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New product introductions in the food industry

- Results from a Danish survey

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Preface

This report is an attempt to measure and analyse Danish food industry firms' new product development. A substantial, yet poorly focused, literature exists on this subject, and some of this is reviewed. Based on a survey of firms, various indicative measures are presented that may be used in benchmarking modern Danish firms both during the last 5 years and alongside results from other countries.

This research is conducted under the auspices of the project "Perspektiver for og Udvikling af den danske fødevarekæde (phase 2)", commonly known as "The Food Chain Project". This project is funded under the Innovationslov and administered by the Directorate for Food, Fisheries and Agribusiness (DFFE) of the Danish Ministry of Food, Agriculture and Fisheries.

Anja Skadkær Møller managed all testing of the questionnaire and training of student interviewers, and data entry. Professor Hartley Furtan and Research Director Mogens Lund commented on draft versions of the report. Numerous food industry firms cooperated with the project in formulating the questionnaire and testing it. The author is most grateful to these firms, and to the 131 firms that provided staff time for interviews.

Institute of Food and Resource Economics, February 2007

Søren E. Frandsen

Summary

This study reports on new product development and introduction by a sample of Danish food industry firms. A review of relevant literature identifies several recent trends and tendencies, including an increasing number of new food products on developed markets and a majority of products being copies of those sold by other firms (so-called "me-too" products). Furthermore, product life cycles are reported to be shortening and the processes of product introduction speeding up. A survey, yielding 131 observations (30% of the firms a stratified sample) indicates that although Danish food industry firms introduced more new products in 2005 than they did in 2000, product life cycles have slowed down and the speed of new product introduction has declined. However, firms consistently identify few barriers to new product introduction although 15-20% of firms claim that regulations constitute such a barrier. Average numbers of products introduced far exceed removals, indicating an increasing number of products on the market.

Survey results indicate that Danish food industry firms use a small proportion of total expenditures for either research and development or new product introductions. Moreover, firms report that these do not feature strongly in their strategy set. The majority of firms in the survey favour a strategy of "a core of existing brands with few new introductions and removals" over strategies involving new product introductions. The survey reveals interesting patterns of changes in the time taken to carry out the tasks of new product development and introduction, particularly that the early (conceptual) stages and phases dealing with regulatory issues have both become longer.

The survey generated substantial data on branding behaviour and the nature of firms' new products. Surveyed firms claimed to favour "truly new" products over me-too products and revealed that local and traditional brands are not favoured for new product introductions. Moreover, surveyed firms' branding profiles increasingly favour larger numbers of products per brand over a single product per brand. Retailers' own-label brands play an increasing role in firms' sales.

The shortage of empirical work in the field of new product introductions precludes comparisons with other sectors and other countries. Clearly, it is of interest to know whether the unexpected results (slowing down of product life cycles, many "truly new" products) indicate Danish food industry leadership of a trend, laggard performance and behaviour, or simply occupancy of some specific part of a broad distribu-

tion. More specifically, this report questions whether there are any problems apparent in firms' new product development and introduction.

If there are such problems, few firms in the survey identified them as explicit constraints on new product development. Surveyed firms claim to spend few resources on new product introduction and that it is not a widespread strategic action. These results suggest few policy options that would have the effect of accelerating new product introduction by Danish food industry firms. Evidence found of the exercise of market power as a barrier to new product introduction was fragmentary, with no clear lead given to policy makers on competition policy: indeed, competitive markets may offer to firms lower returns on new product introductions, than do concentrated ones.

Further research recommended in this report focuses on metrics and measurement, clarification of definitions, and benchmarking across sectors and countries. Preparation for the survey included intensive training of interview staff on definitions of terms (e.g. "new product" and "brand"), while some scope was retained for respondents to use terms they were familiar with. Performance measures, however, were as difficult to define and use in this study as in most studies of this subject. A major econometric modelling exercise using data from this study is currently underway.

1. Background and purpose

1.1. Purpose and scope of the report

The purpose of this report is to present indicators of Danish food industry firms' new product development. The report presents some current research views on the form, process and orientation of new product introduction in the food industry. The results of a survey of Danish firms are presented and discussed in that context.

This research is conducted under the auspices of the project[1] "Perspektiver for og Udvikling af den danske fødevarekæde (phase 2)",[2] commonly known as "The Food Chain Project". This project is funded under the Innovationslov and administered by the Directorate for Food, Fisheries and Agribusiness (DFFE) of the Danish Ministry of Food, Agriculture and Fisheries. The objectives of the project are to:

- measure changes in function, structure and commercial practice in the Danish food industry and compare and contrast these with developments in other countries;
- characterise vertical and horizontal relationships in the Danish food chain and their role in delivering optimal levels of food quality, variety and safety;
- evaluate the efficiency and competitiveness of the Danish food system at each stage of the marketing chain;
- review and evaluate instruments of Danish, EU and foreign public policy in the development of the food marketing chain; and
- communicate research results in a number of media.

