display, shelf space and price promotion) of individual brands and their competitors. In the push and pull model, the in-store attractiveness (β_i) modifies previously unmodified preference (P_i) as follows:

$$\sum_{i=1}^{n} \beta_i . P_i = 1$$

Farris *et al.* call this the modified preference.

Modified preference, however, will result in increased market share only for brands with adequate and continuing availability. In the model availability is expressed as the weighted distribution (PCV), a fraction of users who find a particular brand in the store while shopping. In the case that the preferred brand is not available (not carried or temporarily out of stock) some consumers will compromise their unmodified preference and buy a competitive brand. The result of this is called 'compromised demand'. On the other hand, some consumers seek out their preferred brand in other stores. This is called 'resistance to compromise' (α). The behaviours of both categories of consumers result in a higher level of 'effective' distribution (PCVA), which is a function of weighted distribution (PCV) raised to the power with the resistance to compromise (α).

$$\text{PCVA}_i = 1 - (1 - \text{PCV}_i)^{\alpha}$$

The push and pull model supposes that retailers are motivated to stock high-resistance-to-compromise brands to preclude consumer defections to competing stores. Thus, resistance to compromise does affect the weighted distribution of a brand.

Two concepts, uncompromised demand (som_{ui}) and compromised demand (som_i), which together constitute total market share of a brand, will now be introduced. Uncompromised demand is defined as the effective distribution multiplied by the modified preference (assuming in-store attractiveness is equal for all stores for that brand).

$$som_{ui} = \beta_i \, . \, P_i \, . \, PCVA_i$$

Compromised demand is more complex: preferred brands which are not available will lose sales to available competitors. The increased sales for these available brands is called 'comprised demand'. Total market share, then, is the sum of uncompromised and compromised demand.

$$som_i = som_{ui} + som_{ci}$$

For an understanding of how consumers compromise brands, the stocking rules of retailers yield valuable insights. Farris *et al.* (1989) specify two stocking rules:

1) The store-class-dependent stocking rule (SDR) assumes that all stores have the same decision-making rules, incentives to stock a given brand and the same understanding of these incentives. As a result, the most preferred brand is stocked in all stores, the second most preferred is stocked in all stores with two or more brands and so on.

2) The store-class-independent stocking rule (SIR) assumes that a brand's chance of being stocked is proportional to its weighted distribution in other stores. Each stocking rule has its own effects on the compromised demand (see equations 6a and 6b in the appendix). In both cases, the result is that stronger brands will gain market share over time and possibly replace smaller ones.

The interaction of all the described behaviours gives rise to a two-way causality between market share and distribution. The mechanisms of the push and pull model are depicted in Figure 3. For a detailed analysis of the Farris model we refer to Farris *et al.* (1989) and for a total overview of all constraints of the model to our appendix.

