



EAAE XIth CONGRESS – COPENHAGEN

**The use of brands in food marketing
– results from a survey of Danish food industry firms**

Kenneth Baltzer, Derek Baker and Anja S. Møller
Food and Resource Economics Institute,
Royal Veterinary and Agricultural University, KVL
kb@foi.dk



*Paper prepared for presentation at the XIth Conference of the EAAE
(European Association of Agricultural Economists),
'The Future of Rural Europe in the Global Agri-Food System',
Copenhagen, Denmark, July 24-27, 2005*

Copyright 2005 by Kenneth Baltzer, Derek Baker and Anja S. Møller. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

The use of brands in food marketing - results from a survey of Danish food industry firms¹

Abstract

The paper tests a number of hypotheses concerning branding behaviour of the food industry found in the literature. Based on a survey of 109 Danish food industry firms conducted in 2004, three aspects of branding strategies are analysed, i) the number of brands owned by the firm, ii) the number of brands introduced by the firm during the past year and iii) the percentage of sales obtained from production under private labels. Firms' branding behaviour is related to structural variables including firm size, degree of vertical integration, value added as well as firms' views on food chain organisation and competitiveness.

Keywords: Brands, private labels, food industry, survey (Q13)

Introduction

The food marketing chain is undergoing tremendous change. Industries are becoming increasingly concentrated, retailers are gaining in market power and the food chain itself is narrowing as firms engage more intensively in vertical co-ordination (Dobson, 1999). In this new environment, the use of brands is a very important part of competitive strategies of food processors and retailers. Brands are information signals about a product, a group of products, or a firm that distinguish it from others. The benefits of branding include improved market segmentation, increased consumer loyalty, increased repeat business, ease of new product introduction, and improved corporate image (Beierlein and Woolverton, 1991). For the purposes of this paper, we define branding behaviour as the choices made by firms as to the number of brands to own and introduce, and the decisions associated with manufacturing retailers' own-label brands².

The objective of this paper is to analyse aspects of the use of brands within the processor-retailer relationship. We identify correlations between firms' branding behaviour and selected commercial characteristics and apply this knowledge to issues of Danish food industry development. To do this, we formulate research hypotheses based on the existing literature, and use recent firm-level Danish data to test them.

Casual observation suggests that food products are becoming more intensively branded. This is supported by Kaufman et al.'s (2000) empirical finding that the share of all U.S. food sales that were of branded products increased from 7 to 19% in the period 1987-1997: for fresh-cut and packaged salad items the increase was from 1 to 15%. Such measurement has not been attempted in Denmark. Amongst branded product, the increasing share of retailers' own-label brands in many countries has been well documented. For the U.S., Ward et al. (2002) estimated that retailers' own-label brands (including so-called generic brands) hold a market share of 15% by value and 19% by volume. In 40% of food categories, there had been a statistically significant increase in retailers' own-label brands' market share in the previous 3 years: for 25% of categories, the increase was over 10%. The UK Competition Commission (2000) estimated that about 13% of Danish retail food sales were of retailers' own-label brands in 1995, and that this lags behind the UK, where some authors estimate own-labels to have a market share of over 50% (e.g. Brouwer and Bijman, 2001).

Hughes (2000) describes a progressive narrowing of European food industry channels associated with consolidation at processing, distribution and retail stages of the food chain, and increasing co-ordination amongst those stages. Connor (1999) addresses the market power inherent in that co-ordination, using the term "food convergence", and describes two forms it may take. Both are mobilised by branding behaviour: global branding by food processors and retailers' own-label brands

¹ This paper represents research funded by a grant under the Danish innovations law.

² We use this terminology rather than the more common "private labels" to avoid confusion.

by retailers. Connor identifies “brand monopoly” (a few firms owning the majority of brands) as both a mechanism and an outcome of food convergence. Although featuring few truly global brands, Danish food processors make widespread use of brands in both domestic and export markets (Madsen, 1996; Traill and Meulenberg, 2002). The role of branding in the future development in the Danish food industry has not been explicitly examined.

Brands may be instruments of the exercise of market power in terms of both vertical (between firms at different stages of the food marketing chain) and horizontal (between firms at the same stage) competition. In recent years numerous food brands have entered the list of the world’s 100 most valuable brands (Businessweek, 2004). At the same time, legal scrutiny of mergers and acquisitions in the food industry has increasingly focuses on firms’ acquisition of brands, which are frequently bought and sold for large sums. Further large sums are spent promoting brands. Identification of brand-related problems is a challenge to policymaking institutions more familiar with issues of farm income and consumer protection, than with food industry dynamics and competition. Public sentiment can further complicate the definition of policy problems: one example is the perception that the variety of food available to the Danish consumer is declining over time (addressed by Teknologirådet, 2004), although no empirical evidence has so far appeared. The contributions of this paper are a robust empirical analysis of Danish branding behaviour and its association with firms’ activities and attributes, and inference for commercial and policy development.