1.2. Survey

An interview-based survey of Danish food industry firms[3] was conducted November - December 2005 and March - June 2006. Draft questionnaires were prepared, and repeatedly circulated to 15 different organisations with an interest in food industry research, during the period May-October 2005. Six food industry firms made themselves available for testing of the later drafts of the questionnaire, in many cases being the subjects of numerous mock interviews. The comments, criticisms and proposals of

[1] Further information about the project are available from the author at **db@foi.dk**.
[2] "Perspectives and outlook for the Danish food marketing chain".
[3] The targeted firms were, by design, from non-farm stages of the marketing chain.

both stakeholders and researchers were, as far as possible, incorporated into questionnaire and research design.

The questionnaire comprised 5 sections. In the first, basic descriptive numeric information about firms was requested. The second section requested information about firms' strategic emphases and actions, the third addressed new product introduction and branding, the fourth firms' views on their competitive environment and the final section firms' views on actual events and possible future ones. Each interview took around 50 minutes and targeted the firms' marketing manager or person responsible for marketing and purchasing.

A commercial database of firms' contact details was purchased, with stratified sampling based on size (across size groups but excluding firms with less than 5 employees) and sector (just 8 sectors included), and across three stages of the marketing chain (retail, wholesale and processing). This sampling procedure yielded 986 firms, in many cases being the total number of eligible firms, given the stratified sample. After eliminating defunct firms, incorrect contact details, subsidiaries of other firms in the sample, telephone contacts were made with 444 firms. A telephone protocol was followed, and some 200 interviews were arranged. A team of 6 students was trained in all aspects of the survey from initial telephone contacts to detail of interview technique and data processing. Communications, logistics, training, data management and survey financing were all managed by student worker Anja Skadkær Møller.

1.3. Outline of the report

The second section of this report is a review of literature on the subject of new product introductions. Due to the limited material available on the food industry, this embraces, to some extent, other industries. The review's focus is on recurring themes and commonality, rather than an exhaustive review, of which several have recently been conducted (e.g. Francis, 2005; Van der Panne et al., 2003). The third section describes the database generated from the survey and presents several sets of results. The final sections present conclusions and discuss them in the contexts of commercial firms' interests and policy.

2. New food product introductions

2.1. Food product development processes and innovation

The introduction of new products has been afforded considerable recent importance by economists. At the firm level, Mallick and Schroeder (2003) describe it as a "critical linkage between the business organisation and the market" and as being "fundamental to business success". At a higher level, Hartl and Hermann (2005) state that product innovations "represent a major share of the technical progress in an economy". At the sectoral level, Malerba (1999) emphasises the role of product development within "sectoral systems" featuring heterogeneous firms that interact while innovating. Avermaete's (2006) work applies the same principles to identify a role for innovation and new product development in rural development. Geographic clusters of innovative firms (Braadland, 2000) and a mapping of the vertical and horizontal linkages amongst firms that enable innovation (Love and Roper, 1999) have also seen recent examination.

The pressures faced by firms include "increased competition in the marketplace" and "shortening of product cycles" (Nicholas and Ledwith, 2006; Griffin, 1997) and "an increase in innovation pace" (McNamara et al., 2003). In this environment Woods and Demiralay (1998) portray the modern firm as "trying to balance speed, efficiency, innovation and limited resources to deliver products that fit within its mission and strategy, and yield sustained profits". McLaughlin and Rao (1990) note that new product introductions are a major competitive instrument of food retailers, and limited shelf space requires that not all new products can be accepted throughout the food marketing chain. This combination of the pressure to produce new products and the high cost of failure places substantial demands on firms throughout the chain.

Despite such statements of importance and their focus on the firm, empirical study of new product development introduction has been hampered by data and methodological constraints. Metrics for measurement of development and/or success are rare and poorly developed (Mallick and Schroeder, 2003). Perhaps more importantly, studies have focused on managers' statements (as in strategy studies, e.g. McNamara et al. 2003), case studies (e.g. Woods and Demiralay, 1998) or aggregated sectoral analysis (Malerba, 1999), which omit the nature of the firm.

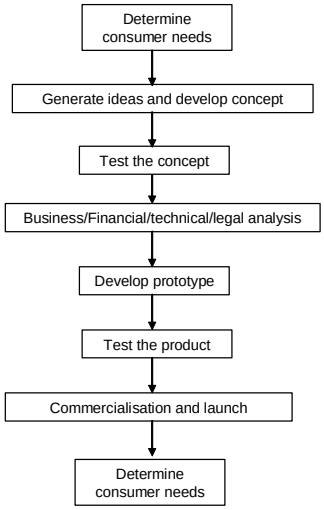
The food industry is often viewed as a user of innovations developed by, or within, other industries (Traill and Grunert, 1997). In part, that view reflects the food indus-

try's linkages to suppliers, service providers and food retailers, and the growing strength of these linkages. A further partial explanation is that food industry firms increasingly need to conform to standards that originate in auxiliary industries. As examples, Braadland (2000) observes that the food industry has benefited greatly from adopting and adapting innovations in transport and information technology. An alternative view is that food industry firms rarely innovate in the sense of laboratory-based research and development, but constantly innovate by developing new products, entering new markets and offering new services (Avermaete and Vianne, 2002; Wilkinson, 2002; Stewart-Knox and Mitchell, 2003). With Yakovleva et al. (2004) and Avermaete and Vianne (2002), Braadland also notes that food industry firms have delivered significant organisational innovations. This observation has resonance in Denmark due to the highly successful model of vertically-integrated co-operation featured there.