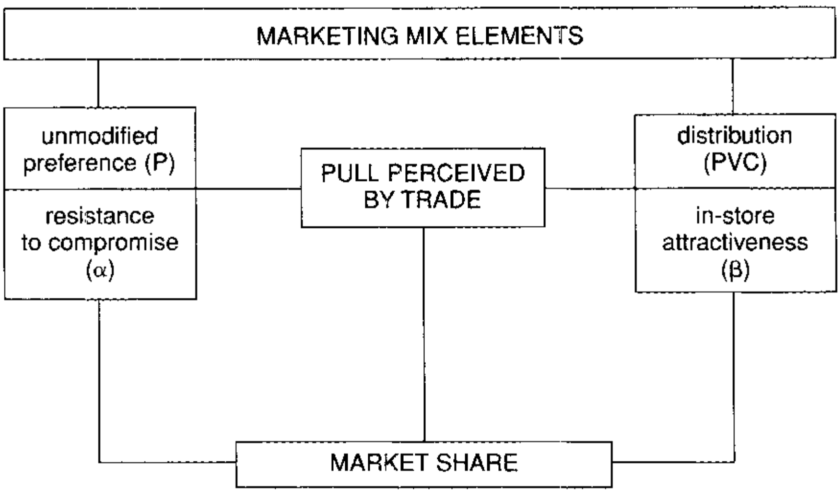

Figure 3 Measures representing breadth and depth of push and pull

The analysis of share and distribution in the Dutch detergent market

The push and pull model presents a consistent relationship between variables long used by marketers in their strategy deliberations: 1) market share, 2) distribution (product availability weighted by category sales), 3) consumer preferences (as measured in a 'fair' store environment), and 4) in-store merchandizing influences (shelf space, displays, retail advertising). This general model cannot be validated in the traditional sense; it is true by definition of its mathematical constructs. However, certain features of the model (such as the curve relating distribution and share) are based on assumed correlations between retail stocking and brand loyalty, and between availability and in-store attractiveness of brand merchandising. The practicality of the model also depends on the ability to operationalize mathematical constructs representing the depth and breadth of push and pull in the model. Our focus here is to determine whether the assumptions underlying the relationships shown in Figure 2 are valid for the Dutch detergent market. We will also pursue a less aggregated analysis of the distribution–share relationship to determine whether observations valid for the overall market share are also valid for individual managers marketing specific brands.

General description of the Dutch detergent market

Now we will briefly discuss the Dutch detergent market of time period October/November 1987 until October/November 1990, including product line segmentation and market share, market structure, innovations and trade structure.

a. *Product line segmentation* The detergent market includes three main product lines: white detergent, fine detergent and parti-coloured. Each main product line can be further divided into three subgroups: powder, liquid and powder compact.
b. *Market share* Of the total sales white detergent holds 73 per cent, fine holds 6 per cent and parti-coloured holds 21 per cent.
c. *Market structure* is quasi-oligopolistic with three firms (Henkel, Lever and Procter and Gamble) claiming about 80 per cent of the market.
d. *Market innovation* Although advertising claims and positioning of the brands have changed little, two important innovations (liquid and compact detergent) could possibly upset the current equilibrium.
e. *Market advertising* The three main manufacturers accounted for 95 per cent of all detergent advertising: Procter and Gamble for 37 per cent, Henkel for 36 per cent, Lever for 22 per cent.

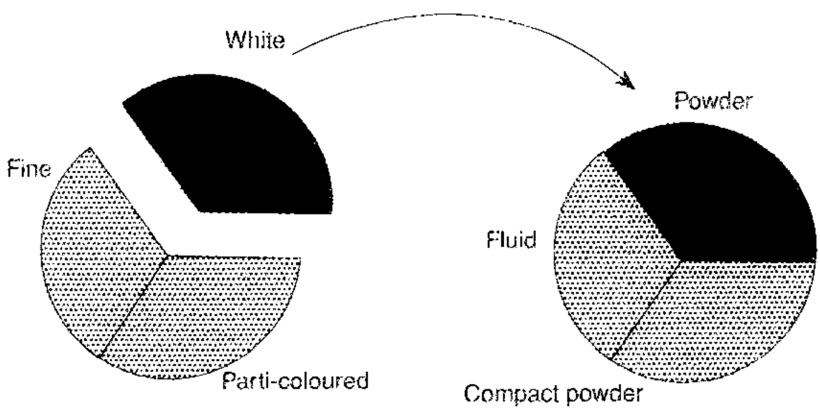

Figure 4 Segmentation of the detergent market

f. *Retail structure* In The Netherlands the detergent market is highly concentrated, with 43 per cent market share going to the four major chain stores, 20.8 per cent to three regional chain stores, 23.6 per cent to six co-operatives and 12.2 per cent going to four independent groups.

The data

To make practical use of the proposed push and pull model, marketers would require reliable data on consumer willingness to search and the effects of in-store merchandising. However, these data are not readily available. For example, evaluation of willingness to search (α) requires expensive out-of-stock experiments. Recently (March 1992), Nielsen (Netherlands) has begun to market data on in-store marketing effects. For information security reasons no firms were willing to release sales promotion data. We assume, however, that most marketing managers do use data about, e.g., promotion and distribution to make managerial decisions. The following types of data were obtained:

a. *Weighted distribution data* from Nielsen reflect percentages of stores where a brand is available (weighted by their total sales in the product class).
b. *Market shares data* reflected by the two monthly Nielsen reports.
c. *Preference data* from NIPO, a marketing research firm, who provide quarterly measurements of consumer preferences. By asking 'what brand do you mostly buy and what brand sometimes?', data on modified preference, resistance to compromise and compromised demand are obtained. These NIPO data cover a three-month period; therefore they had to be normalized to two periods, assuming constancy of preference over quarters.
d. *Monthly advertising budget data* obtained from the Dutch Budget Commission on Advertising include the amount of spending on television, radio, newspapers and magazines and outdoor promotion.