The paper proceeds by presenting the survey data and empirical model employed, followed by a discussion of hypotheses found in the literature. The hypotheses presented in this paper concerns relationships between processors brands and retailers’ own-label brands, firm size, degree of vertical integration, value added and firms’ views on food chain organisation and competitiveness. These are selected from a wider range of hypotheses (including such issues as firms’ trade orientation, commodity sector and position in the food marketing chain), which are analysed in more detail in Baltzer et. al. (2004). Results from the regressions are presented and the paper concludes with a short discussion of the main findings.

Data

We employ a survey of Danish food industry firms conducted in November 2003 (see Baker et al. 2004). A sample of 700 food processing and distribution firms was contacted by telephone and invited to participate in the survey. Participating firms were sent a questionnaire and materials to guide its completion, and supporting information. 109 completed questionnaires were received (a 16% response rate), of which 69 were food processors, 29 were food distributors, 9 were input suppliers and 4 were other actors in the food marketing chain. The relevant corresponding Danish populations are believed to be about 350 food processors, and about 600 food distributors and input suppliers (Baker, 2003). The survey questionnaire featured questions on basic information on firms’ size, structure and functions, sought firms’ views on food industry problems and opportunities, and their estimates of the form of financial impacts of food-related policies in 30 specified regulatory areas (Hamann and Baker, 2004). This paper utilises the descriptive data from the first part of the questionnaire, and isolated questions from the policy-related sections of the questionnaire.

Firms were asked to report: the number of brands they own (in 2002 and in 1997); the number of new branded food products introduced (in 2002 and in 1997); and the share of sales value occupied by retailers’ own-label brands (in 2002 and in 1997). The 2002 observation is used as a measure of a firm’s branding behaviour, and the change between 1997 and 2002 is used as a measure of change in a firm’s branding behaviour. Thus, six models of branding behaviour are developed, as discussed in the next section.

Other survey questions used to characterise responding firms for 2002 include stage of the marketing chain and commodity specialisation, size, degree of specialisation in the food industry, vertical integration by ownership of the firm, ownership outside the food industry, vertical integration by ownership of assets and trade intensity expressed as share of sales exported and agricultural purchases imported respectively.

Several variables have been constructed from these responses for the purposes of analysis. We employ, as a measure of firm size, the number of employees. A proxy measure of value-added is

calculated as annual revenue/number of employees. Several derived measures of vertical integration are used: % ownership by firms from other stages of the food chain is used to measure ownership by retailers, by farmers or farm co-operatives and by food processing firms; a second set of vertical integration measures use the survey responses on asset ownership, to construct counts of the number of assets owned by each firm outside the stage of the chain that the firm belongs to.

Questions regarding food industry policy issues consisted of several “problem statements”, to which firms could respond with “I agree” or “I disagree”. Responses from four such problem statements have been included in this study: (i) “The Danish food industry produces too few new products”, (ii) Food retailers’ own-label brands have too large a share of the Danish market”, (iii) Danish food processors have too much market power”, and (iv) “Danish food retailers have too much market power”.

Model

We propose six models of branding behaviour of the general form

$$y = f(X, \beta) \quad (1)$$

where y is a dependent variable based on questions on branding behaviour, X is a set of independent explanatory variables drawn from other survey data, and parameter β is an estimate of the relationship between y and X . We make no assumptions about the direction of causality in (1), but instead seek associations amongst variables y and X that are able to be interpreted in relation to our research objectives. Hence, our models entail some interchange of y and X , using the independent variable of one equation as a dependent variable in other. An example of a similar approach is that of Zellner (1989), who applies simultaneous equation techniques to address endogeneity issues. While relatively straightforward in a system of linear equations, such methods are not tractable in the more general models analysed in this study.³ Also, lack of good instruments (and the specificity of survey data) prevents the use of Instrumental Variable estimation.

Although existing research justifies assumption of a linear (or log-linear) relationship in (1) between branding behaviour and explanatory variables ($E(y|X) = X\beta$), the data does not lend itself to that approach. The first data problem (common to most surveys) involves unanswered questions, resulting in missing values for y and/or X . In addition to reducing the degrees of freedom considerably, limiting the analyses to the full set of data would ignore the information provided by respondents, who filled in only part of the questionnaire.⁴ We have therefore replaced missing data on X with artificially-generated values (following Griliches, 1986).⁵ This procedure is performed for each of the incomplete variables in turn, starting with the ones containing fewest missing values. Synthetic data are not generated for missing observations on dependent variables y .⁶ One criticism of this approach is that it underestimates the variance of the resulting variables (by analogy, the artificially-generated values are placed on the regression curve and do not include the random deviations (Marini et. al., 1980)). However, as the frequency of missing values in individual variables is relatively small (typically in the range of 10-15%), we judge the resulting bias to be minor.