Numerous authors have produced typologies of innovations that range from simple "product or process innovation" model classifications to those that detail up to 17 forms of innovation that may or may not involve new product development (Hamilton-Howard, 2000)). Whatever the subdivision of activities, new product development and introduction processes are often represented as sequences: an 8-stage version (Woods and Demiralay, 1998) of which is presented in figure 2.1.

The management of new product development is frequently portrayed as being active not within each stage, but rather at the "gates" between the stages. Such a "stage-gate" approach essentially provokes "go or kill" decisions by management. Smith and Reinerstein (1998) review a range of variations on this theme, and departures from it. The variations include "toll gates" (where value needs to be delivered between stages to ensure a "go" decision), "milestones" (where minimum targets are invoked), and "facets" (where product attributes must be apparent before proceeding between stages). While Griffin (1997) found that almost 40% of U.S. firms had no formal new product development procedures, she also found that the remaining 60% used a blend of stage-gate controls and cross-departmental and cross-functional management tools. Nicholas and Ledwith (2006) identify formal procedures for risk assessment at stage gates, but do not describe them or extend them.

Figure 2.1. Example of product development sequence



Smith and Reinerstein's most interesting departure from the stage-gate methodology is a time-dependent review procedure, adopted by firms that emphasise time-to-introduction. In a blend of the time-dependent and stage-gate approaches, these authors also identify a "critical path" as a subset of the development stages. Stages that lie on the critical path are characterised by the fact that any delay in completing them also delays product introduction. Their conclusion is that the key management role is to minimise the number of stages that belong to the critical path. In a series of case studies taken from non-food industry firms, these authors name and describe the benefits available from overlapping the stages of a new product development project. These arguments are particularly strong where many products are being developed simultaneously so that specialist skills can be marshalled efficiently. Their examination of costs also identifies differential costs and benefits of delayed introduction at different stages of the development process. In particular, they argue that time at the beginning of the development process is relatively cheap, due to the expertise being used, potential for disruption, and commitments to suppliers.

2.2. Numbers of new food products

Modern food retailers offer a huge range of products, and are widely credited with introducing large numbers of new products. Kinsey and Senauer (1996) also observe that food retailers' new products make up a large proportion of the products on supermarkets' shelves. Less visible are product introductions by food processing and distribution firms and farmers, and even less visible are the linkages and connections by which new food products are introduced throughout the food system.

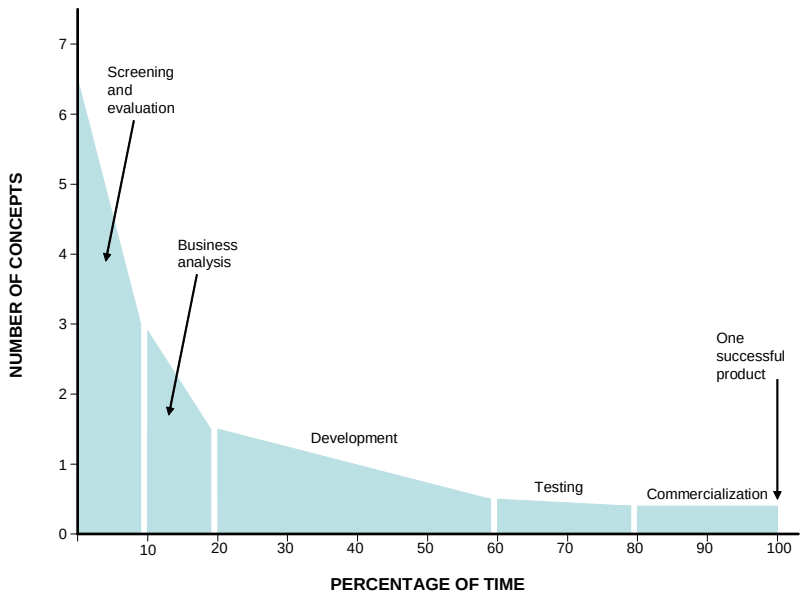
Few numerical estimates of new food product introductions are available, and most published claims are approximations as numbers of trademarks and patents appear to provide little guidance. Harris (2002) claims that new food product introductions in the United States rose from 10.000 in 1990 to peak at 17.000 in 1995, and then declined by 43% (to 9.000) in 2000. Ozimek (1995) reports stagnation in new food product introductions at around 12.000 in Canada from 1992 onwards. ILO (2006) observes that 50.000 new food products are introduced in Europe each year.