An analysis of the non-linear curve

In the 1989 article, Farris *et al.* show an increasing relationship between distribution and market share. Figure 5 parallels that analysis for the total white detergent market (liquid, powder and compact powder) in the Netherlands. This graph incorporates data for all major brands and for each of the bi-monthly research periods. The pattern is virtually identical to that reported by Farris *et al.* (1989).

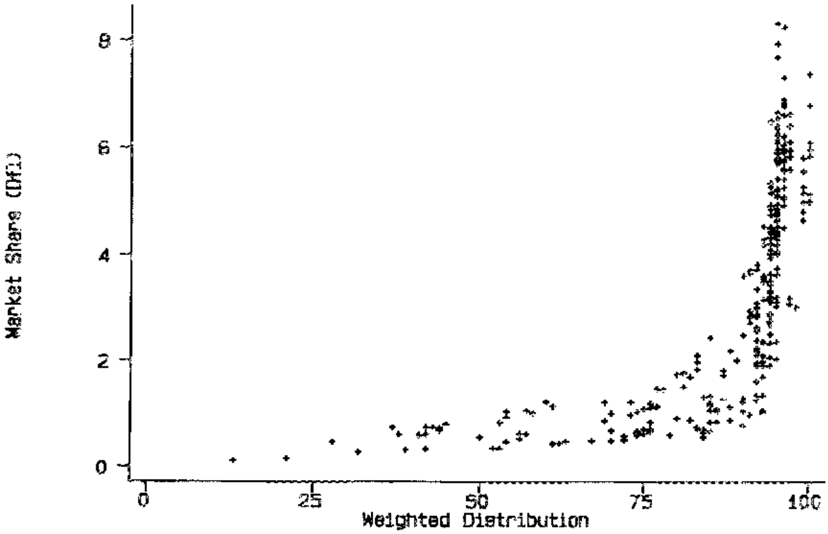

Figure 5 The relationship between distribution and market share for the white detergent market

OBSERVATION ONE The Dutch white detergent market shows a convex relationship between distribution and market share.

The graphs of market share and push-pull variables

The relationships between push and pull variables (market share, distribution, advertising and preferences) are shown in Figure 6 and Table 1. The correlation matrix in Table 1 parallels the main relationships in the Farris model (see Figure 3). All correlations are calculated and are positive and significant to 0.99. Surprisingly, preference is more highly correlated with distribution (0.81) than with advertising (0.51). However, because we are dealing with correlations, a causal interpretation is not made here.

Table 1 Correlations amongst key variables

	Distribution	*Market share*	*Preference*	*Advertising*
Distribution	1			
Market share	0.81	1		
Preference	0.81	0.92	1	
Advertising	0.44	0.60	0.51	1

(All correlations significant at 0.99)

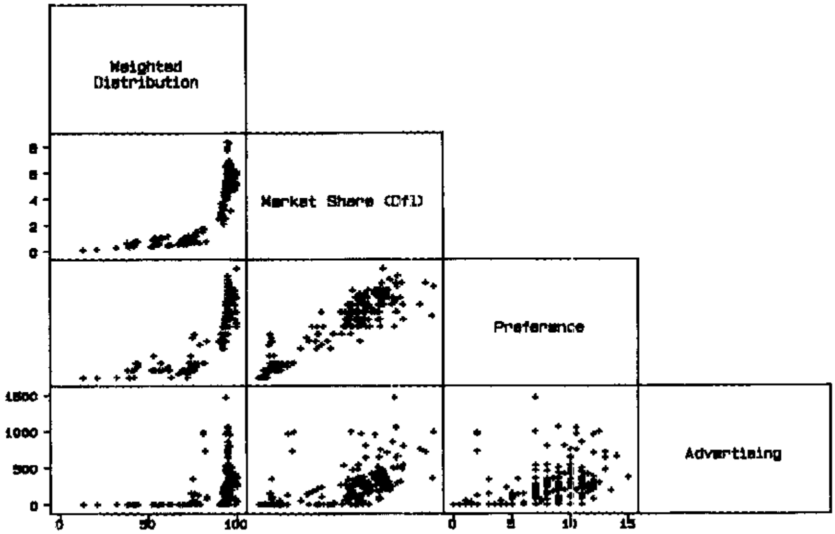

Figure 6 Relationships in the white detergent market

OBSERVATION TWO The Dutch white detergent market shows strong correlations between distribution, market share and preference.