A second data problem is the distribution of branding behaviour variables. The number of brands owned by a firm and the number of brands introduced by the firm in the previous year are both bounded from below by zero, i.e. $y \in [0, \infty]$, while the share of firm revenue sold as retailers' own-label brands is measured as a percentage, i.e. $y \in [0, 1]$. Because estimation with a linear model

³ As pointed out by Zellner (1989), simultaneous equation estimation has been criticised for being highly sensitive to changes in model specifications.

⁴ Of a total of 109 firms, only 58 answered all the questions used in this analysis. However, most firms’ responses omitted only a few questions.

⁵ Griliches’ method predicts the missing value based on the parameters of an auxiliary regression. The type of regression depends on the nature of the variable to be completed. For instance, for fractional variables (e.g. the export intensity of the firm), missing values are predicted based on a non-linear fractional data regression (see below).

⁶ Little is known about the effects of generating artificial values for dependent variables, but Greene (1993) reports a consensus against it.

delivers constant coefficients, fitted values of y (branding behaviour) could lie outside its permitted range. Imposing $y \in [0, \infty]$ and/or $y \in [0, 1]$ on our model by logarithmic transformation would erroneously preclude $y = 0$. Instead, we adopt two non-linear model specifications: the “count data” and the “fractional data” models (Papke and Wooldridge, 1996; Wooldridge, 2002) and apply Maximum Likelihood estimation. The empirical specification is described in greater detail in Baltzer et. al. (2004).

The models of change in branding behaviour ($\Delta y = y_t - y_{t-1}$, where t and $t-1$ are adjacent time periods) also feature bounded dependent variables, of a more complex form than the observations on the respective y . The change in the number of brands owned and the change in the number of new brands introduced may take both negative and positive values. While the variables are unbounded from above, there is a lower bound defined as the negative of the y_{t-1} values. The lower bound on the dependent variables is in itself a variable, creating specification difficulties. We therefore use simple OLS regression, recognising that parameter estimates will be constant and fitted values may fall outside the permitted range.

In the case of change in retail brands' sales share as the dependent variable Δy the bounds are different again, yielding a permitted range $\Delta y \in [-1; 1]$. To accommodate this interval, we simply scale the dependent variable by adding 1 and dividing by 2 to yield a dependent variable on the $[0; 1]$ interval (i.e. a standard fractional variable). We then use a fractional data model to derive estimates. For interpretation we rescale the parameter by multiplying by 2.⁷

Although Maximum Likelihood yields more precise estimates than alternative non-linear techniques it does not produce measure of the goodness-of-fit that are suitable for model comparison. A variety of constructed statistics have been proposed (see Maddala, 1983), and we adopt the very simple pseudo- R^2 suggested by MacFadden (1974 - cited in Wooldridge, 2002).⁸

Hypotheses concerning firms' branding behaviour

Relationships between processor brands and retailers own-label brands

Schmalensee (2001) and Cotterill (1999) proposed theoretical models in which brands are located within a space describing consumer preferences. They portray an anti-competitive “crowding” of firms around and between profitable locations. Over-supply of breakfast cereal brands provides empirical support for the model (Connor, 1999; Gejdensen and Schumer, 1995, 1999). Putsis (1997) used British scanner data to examine brand proliferation in 135 food products in 1991 and 1992. He found the aggregate number of new brands to be positively related to the prices of both processors' brands and retailers' own-label brands. Conversely, he found that concentration of brands (meaning a few firms own the majority of brands) leads to lower costs of introduction and, accordingly, lower prices. Ward et al. (2002) found that expansion of retailers' own-label brands was associated with increased prices for processors' brands, as processors adopted non-price competitive tools (e.g. advertising and promotions) and focused on maintaining quality differentials between their own products and the retailers' own-label brands.

Connor (1981) examined the connection between product introductions and market structure. He found that product proliferation tends to occur in oligopolistic industry sectors featuring differentiated products, and that firms' new brand introductions in a given product group are slightly negatively correlated with firms' share of retailers' own-label brands in sales for that product group. In a similar study, Zellner (1989) found the same negative (although insignificant at 10% level of test) correlation, and that firms' number of new brands is positively associated with their number of existing

⁷ We do not subtract the 1. As the parameter estimates are essentially derivatives, any added scaling constant disappears.