Most commentators agree that the attrition rate is high amongst new food products, although estimates vary wildly. Ozimek (1995) estimates that 10% of new food products "make it as far as consumer testing", and of those just 10% make it onwards to the market: this implies a 1% survival rate. Harris (2002) notes that one fifth to one third of new food product introductions are "successful", although success is not defined. Fredericks and McLaughlin (1992) observe that "50% of launched products do not make it through the first year, because they do not meet [firms'] performance standards": the standards applied by firms are neither described nor enumerated.

ILO (2006) claims that just 50% of new food products remain on sale one year after their introduction. Connor's (1999) well-known study of breakfast cereals in the Unites States found that almost all newly-introduced brands were withdrawn within 5 years. In one of the few European studies, Asplund and Sandin (1999) found that in Sweden, 25% of new beer products were withdrawn within 18 months and 50% within 48 months. McLaughlin and Rao's (1990) U.S. survey data show that supermarket intermediaries' "accepted" 21% of the new food products they were offered in 1986-87. However, this rate varies substantially according to type of product (21-61%), price of product (more expensive ones having a higher acceptance rate) and advertising and promotion (24% for those with no promotion and 46% for those with high promotion levels).

Figure 2.2 presents Booz, Allen and Hamilton's (1982) schematic view of new product development, and it should be noted that this diagram proceeds only to new product introduction, and not beyond into a "product life cycle". The diagram also introduces the practical consideration that within the firm, new product introduction proceeds as a series of "concepts" or "projects" (Cooper, 1992) or "portfolios of projects" (Nicholas and Ledwith, 2006) that require highly specific management within the firm. Griffin (1997) found that one successful product introduction "required 6.6 ideas to generate", and that this number had "fallen from 7.0 in 1992".[4] More generally, we observe that a particular project, if successful, may yield more than one product: alternatively a single product may be the result of several projects. An interesting study by van der Panne et al. (2003) has projects as its focus, rather than products. That study measures, for example, the extent to which project activities adhere to a task "trajectory" as depicted in figure 2.2.

Figure 2.2. Attrition between product concept and product introduction



Source: Booz, Allen and Hamilton (1982).

[4] Griffin does not discuss the statistical significance of the result.

It may be inferred from the existence of products' life cycles (see below) that new product introduction is not unambiguously equivalent to a broadening of range or consumer choice, nor to an increase in the numbers of products available. Rather, new products may replace old ones and old products may be complemented by extensions into new markets, perhaps with small alterations. It is therefore important to clarify what is meant by a "new product".

2.3. Types of new food products

Identifying new food products, counting them, measuring their attributes and quantifying the associated behaviour of firms, represent considerable research challenges. Several researchers have defined "types" of new product (see Fuller, 1994; Cooper, 1993; Dimanescu and Dwenger, 1996; Harris, 2002 and Poolton and Barclay, 1998), and a selection of these classifications is presented in table 2.1. A notable feature of all classifications is the predominance of new product types that are, in some way, a variation on an existing product.

Table 2.1. Typologies for new products

Author	Types of new product
Fuller (1994)	Line extensions Repositioned existing brands New forms of existing brands Reformulations of existing products Innovative products Creative products
Cooper (1993)	New-to-the-world products New product lines Additions to existing product lines Improvements and revisions to existing products Repositioned and retargeted products Products enabling cost reductions
Dimanescu and Dwenger (1996)	Breakthroughs Incrementals Derivatives Customised products
Harris (2002)	"Me-too" products Line extensions Seasonal products Classically innovative products

Harris (2002) reports that 77% of new food products introduced in the U.S. are "me-too" products, defined as "a new version of an existing product already offered by an

existing firm". He finds that 13% of new products are seasonal products, 6% are extensions of existing lines, and just 1.5% "classically innovative" (a term he leaves undefined). Brenner (1994) identifies five possible points of origin of new product sales from a firm: it is notable that just one of these might be termed "classically innovative".

- internal development using R&D;
- acquisition of product lines;
- new applications of existing products;
- new markets for existing products; and
- business and service extensions that are linked to existing products.

2.4. Firm size and context

Firm size, and the relationships between firms, have been shown to affect innovation processes (Love and Roper, 1999), but this has not been widely examined for the food industry. Ozimek (1995) found that Canada's top 20 food industry firms introduced 13-17% of new food products, and he notes that this share fell between 1989 and 1993. For the U.S. Harris (2002) estimates that 86% of new food products are introduced by small-to-medium sized food industry firms, with just 14% due to the 20 largest firms.