A closer look at the marketing data by brand

Farris *et al.* (1989) make two important observations in regard to the stocking rules by retailers:

- the relationship between market share and weighted distribution is strictly convex when the SDR stocking rule applies and resistance to compromise equals 1.
- returns of market share to weighted distribution diminish when the SIR stocking rule applies or the resistance to compromise is larger than 1.

As shown in Figure 5, the relationship between market share and weighted distribution is strictly convex for the total Dutch white detergent market. But does that relationship hold for individual brands? To find out we have plotted the relationships between distribution and market share for thirteen brands. The result, seen in Figure 7, shows only *linear* curves with brands having either high market share and high distribution or low market share and low distribution. Only a few brands have distribution values near 0.8. During the time period investigated, the critical values of distribution and share are spanned by only two

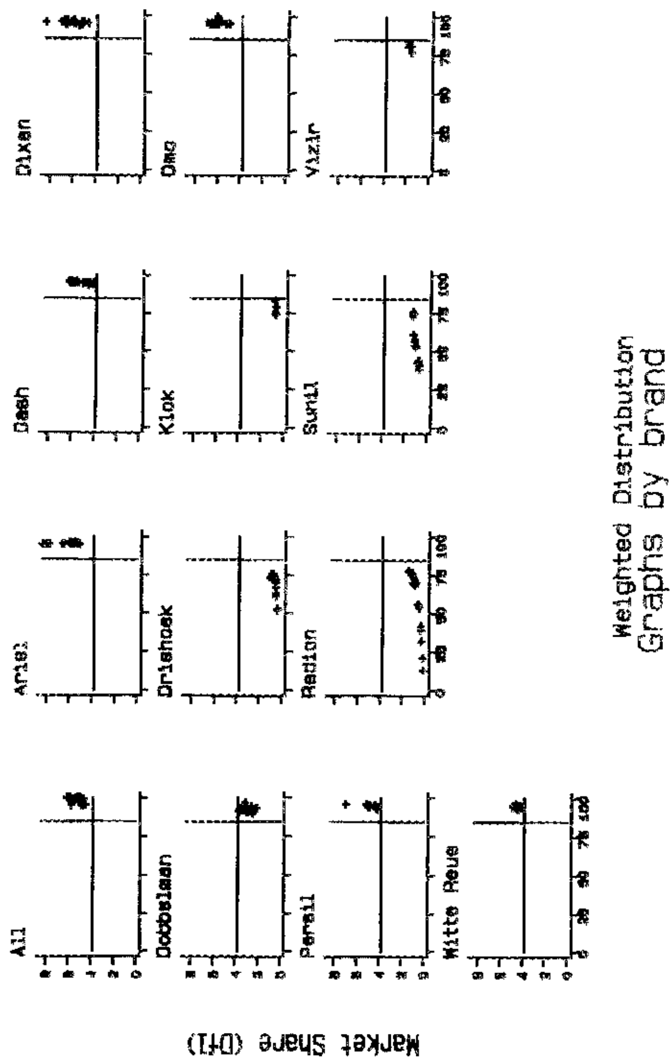

Figure 7 The relationship between distribution and market share for specific brands