⁸ Pseudo $R^2 = 1 - \frac{\ell_{model}}{\ell_{intercept}}$ where ℓ_{model} is the logarithm of the likelihood value of a specification including all explanatory variables and $\ell_{intercept}$ is the logarithm of the likelihood value of the specification including only the intercept. The pseudo- R^2 takes a value between 0 and 1 and measures the degree, to which the fit of the model is improved by including explanatory variables. However, the measure does not have the same interpretation as the traditional R^2 , and caution is needed in drawing conclusions from pseudo- R^2 .

(processors') brands. He interpreted new product introduction as a quasi-permanent entry barrier, with long-run cost advantages over advertising and other competitive tools.

Mills (1999) and Traill and Meulenberg (2002) offer different explanations of processors' portfolio mix of their brands and retailers' own-label brands as a counter strategy against retailers. Mills suggests that processing firms' intention is to divert displacement by retailers' brands to other processors' brands (the "fighting brands" theory). His analytic framework includes two firms in a vertical relationship: one processor selling a high quality brand and one retailer producing own-label brands. Traill and Meulenberg (2002) found that processing firms with a high reliance (>50%) on retailers' own-label brands emphasise both new product development and process innovation, suggesting a positive relationship between retailers' own-label production and new brand introductions.

Consideration of brand management in the context of brand portfolios leads us to propose that firms that own many brands are likely to introduce more new brands, and vice-a-versa. It also suggests that firms with high levels of sales as retailers' own-label brands would own few brands of their own (Cotterill, 1999; Putsis, 1997; Connor, 1981). However, the study by Traill and Meulenberg (2002) and Mills' (1999) extension of the portfolio theory suggest that firms would introduce new brands alongside their sales of retailers' own-label brands, as part of a defensive strategy.

We hypothesise a positive relationship between numbers of brands owned and numbers of brands introduced, and between numbers of brands introduced and sales share of retailers' own-label brands. We propose a negative relationship between numbers of brands owned and sales share of retailers' own-label brands.

Firm size

Intuition suggests that large firms are likely to own more brands than small firms, and to introduce more new brands. This hypothesis is supported weakly by Zellner (1989). Furthermore, large firms are likely to operate in concentrated industry segments, and there is an established positive relationship between concentration and brand ownership, and concentration and brand introductions (Cotterill, 1999; Putsis, 1997; Conner, 1981). We therefore hypothesise an (indirect) positive relationship between a firm's size and the numbers of brands it owns, as well as between the firm's size and the numbers of new brands that it introduces. No specific relationship is proposed between a firm's size and the share of its sales that are retailers' own-label brands.

Vertical integration

The connection between vertical integration and branding behaviour has not been addressed in the literature we have reviewed. Two intuitively-appealing hypotheses arise. In one, firms vertically integrate in order to better control quality and information flows as described by Hennessy (1999). Both quality control and information flows are associated with brand ownership and management. In the second hypothesis, vertical integration is an alternative strategy to branding, adopted where brand management has proven difficult due to transactions and other costs (Frank and Henderson, 1992).

We propose that both positive and negative relationships might exist amongst our sample of firms, as it is drawn from a variety of commodity sectors, so that an estimate's sign remains indeterminate *a priori*. We do propose, however, that vertical integration is negatively related to sales share of retailers' own-label brands. Furthermore, we propose that ownership by a retailer is a special case of vertical integration, and is likely to be positively associated with use of retailers' own-label brands, but negatively related to brand introduction and brand ownership.

Traill and Meulenberg (2002) suggest that co-operatively-owned firms are oriented toward innovation in "process", rather than "product". We interpret this to mean that co-operative ownership bears a negative relationship to numbers of brands owned, and to numbers of new brands introduced. Co-operatives' farmer-orientation suggests a negative relationship with the share of sales as retailers' own-label brands.

Value added

Intuition suggests that firms with popular brands will be firms that exhibit high value-added, and that retailers' own-label brands appropriate value-added to the retailer and away from other stages of the food marketing chain. However, if a small proportion of brands are profitable (Cotterill, 1999), then a firms' value-added may be unrelated to its branding behaviour. We propose that share of sales as retailers' own-label brands are negatively associated with value-added, but offer no hypothesis about brand ownership and brand introductions.

Firms' views on food chain organisation and competitiveness

We recognise that relationships between firms' branding behaviour and their views on issues of food industry policy are likely to be complex. Two conflicting hypotheses are apparent: first, that firms' expression of a particular view is associated with a firms' failure to overcome a particular problem; and second, that the view is expressed despite success in branding, possibly as a result of disappointing profitability associated with a specific branding strategy.