Avermaete (2006) cites evidence from Belgium that small and/or rurally-located food industry firms introduce different types of products (specifically, locally-known products) from those of large firms. She notes that firms "rarely innovate alone", but collaborate and/or co-operate with other members of the food marketing chain as one basis of "innovative clusters". Boon (2001) reports on 4 Danish case studies of innovations across a product- and market- differentiation spectrum of options involving co-ordination between firms at different stages of the marketing chain. He focuses on "systemic inter-dependency" whereby product differentiation capacities of vertically-arrayed partner firms are both complementary and technically strong. His cases emerge from different Research and Development backgrounds (some public and some private) and are technologically (cost-push) or consumer (demand pull) oriented.

It is not clear whether such organisational models are the preserve of a specific size class of firms, or of those that trade in a co-ordinated way or simply happen to be geo-

graphically co-located. Harris (2002) proposes that there may be a U-shaped relationship between firm size and new product development: smaller firms being best able to develop products for niche markets and larger firms serving the more uniform, large scale markets. This assumption is used by Buhr (2004) and Brester (1999) in advocating niche marketing for small food processors and farm-based businesses.

2.5. New food products and brands

Connor (1999) proposes that new product introductions have a role to play in entry deterrence, as brands strategically occupy both profitable and unprofitable market niches so as to restrict the market available to entrants. Baker et al. (2006) propose that retailers may use their own-label brands in a similar way within the vertical food chain, to expropriate value-added from processors and distributors. Asplund and Sandin (1999) conclude that firms' new product introduction and their products' survival are positively associated with incumbency and the number of brands and products already on offer. They note that new firms that form solely to introduce a new product (designated by the authors as "innovative start-ups") face more serious consequences of product failure than do firms with an existing portfolio. However, these authors found that large firms tend to withdraw products after a shorter time than do small firms.

Just as type of new product is poorly defined in the literature, so is the distinction between "new products" and "new brands". To the author's knowledge, no study clearly delineates between the two, and McLaughlin and Rao (1990) deliberately ignore distinctions amongst forms of "newness". The various product typologies presented in table 2.1, however, indicate the potential role of brands in promoting, at one extreme, line extensions; at another, totally new products; and at yet another, assistance in repositioning of products within or between markets. Braadland's (2000) interesting alternative view is that branding is one of the two major innovative activities for food industry firms (the other being organisational change). He defines branding as an innovation that, rather than delivering new products, serves to keep "products the same" in the eyes of the buyer.

2.6. Food product life cycles

New food products are widely believed to exhibit life cycles in terms of analogies to gestation, birth, growth, senescence and death. For an empirical study of food products' longevity in the market, the interested reader is directed to Asplund and Sandin

(1999). Beyond the food industry, Mallick and Schroeder (2003) present product life cycles as consequences of measurable variables within specific industries. They use the term "clock speed" to refer to an industry's rate of change in technology and market conditions, but do not provide a empirical basis that would allow its measurement. Malerba (1999) expresses similar views about sectors of the economy that feature inter-firm linkages. Such considerations are beyond the scope of the current study, which focuses on new product development. Consideration of product longevity, withdrawal and modification is deferred to later work.

2.7. Performance and success factors for new products

In the current study, new product development processes are studied, but not the success or failure of products once they are introduced. In spite of this, a review of the literature on new product development success offers interesting insight. It is also likely that firms are aware of many success and failure factors that are now embodied as feedback loops in their new product development procedures.

There is surprisingly little agreement amongst researchers on criteria for measuring success in new product development. The cross-functional emphasis that firms increasingly place on new product development is reflected in work by Lester (1998), van der Panne et al. (2003) and Cooper (1999, 1992) who refer to "projects" rather than products.[5] Hence, interpretive care must be taken to differentiate between criteria that target processes, projects and portfolios, while addressing the general subject of new product development. Crawford (1987) reviews firms' own assessment of new product development with the summary "none tried to compare, except to themselves".

Francis (2005) and Woods and Demaralay (1998) both list difficulties in establishing links between a firm's "practices" and "performance". These include spillovers within and beyond the firm, and the degree to which the new product satisfies firm policy and strategy. Van der Panne et al. (2003) note that there may not be any strict correspondence between innovations, projects and new products. At the plant level, Love and Roper (2006) use the number of new products introduced annually as a performance measure. At the firm level, Brenner (1994) advocates using the share of sales that are from new products. However, he observes that measurement of sales of new

[5] Cooper (1999, 1992) developed a management tool known as "NewProd" that has as its stated aims to (i) "doing the right projects" and (ii) "doing the projects right".

products should commence only when new products achieve a specified threshold sales volume, and that at least 5 years must pass to ensure that the new product has had a fair chance of success.