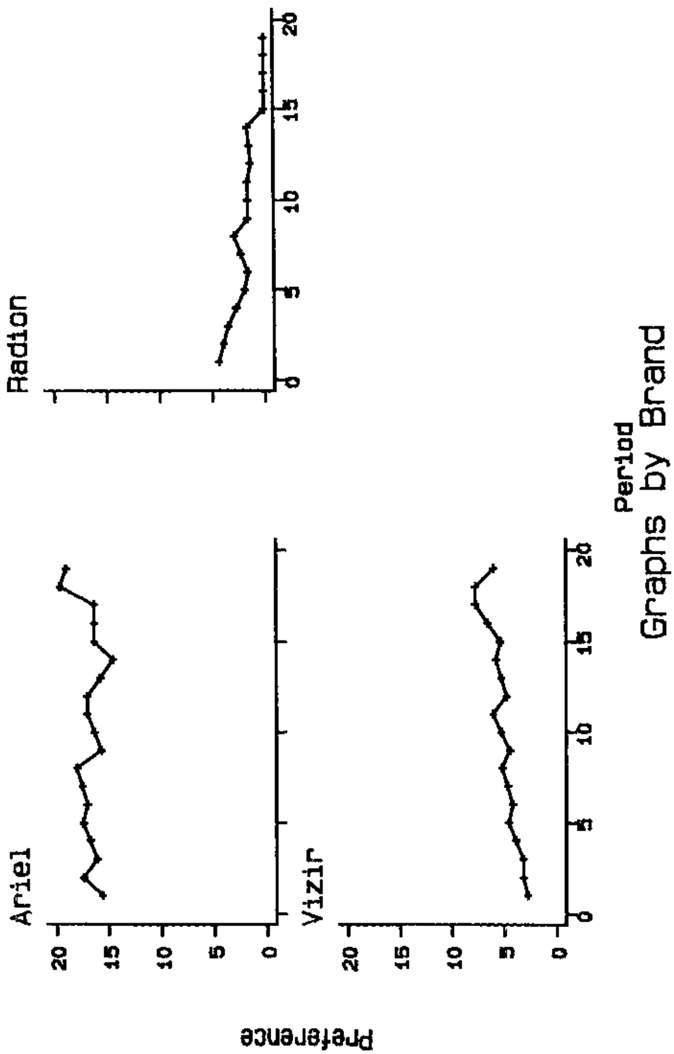

Figure 8 The evolution of preference for specific brands

brands, Vizir and Radion. Why these two brands showed this pattern will now be briefly explained. Vizir has low distribution and market share because it was introduced as a liquid brand. In-depth interviews with product managers of specific companies revealed that Vizir got a bad press during its introduction which resulted in a substantial setback. As Figure 8 shows, the preference for Vizir (compared, for instance, with Ariel) has grown after some time. When we look at Radion, we can see that the preference has been declining because Radion has been gradually taken out of the market.

Brands above the threshold level of 0.8 seem able to lose or gain share without appreciable change in distribution. Brands below 0.8, however, display an opposite pattern: gains and losses in distribution with negligible changes in market share. Only those brands which span the critical distribution level exhibit nonlinearity. The push and pull model can explain this behaviour if brand loyalty is considered. When brand loyalty is high, consumers search for brands not stocked; thus additional distribution changes have only a small effect on market share.

By the same token, if consumers in a market have high willingness to search for some brands (brand loyalty is high), the effect of compro-

Table 2 Distribution of brands according to market share and distribution

Market share	*Weighted distribution*	*Brand*
High	High	All, Ariel, Dash, Dixan, Omo, Persil, (Witte Reus)
High	Low	
Low	High	Dobbelman, (Vizir), (Witte Reus)
Low	Low	Driehoek, Klok, Radion, Sunil, (Vizir)

mised demand as a source of 'extra' share will be minimal. In related work on consumer behaviour towards out-of-stocks, two of the authors have shown that resistance to compromise is quite high compared with that in other grocery product categories: cola, margarine, coffee cream and rice.

Table 3 The major brands by parent company

Company	*Brands*
Lever	All, Omo, Radion, Sunil
Procter & Gamble	Ariel, Dash, Vizir
Henkel	Dixan, Persil, Witte Reus
Kortman Intradal	Dobbelman, Driehoek, Klok

This observation helps explain the extreme steepness of the slope at upper ranges of distribution in Figure 5. Of course, some quality differences in distribution (in-store merchandising factors) will also contribute to the higher shares of leading brands. The non-linear curve consists of two distinct branches: one for low-end brands, another for top end. Furthermore, these groupings are 'fixed' in time. As a matter of fact, as shown in Table 2, all brands fall within three possible categories, with the category of high share and low distribution being vacant.

In Tables 2 and 3, note that brands in the high-high segment belong to three main companies that dominate the market. However, it appears that this oligarchic dominance over distribution has not been an insurmountable entry barrier at least for one of the smaller firm's brands (Dobbelman by Kortman Intradal).

The three main companies have strong brands at top level and one or two brands that are positioned at the low end of the market (fighting brands).

OBSERVATION THREE At any given point in time, the white detergent market is a composite of three different kind of brands: established leading brands that do not appear to benefit from additional distribution, brands in transition and brands that are positioned for narrow segments of the market.