As an example, firms with the view that retailers' own-label brands' market share is "too large" may either have failed to introduce or sustain their competing brands, or alternatively may have seen their brands maintained but at a lower level of profitability. Similar examples might be constructed for firms' statements about market power by processors and retailers, and about the overall number of new food products being introduced to the Danish market.

Despite the lack of clear hypotheses with regard to firms' definitions of food industry problems, we maintain these variables in the analysis to provide insight into the definition of such problems. Its association with specific aspects of branding behaviour has important policy implications.

Results

The six regressions presented in this paper include explanatory variables related to the research hypotheses discussed in the previous section, as well as control variables that are not directly related to the hypotheses (e.g. commodity sector and import and export intensities). Only the variables related to the hypothesis are commented upon below. During analysis, the list of specified explanatory variables X has been edited using a multiple-step procedure to exclude insignificant variables, one at a time, starting with the least significant. At each step a hypothesis of joint insignificance of all excluded variables was tested, until all insignificant variables had been excluded, or until the joint-insignificance hypothesis was rejected. The remaining variables are retained in the models, and the resulting parameter estimates are reported in tables 1 and 2. Some transformations have been carried out on reported parameters to assist with interpretation (see Baltzer et. al. (2004) for details). By way of example, we explain the estimates' magnitudes as follows: firms for which retailer's own-label brands account for 1% more of sales than the sample average tend to have 1.64% fewer processors' brands than the average firm in the sample (see table 1, row 4); and those firms have also introduced 1.88% more new brands than the average firm in the survey.

The models explaining current branding behaviour, particularly with respect to the number of brands owned, appear to fit the data well. We find a reasonable number of significant variables and the estimates generally conform to our hypotheses. The models of the change in branding behaviour are poor in terms of goodness-of-fit (R^2 and pseudo- R^2 measures are very low). This may be due to the limited variation in the dependent variables, so that adding independent variables to the intercept does not improve the model's explanatory power. This is also reflected in the small number of significant variables. As the results are generally meaningful and consistent with prior hypotheses, we are satisfied with the performance of the models.

Relationships between processor brands and retailers' own-label brands

The results support our hypotheses on the interaction amongst variables measuring branding behaviour: firms that own a lot of brands tend to introduce many new ones, and tend to have a small share of sales as retailers' own-label brands; and firms that introduce a lot of brands each year also have a large share of sales as retailers' own-label brands. The robustness of this result is indicated by

internal consistency in terms of sign and significance amongst equations (the second, third and fourth rows of table 1).

Table 2's results show that the interaction amongst the variables measuring changes in firms' branding behaviour is less pronounced. The only significant coefficient is a negative correlation between the change in the number of brands introduced and the change in the sales share of retail brands. This suggests that firms that have increased their involvement with retailers' own-label brands tend to reduce their rate of brand introductions over time. In combination with table 1's result, this supports Mills' (1999) conjecture that while short term relations may be complementary, the defensive portfolio strategy is not viable in the long run. In particular, the relationship between longer-run changes in the two variables will be negatively correlated.

Table 1. Models of branding behaviour

Parameter	Equation		
	No. of brands owned	No. of brands introduced	Retail brands' share of sales
Constant	1.585*** (4.609)	0.940* (1.911)	0.069 (0.206)
Brands owned (#)	-	1.221*** (4.281)	-0.259*** (-2.809)
Brands introduced (#)	52.779*** (9.108)	-	9.806*** (4.034)
Retail brands share (%)	-1.641** (-2.526)	1.875*** (5.999)	-
Owned by non-food (%)		-0.717 (-1.487)	
Owned by retailer (%)		- 3277.135*** ^{a)} (-7.816)	0.226** (2.040)
Employment (ln)	0.325*** (3.397)	0.355** (2.445)	
Value added (ln)			-0.087* (-1.913)
Import intensity (%)	0.742** (2.044)	-0.933* (-1.864)	0.181** (2.228)
Export intensity (%)		-1.475*** (-3.879)	
Meat sector (0/1)	-79.051*** (-2.708)	-100*** (-46.902)	
Dairy sector (0/1)	85.668 (1.604)	-61.125** (-2.567)	25.006** (2.368)
Distributor stage (0/1)		-67.567** (-2.423)	36.704*** (2.833)
Processor stage (0/1)	45.976* (1.710)		26.877*** (3.563)
Problem: Processor too much power (0/1)	-44.722* (-1.673)		
Max. log-likelihood	-248.03	-59.65	-36.35
No. of iterations used	9	11	9
Pseudo-R ²	0.79	0.50	0.17

Notes:

Parameter estimates measure the % change (first two columns) or the %-point change (last column) in the dependent variable associated with a marginal change in the independent variable. Figures in parentheses are t-test critical values. Asterisks indicate statistical significance at 1% level of test (***), 5% (***) and 10% (*).

a) the estimate should be interpreted as a app. 3% fall in the number of new brands introduced associated with a 0.001% rise in ownership by retailer.