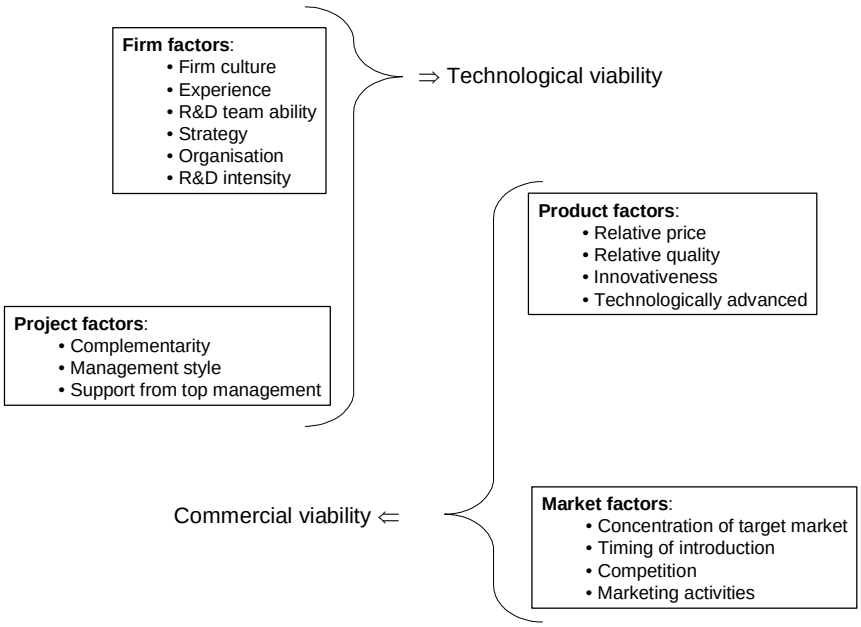
Even in the absence of metrics for success, success and failure in new product development has a large literature. Most research identifies the recognition, composition, motivation and empowerment of project teams within firms as being a critical factor in the success of new product development and introduction (Lester, 1998). It is observed that these are often led by individuals with unique skill sets and experience (so-called "intra-preneurs"), although in some cases these are management staff with an ability to garner support within the firm.

Crawford also observes that case study interviews with firms face substantial respondent bias because the interviewee is frequently deeply involved in the new product development process. Based on precisely such interviews with managers, Cooper (1998) identified factors critical to success in new product development:

- the degree to which the product is unique and superior to existing alternatives;
- the firms' understanding of the future development of the market; and
- synergy between the product and the firm's overall use of resources.

Cooper relates these factors to the criteria that should be used in a stage-gate development procedure. In a similar discussion, Mallick and Schroeder (2003) identify just two critical success factors: "product performance" and "unit cost". Their arguments, however, identify several contradictions: a lengthy product development time may often be associated with improved product performance, but it is also likely to raise unit costs (due to increased development costs). Therefore, while product performance may be central to capturing market share, the cost of achieving it may raise prices and so reduce market share. Van der Panne's (2003) treatment is more general, embracing the firm, the project, the product and the market. Notably, their discussion separates technical and commercial viability (see figure 2.3), with firm and project factors being entirely assigned to the former.

Figure 2.3. Critical success factors in new product development



Source: van der Panne et al. (2003).

Link's (1987) study (see table 2.2) yields a similar set of conclusions to those presented by a number of other authors.[6] A notable feature of Link's results is that for the most part, identified success and failure factors are different. Link's study addresses a number of different industrial sectors, including food. For the food sector, he draws attention to firms' claims that pricing and access to the distribution channel are the most important factors in product success.

[6] See, for example, Griffin (1997), Lester (1998), Cooper (1996), Nicholas and Ledwith (2006) and in an extensive review, Francis (2005).

Table 2.2. Factors affecting the success and failure of new products

Most important factors in product success	Most important factors in product failure
1. New product's synergy with existing marketing skills within the firm	1. The market was too competitive
2. New product's synergy with existing technical and manufacturing marketing skills	2. Insufficient pre-launch research
3. High product quality	3. Product not novel
4. Significant savings or benefits offered	4. Product offered negligible savings or benefits
5. Appropriate pricing and targeting strategy	5. Inadequate resources devoted to sales
6. Distribution channel support	6. Inadequate promotion and sales

Source: Link (1987).

Link (1987) identifies firms' inadequate funding and support of new product development as the single greatest factor contributing to new products' failure. Cooper (1992) argues that the problems lie in firms' incorrect choices of development projects, one effect of which is the dilution of resources channelled to all projects.

Many articles reviewed above have emphasised newness of products, innovativeness and superiority. Yet, observations reported in previous sections indicate that firms (and not only in the food industry) tend to introduce products of limited newness. Particularly in the food industry, many new products are copied from those of competitors. Francis (2005) reviews a substantial literature on firm's new product development and introduction to conclude that "copy-cat products are painfully underrepresented".

2.8. Barriers to new food product introductions

Braadland's (2000) survey of Norwegian food industry firms identified the barriers to innovation they claimed to face. Although the topic of the survey was innovation, much of Braadland's emphasis was on product innovation.[7] Table 2.3 details those findings, which tend toward the general. He further reports that Norwegian food industry firms rank "innovation" 2nd-to-least important in potential strategic investments.

[7] There is also significant emphasis on organisational innovations.