Radion is one of two brands that shows a somewhat nonlinear relationship between share and distribution. However, as mentioned earlier, the data reveal that the brand has been slowly removed on purpose from the market, so the curve reflects a declining brand rather than a growing brand. However, a brand that traces the full distribution pattern does show the nonlinear pattern. A similar trend has been identified by Farris *et al.* (1989) for a brand of instant coffee launched by a major food company in the US. The new coffee brand achieved over 90 per cent unweighted distribution almost immediately; and then began to lose share steadily. This is the only brand that traces the entire share distribution curve described by cross-sectional data (the detergent data displayed here reflect only the last three years).

OBSERVATION FOUR Although it is convenient to think of brands gaining incremental distribution, this is not the pattern most new products exhibit. Instead, they are launched with massive advertising and promotional support and achieve broad distribution very rapidly. Only if they fail into a downward spiral of declining share and distribution will the full convex pattern be traced by an individual brand.

To further substantiate observation four we will now present some more detailed analyses of the liquid white detergent market, a market which

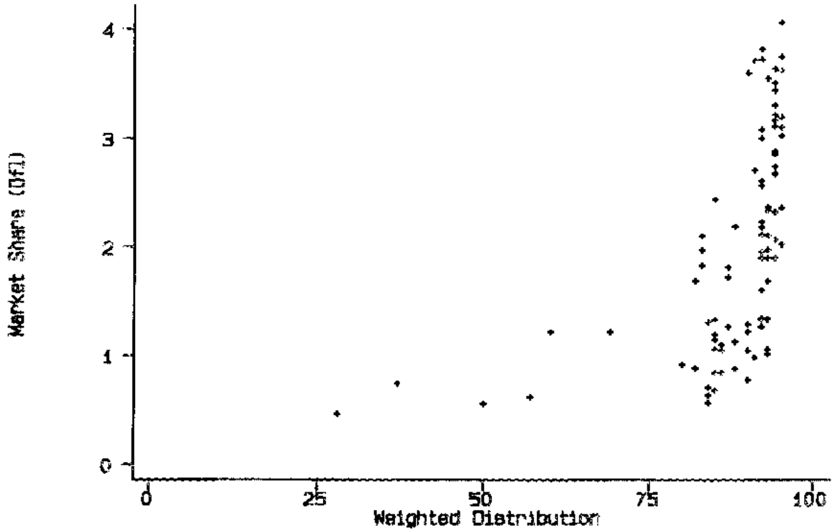

Figure 9 The relationship between distribution and market share for the liquid detergent market

allows us to study the evolution of the share/distribution relationship beginning at the time of initial brand introduction.

Development of share and distribution in the liquid detergent market

Unfortunately the liquid detergent market yields only limited data pertaining to distribution variations since most brands seem to jump quickly from zero to their maximum distribution and thus stay there. Table 4 shows the maximum weighted distribution levels obtained by both powder and liquid versions of the various brands.

The data available, however, appear to fit a convex relationship far better than a simple linear one. This is particularly true if we acknowl-

Table 4 The maximum weighted distribution levels of the different brands

Brand	*Powder*	*Liquid*	*Brand*	*Powder*	*Liquid*
All	100	95	Omo	100	95
Ariel	96	95	Persil	96	95
Dash	96	90	Radion	89	—
Dobbelman	98	—	Sunil	76	—
Dixan	97	91	Vizir	82	89
Drichoek	77	—	Witte Reus	96	87
Klok	83	—			