Table 2. Models of change in branding behaviour (1997-2002)

Parameter	Equation		
	Change in no. of brands owned	Change in no. of brands introduced	Change in retail brands' share of revenue
Constant	5.937** (2.133)	2.726*** (2.590)	-0.068** (-2.566)
ΔBrands owned (#)	-		
ΔBrands introduced (#)		-	
ΔRetail brands share (%)		-6.446*** (-2.649)	-
Owned by retailer (%)			0.098* (1.830)
Employment (ln)	1.376** (2.017)		
Meat sector (0/1)			4.157* (1.934)
Problem: Retail brands too high market share (0/1)		0.900** (2.363)	
Problem: Processor too much power (0/1)			6.387** (2.328)
Max. log-likelihood			-51.19
No. of iterations used			4
Pseudo-R ²	0.09 ^{a)}	0.08 ^{a)}	0.0009

Notes:

Parameter estimates measure the absolute unit change (first two columns) or the %-point change (last column) in the dependent variable associated with a marginal change in the independent variable. Figures in parentheses are t-test critical values. Asterisks indicate statistical significance at 1% level of test (***), 5% (**), and 10% (*).

^{a)} These measures are actual R² – not pseudo-R².

Firm size

Positive correlations are established between the size of the firm (measured by the number of employees) and the number of brands owned, and the number of new brands introduced. Results indicate that firms with 1% more employees than average own 0.33% more brands than average (row 7, column 1 of table 1) and introduce 0.35% more new brands than average (row 7, column 2). This supports our earlier hypothesis, based on other authors' previous research findings that numbers of brands owned, and numbers of new brands introduced, are positively correlated with firm size.

Because larger Danish firms tend to operate in more concentrated industries, the result also supports our hypothesis that branding is more frequent in such industries. Our results indicate that larger firms are expanding their stock of brands over time faster than the industry average (row 6 of table 2), perhaps reflecting the increasing concentration in the Danish food industry.

We identify no significant relationship between firms' size and their use of retailers' own-label brands, also supporting our earlier hypothesis. This suggests that both small and large Danish firms are involved with production of retailers' own-label brands.

Vertical integration

Contrary to our prior hypotheses, we find that few measures of firm ownership and vertical integration are significant in explaining branding behaviour. The one exception is that a firm's level of ownership by a retailer is positively correlated with sales share of retailers' own-label brands (table 1) and with the change in the retailers' own-label brands' share (table 2). We find no relationship between retail ownership and number of brands owned by a firm, but our results strongly indicate that firms with a high % ownership by a retailer are disinclined to introduce new brands (table 1).

Examination of the data reveals that all the firms in the survey that are, to some extent, owned by retailers did not introduce a single new processors' brand in 2002. This suggests that retailers' investment strategy in the food industry involves boosting production of retailers' own-label brands, and/or limiting the introduction of (competing) processors' brands. It would appear that considerations of quality control and information exchange for processors' brands do not motivate Danish retailers' investments in food processors and distributors.

Value added

The analyses offer relatively weak evidence to support our hypotheses on the relationships between firms' branding behaviour and their value added. There is no significant correlation between firms' number of brands owned and their value added, implying that a large brand portfolio may include both successful and unsuccessful brands. Similar arguments can be presented with respect to the number of new brands introduced.

However, we identify a negative relationship between value added and the sales share of retailers' own-label brands (row 8 of table 1). This supports our hypothesis that value added by retailers' own-label brands may be being transferred along the food marketing chain, at the expense of the firms that produce the brands. This has important implications in explanations of retailers' strategies within the Danish food industry, and these are discussed further below.

Firms' views on food chain organisation and competitiveness

Of the four food policy issues deemed relevant, our results indicate that only two are associated with firms' branding behaviour: the issues represented by the statements "Food retailers' own-label brands have too large a share of the Danish market" and "Danish food processors have too much market power".

Firms stating that processors have too much market power own fewer brands than the industry average (row 15, column 1 of table 1). The sentiments expressed by those firms could be taken as a measure of frustration over the failure to compete with large processors. Those firms are not currently producing significantly more or less retailers' own-label brands than is the average firm in the sample, but over a five year period they are increasing their share of retailers' own-label brands (table 2, row 9, column 3).