Table 2.3. Factors thought to provide barriers to new product introductions

Barrier	Notes
Organisational relations between firms and within the firm	
Lack of market information	Factors thought to be somewhat specific to food industry firms, as opposed to other sectors
Strict standards and regulations[8]	
Market failure for innovations	
Lack of qualified staff	
Lack of information about technology	Factors thought to be shared by firms in all sectors
High innovation costs	

Source: Braadland (2000).

Francis (2005), Braadland (2003) and van der Panne et al. (2003), discuss the impact of the competitiveness of the market on the product introduction process in particular, and innovation in general. Opinion is divided. Some commentators claim that a competitive market discourages new product introductions because firms cannot differentiate products and reap rewards from development expenditure. Others claim that fewer buyers and/or sellers will reduce the potential market for new products. Some resolution of the disagreement is provided by the idea that in a competitive market, entry and exit will also result in a cycling of products and opportunities for new product development.

Harris (2002) attributes declines in new food product development in the U.S. to narrowing of the marketing chain and improved efficiency in product introduction procedures. McLaughlin and Rao (1990) address this directly in a survey of U.S. firms by measuring (i) the number of firms offering competing products and (ii) the number of brands carried by the buyer that compete with new products. The number of competing firms was positively correlated with probability of acceptance of new products by an intermediary, while for the number of competing brands the relationship was negative.

McLaughlin and Rao (1990) note that new product introductions require costly activities at all points in the chain, so predisposing to the collaboration amongst vertically-aligned firms studied in detail by Boon (2001). McLaughlin and Rao identify, for example, shared efforts in product promotion throughout the marketing chain. They do

[8] It is notable that Braadland makes no distinction between standards (originating from trading relationships and requirements) and regulations (which originate from government).

not, however, find that profitability of retailers' shelf space is influential in new product acceptance, although product gross margin and elements of category management were significant. Sparks (1997), Ward et al. (2002), Galizzi et al. (1997) and Baker et al. (2006) have all examined the processor/retailer interface for possible links to new product introductions. In general, the outcome is likely to depend on firms' strategies (Galizzi et al.): processors may react to retailers' own-label brands by further product differentiation (Ward et al.), which pre-disposes to new product development. Retail investments in the food processing sector may be to capture and utilise brands (Sparks) or to utilise capacity for manufacture of own-label (Baker et al.).

3. Survey results

3.1. Characteristics of responding firms

The survey procedure yielded 131 valid responses (a 30% response rate on 444 firms). The degree to which the survey is representative of the population of Danish food industry firms cannot be directly estimated, although table 3.1 below provides an overview. Eleven firms from the sectors "ingredients", "primary agriculture" and various "services" also appear in the survey dataset. These firms are classified by Statistics Danmark as being one of retailers, processors or wholesalers, but claim to operate at another stage of the chain.

The numbers of firms in the population (Statistics Danmark, 2006) includes firms with less than 5 employees, defunct firms, subsidiary firms and/or firms otherwise ineligible for the survey. Coverage rates range from the very low (8 unspecialised retail firms out of 3129 in the country) to quite large (9 of 39 fruit and vegetable processors, and 17 of 61 dairy processing plants (including ice cream manufacturers)). Many of the largest and best-known of Denmark's food industry firms participated in the survey.[9] Clearly, coverage and representativeness is greatest amongst processing firms, although sufficient wholesale and retail firms are included to allow some inference to be drawn.

Table 3.1. Numbers of firms: sample and population characteristics

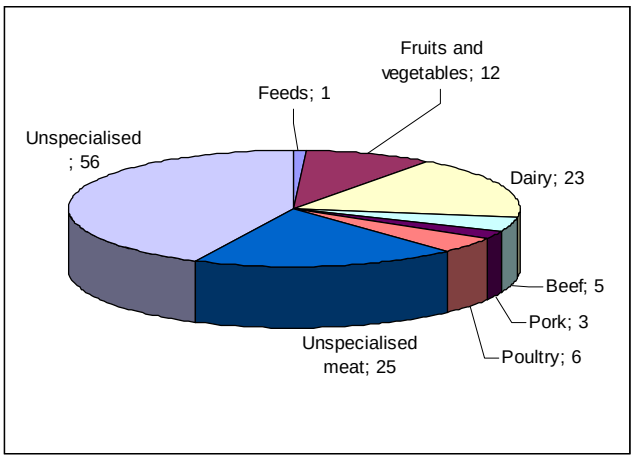
	Numbers of firms							
	Processing		Retail		Wholesale		Other	
Commodity sector	Popn.	Survey	Popn.	Survey	Popn.	Survey	Popn.	Survey
Feed	43		na		na			1
Fruit and vegetables	39	9	556		219	2		1
Dairy	61	17	119		130	4		2
Beef	24	5	na		na			
Pork	26	3	na		na			
Poultry	8	3	na		na	1		2
Unspecialised meat	na	10	724	8	235	6		1
Unspecialised	na	7	3129	17	241	28		4

na not available.

[9] Confidentiality precludes disclosure of firms' names, and detailed discussion of their sector and location.