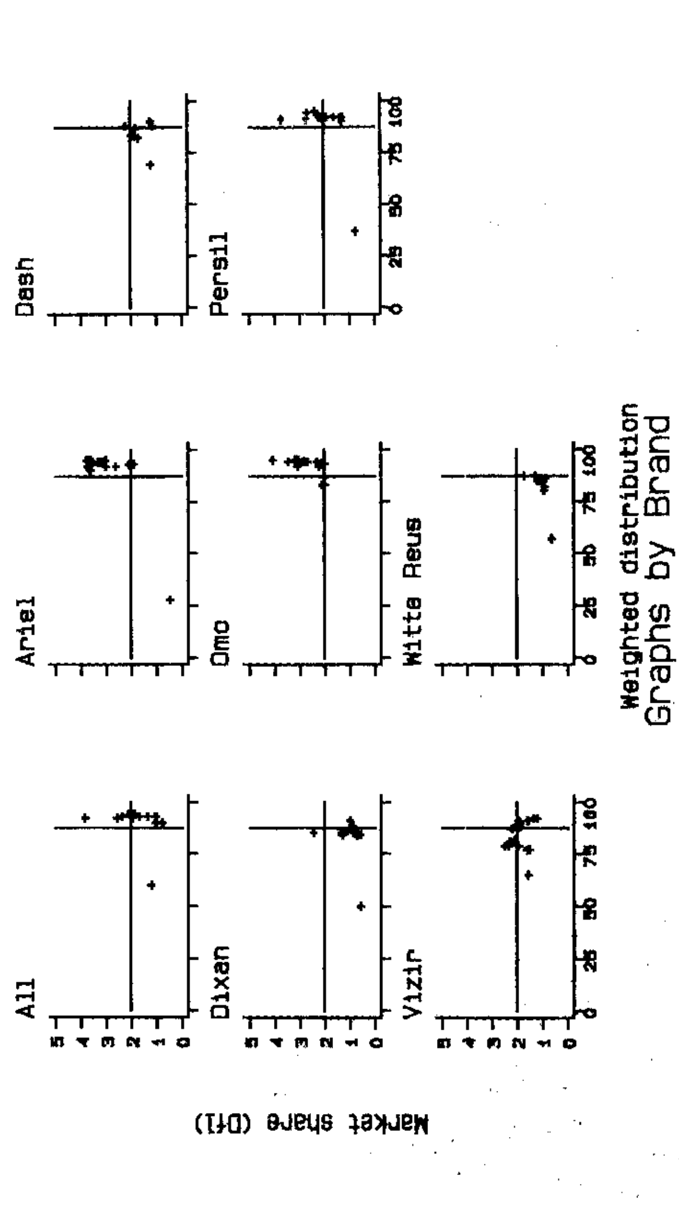

Figure 10 The relationship between distribution and market share for specified brands (fluid detergent)

edge that the logically consistent model of distribution and market share must be fitted through the origin. In other words, at zero distribution, share must also be zero. Figure 10 shows details for various liquid versions of established brands. The well-known brands quickly obtain distribution in the liquid segment. We hypothesize that the reputation of established brands allows them to get their innovations quickly and reliably on the shelf. Thus, the availability of the top brand-extensions allows consumers to buy their favoured brand-extensions. One would expect that small companies lacking established brands, capital and reputation might be forced to 'fight their way up the curve'. As it turns out, however, no small firm has achieved any distribution in the liquid segment.

Brands successful in the long term do not trace the traditional curve thought to describe the relationship between distribution and market share. Only for those that fail is this convex pattern traceable. When markets and trade are both oligarchic, the discontinuities implied may be even greater. Finding meaningful relationships in such patterns requires logically consistent models of distribution. As we mentioned, we believe but cannot produce evidence that supports the idea that these new brands benefit from the reputation of the manufacturer in getting distribution support. However, P&G's inability successfully to establish Vizir shows that consumer acceptance is necessary but not necessarily a result of good distribution. Even though Vizir was the first liquid detergent, it was received with scepticism, and never obtained top status (Figure 10 shows that this is the case).

The push and pull model and implications for distribution strategy

Since the convex distribution and market share curve has been observed for the aggregate white detergent market but not for the individual brands, it is tempting to conclude that the curve is not valid for two reasons: a) when one looks at the data by brand, one sees that brands owned by the major firms 'jumped' from zero to high distribution and market share very quickly; b) only if they fail do these brands follow the convex pattern.

In management literature, this sudden shift in market position is typical for a configural approach to market phenomena (Miller and Friesen 1984). Configuration refers to the fact that only certain combinations of market positions are possible and that one combination can suddenly change to another.