The analysis does not associate any specific current branding behaviour with firms stating that retailers' own-label brands have too large a share of the Danish market. However, those firms have increased their numbers of new brand introductions over the last 5 years (see table 2). This branding behaviour could be interpreted as a strategy to counter increasing competition from retailers' own-label brands, as the firms that are proliferating brands are also increasing their sales share of retailers' own-label brands.

Discussion and conclusions

In this paper we analyse aspects of the use of brands within the processor-retailer relationship. We employ survey data from a sample of 109 Danish food industry firms to establish correlations amongst variables of branding behaviour and between branding behaviour and firm characteristics, including firm size, degree of vertical integration, value added and firms' views on food chain organisation and competitiveness.

We find strong and robust relationships between the use of processors brands and retailers' own-label brands. A pattern seems to be emerging of firms producing processor brands on the one hand, and firms, which focus more on the production of retailers' own-label brands on the other. The former firms tend to be relatively large, they already have a large portfolio of brands, and they continue to rely on processors' brands by introducing a large number of new brands. This appears to be a conscious strategy by processors to counter the increasing prevalence of retailers' own-label brands. Indeed, those firms that have increased their rate of new processor brand introductions are the ones that believe that retailers' own-label brands "have too high a share of the Danish retail food market".

The firms that focus more on the production of retailers' own-label brands tend to have a larger share of ownership by retailers and a lower value added. This indicates that Danish retailers' investment in firms at other stages of the food chain involves generating own-label brands from those firms, and that the value added generated by retailers' own-label brands may be shifted "along" the food marketing chain, away from the firms that produce them. Moreover, the longer term model indicates that firms with high levels of ownership by retailers are increasing their sales' shares of retailers' own-label brands more quickly than the industry as a whole. These results argue against a possible alternative strategy: that retailers' investments at other stages of the food chain are an alternative to use of own-label branding, possibly associated with control of quality and enhanced information exchange.

Interestingly, firms that are engaged in retailers' own-label production tend to introduce a large number of new processor brands. Previous research has suggested that food industry firms might develop a portfolio of a mix of processor brands and retailers' own-label in an attempt to displace other processors' brands, at least in the short term. However, several researchers agree that this is unlikely to be successful in the long term. Our results support both hypotheses, as our model of 5-year change shows that the firms with the fastest growth rate in brand introductions have actually reduced their sales' share of retailers' own-label brands. If such a "fighting brands" strategy is pursued by firms in Denmark, it appears that they abandon it again within 5 years.

Retailers' own-label brands may well be a means for retailers to extract value added from the food marketing chain, at the same time as they may provide a means for new entrants to become established in food processing in Denmark. If these two forces are working together, then the traditional Danish food industry firms will be squeezed between losses of market share for their brands and reduced opportunities for production of retailers' own-label brands. As a logical extension of these arguments, local or low-volume brands, that offer few economies of scale in processing, are likely to be abandoned by the rapidly-consolidating food processing firms in Denmark and those from abroad.

The traditional strengths of Danish food processing firms (export orientation, vertical integration, industry concentration) are not necessarily a strong basis for continued success in a brand-dominated food industry. Rather, it appears to be retail firms that are best-placed to serve that market and their gains may well be at the expense of firms at other stages of the food marketing chain in Denmark.

This research is suitable for duplication in countries other than Denmark. Much could be gained from identification of food industry firms' differences and similarities in branding behaviour within and beyond the European Union. Inclusion of performance data on brands (e.g. brand longevity) and firms (e.g. profitability, expenditures on brand promotion) would enhance the analysis. This would require a new survey methodology. In particular, this would examine the extent to which brands are of a corporate (firm-based), collective (applied to a range of products) or single product type. This would be of particular interest in international comparisons. The mechanisms of interaction between processors' brands and retailers' own-label brands deserve more research. The pattern and nature of replacement of one by the other are obviously complex, and likely to vary across many measures of firm type. The research presented here provides a useful entry point to international and inter-sectoral comparisons, to discussions of the future development of the food industry.

References

- Baker, D., T.V. Jensen, D. Das and T. Dalgaard (2004). Survey of Danish food industry firms' views on policies that impact the food industry. Danish Research Institute of Food Economics, Working paper no. 06/2004.
- Baker, D. (2003). The Danish food marketing chain: developments and policy choices. Danish Research Institute of Food Economics, Research report no. 154.
- Baltzer, K., D. Baker and A. S. Møller (2004). The branding behaviour of Danish food industry firms. Food and Resource Economics Institute, Research report no. 170
- Beierlein, J.G. and M.W Woolverton (1991). *Agribusiness Marketing: the management perspective*. Prentice-Hall, New Jersey.
- Brouwer, F. and J. Bijman (2001). Dynamics in crop protection, agriculture and the food chain in Europe. Agricultural Economics Research Institute, the Hague, the Netherlands.
- Businessweek (2004). The top 100 brands. 2nd August 2004.
- Collins, A. (2001). An investigation into retailers' margin-related bargaining power. Department of Food Business and Development, National University of Ireland, Cork. Discussion paper No. 34.
- Connor, J.M. (1999). Breakfast cereal: The extreme food industry. *Agribusiness* 15(2): 247-260
- Connor, J.M. (1981). Food product proliferation: a market structure analysis. *American Journal of Agricultural Economics* 63(4): 607-617
- Cotterill, R.W. (1999). High cereal prices and the prospects for relief by expansion of private labels and antitrust enforcement. *Agribusiness* 15(2): 229-245
- Dobson, P. (1999). Buyer power and its impact on competition in the food retail distribution sector of the European Union. Study for the EU-DGIV. no. IV/98/ETD/078.
- Frank, S. and D. Henderson (1992). Transactions costs and determinants of vertical co-ordination in the U.S: food industries. *American Journal of Agricultural Economics* 74(4): 941-950.
- Gejdenson, S. and C. Schumer (1999). Consumers in a box: A consumer report on cereal. *Agribusiness* 15(2): 207-218
- Gejdenson, S. and C. Schumer (1995). Consumers in a box. House of Representatives, Washington D.C. 7 March 1995.
- Greene, W. H. (1993). *Econometric analysis*, 3rd ed., Prentiss-Hall.
- Griliches, Z. (1986). Economic data issues. In Griliches, Z. and Intriligator, M., eds., *Handbook of Econometrics*, vol. 3, Amsterdam: North Holland
- Hamann, K. and D. Baker (2004). Review of policies impacting the Danish food marketing chain. Danish Research Institute of Food Economics, working paper no. 07/04
- Hennessy, D. (1999). Information asymmetry as a reason for food industry vertical integration. *American Journal of Agricultural Economics* 78(5):1034-1043.
- Hughes, D. (2002). Grocery retailing in Europe and emerging routes to the consumer. *Eurochoices* 1(3): 12-17.
- Kaufman, P., C. Handy, E. McLaughlin, K. Park and G. Green (2000). Understanding the Dynamics of Produce markets. Economic Research Service of USDA, Agriculture Information bulletin No. 758.
- McFadden, D.L. (1974). Conditional Logit Analysis of Qualitative Choice Analysis. In *Frontiers of Econometrics* (Karlqvist, ed.) New York. Academic Press: 105-142.
- Maddala, G.S. (1983). Limited-dependent and qualitative variables in econometrics. *Econometric Society Monographs* NO. 3. Cambridge University Press.
- Madsen, T.K. (1996). The structure and behaviour of some Danish food companies. MAPP working paper no. 36 March 1996, project no. 13.

- Marini, M. M., A. R. Olsen and D. B. Rubin (1980). Maximum-likelihood estimation in panel studies with missing data. *Sociological Methodology* 11:314-357.
- Mills, D.E. (1999). Private labels and manufacturer counterstrategies. *European Review of Agricultural Economics* 26(2): 125-145
- Papke, L. E. and J. M. Wooldridge (1996). Econometric methods for fractional response variables with an application to 401 (k) plan participation rates. *Journal of Applied Econometrics* 11(6): 619-632
- Putsis, W.P. (1997). An empirical study of the effects of brand proliferation on private labels. *Review of Industrial Organization* 12: 355-371
- Schmalensee, R. (2001). Entry deterrence in the ready-to-eat breakfast industry. *Bell Journal of Economic* 9: 305-327.
- Teknologirådet (2004). Fødevareudbuddet I Danmark – myter og facts. BioForum-konference. 2 June 2004.
- Traill, W.B. and M.T.G. Meulenberg, (2002). Innovations in the food industry. *Agribusiness* 18(1): 1-22.
- U.K. Competition Commission (2000). Supermarkets: A report on the supply of groceries from multiple stores in the United Kingdom. Report to the Secretary of State for Trade and Industry.
- Ward, M.B., J. B. Shimshack, J. M. Perloff, and M. J. Harris (2002). Effects of the private-label invasion in food industries. *American Journal of Agricultural Economics* 84(4): 961-973
- Wooldridge, J. M. (2002). *Econometric Analysis of Cross Section and Panel Data*. MIT Press
- Zellner, J.A. (1989). Food industry conduct. *American Journal of Agricultural Economics* 71(1): 105-115