Some complementary observations

a) Distribution structure: the jumping of market share can be explained because the Dutch detergent market is an oligarchic market (three main manufacturers which supply to four major chain stores represent 43 per cent of the market share). The concentration of trade might explain why top brands jump quickly to high distribution: when the main multiples decide to adopt a brand on their shelves a high distribution is quickly reached.

b) Manufacturers: leading companies have core competencies that allow them to operate effectively and efficiently within fast-moving consumer industries (Hamel and Prahalad 1989). For instance, Procter and Gamble has expertise in product development, experience in marketing communications campaigns and economies of scale in communications. These advantages allow them to gain market share very quickly.

c) Retail reputation: good supplier reputation makes it much easier for major manufacturers to get their brands on the shelf. Wagner *et al.* (1990), for instance, suggested that the prior sales of a manufacturer's product were the best predictor of the adoption of new brand extensions (see also Haines and Silk 1967). In this context, because the new brands can be expected to be supported by high advertising budgets, retailers see less risks in adopting them (Heil and Robertson 1991).

Managerial implications

a) No middle-of-the-road market position: in this study, brands with medium distribution and market share do not stay around there for long as they might never get larger distribution. PIMS studies have emphasized a similar idea: no brands can maintain what is called a middle of the road position (Buzzel and Gale 1987).

b) Advertising sells brands to the trade, not just to consumers: though the short-term effects of advertising are still under debate (Leeflang 1992), this article shows that advertising's effect is at least partly indirect. That is, it increases distribution and increased distribution boosts sales. So, if one were to reduce advertising, especially at critical levels of share and distribution negative feedback is likely.

c) Timing is crucial: top brands seem to jump immediately. There is room for only so many brands in a market. Being one of the first makes it easier to obtain distribution (Alpert *et al.* 1992); later, when other brands must be displaced, the battle for shelf space is more difficult.

Topics for future research

a) Complex system theory and chaos theory have recently attracted much attention (Arthur 1990). The nonlinear (convex) curve observed in this paper would indicate how nonlinear models might explain why brands seem to disappear suddenly from markets. For instance, a supplier-induced out-of-stock condition could damage the supplier's reputation with the distribution, which then might cause a drop in distribution and consequently in sales.

b) The stocking rules play an important role in the push and pull model. However, these rules are complex as they apply to brand extensions and in-store marketing displays. Future research is needed to help us better understand the adoption criteria of the trade.

c) Accurate measurement of resistance to comprise is essential, to better understand the pull effects of the brands, and that means comprehensive out-of-stock studies. These studies are very expensive but might be worth it (Emmelheinz *et al.* 1990).

d) Finally, this study should be extended to different markets.

Policy implications

An implication of this study is that innovative brands produced by smaller manufacturers might never obtain shelf space. Policy making should consider this aspect (Verbeke 1992).

Conclusion

In this paper, the nonlinear distribution and market share curve, as well as the push and pull model, developed by Farris *et al.*, has been studied in an exploratory way in the Dutch detergent market. The nonlinear distribution and market share curve and the push and pull model have been observed on the aggregate but not on the individual brand level, except for those that were losing market share. It was concluded that most top brands jump from low distribution to higher distribution and thus to a higher market share. This jumping phenomenon has implications for marketing managers: timing of product development and advertising allocation are crucial.

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Appendix: The equations of the Farris et al. (1989) model

1. The preference for the different brands counts to one so every consumer has only one brand that he prefers.

$$\sum_{i=1}^{n} P_i = 1$$

2. The in-store promotion alters the consumer preference.

$$\sum_{i=1}^{n} \beta_i . P_i = 1$$

3. Effective distribution is a function of distribution and the resistance to compromise (alpha).

$$PCVA_i = 1 - (1 - PCV_i)^{\alpha_i}$$

4. Total market share is a combination of compromised and uncompromised demand.

$$som_i = som_{ui} + som_{ci}$$

5. Uncompromised demand.

$$som_{ui} = \beta_i . P_i . PCVA_i$$

6. The compromised equation depends on the accepted stocking rule.

a. Store-class-dependent stocking rule:

$$dsom_{ci} = \Sigma_{n<i}[\ [\ (\beta_n P_n (1 - PCV_n)^{\alpha n}\ ]\ [\ \sum_{j=n+1}^{i} \frac{PCV_J - PCV_{J-1}}{1 - PCV_n}\ ] \frac{\beta_i P_i}{\Sigma_{g \neq j} \beta_g P_g}\ ]$$

b. Store-class-independent stocking rule:

$$isom_{ci} = \sum_{L \neq i} [\beta_L P_L (1 - PCV_L)^{a_L} \frac{\beta_i P_i PCV_i}{\Sigma_{g \neq L} \beta_g P_g PCV_g}\ ]$$

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