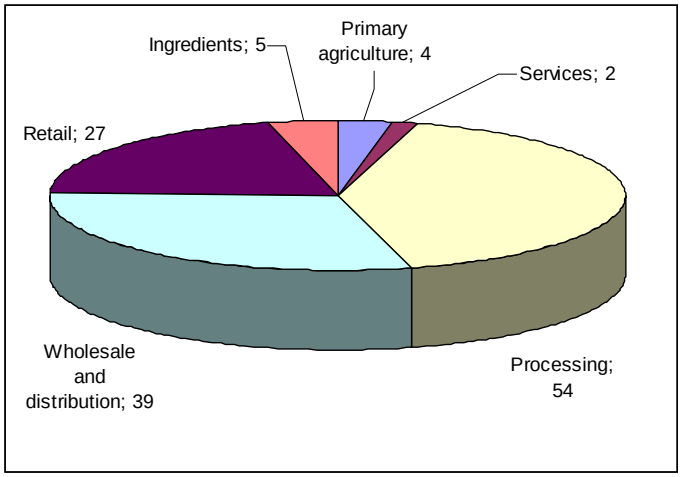
The distribution of responding firms according to sector, stage of chain and size is presented below. By design, firms in just 8 commodity sectors were surveyed, including "unspecialised" and "unspecialised meat", which together make up 81 firms of 131 (see figure 3.1).

Figure 3.1. Sectoral distribution of firms surveyed



By design, the survey addressed principally the non-farm stages of the food marketing chain, including services and ingredients. As seen in figure 3.2, processing, wholesale and distribution and retailing dominate the dataset. The four firms classified as primary agriculture are firms that describe themselves in that way despite having functions at other stages of the chain and being registered with commercial authorities in other stages of the chain.

Figure 3.2. Distribution of firms surveyed, by stage of chain



Firms in the survey averaged annual sales of 812.5 million DKK and employed an average of 333.4 employees. Figures 3.3 and 3.4 display the firms' distributions according to revenue and labour force size classes. In both cases a reasonable cross-section of size classes was achieved.

Figure 3.3. Distribution of firms surveyed, by revenue size class

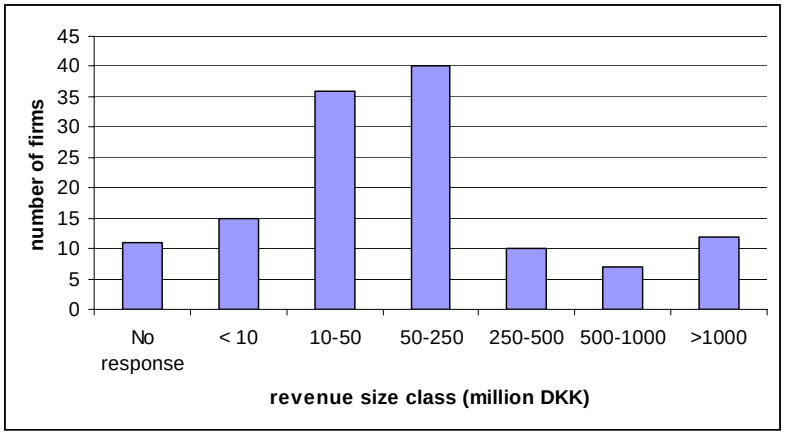
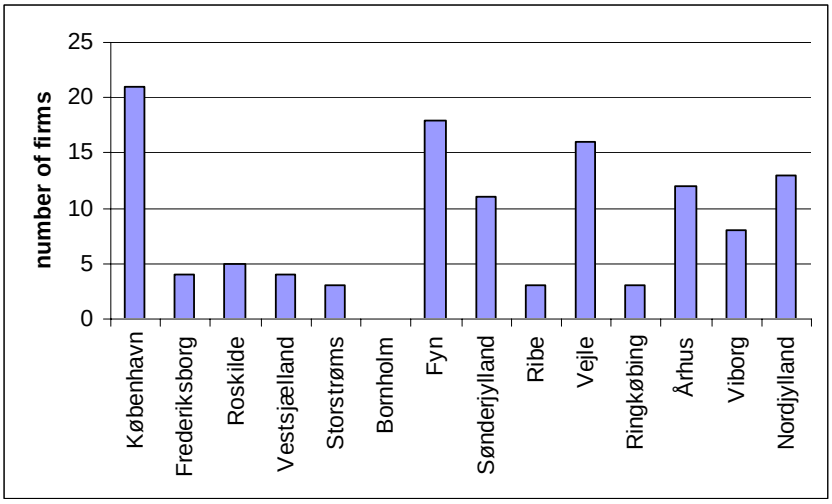


Figure 3.4. Distribution of firms surveyed, by employment size class

All regions of Denmark yielded at least 3 firms in the survey, with the exception of Bornholm, which yielded none (see figure 3.5).

Figure 3.5. Distribution of firms surveyed, by location



3.2. New product introductions

Firms in the survey averaged 129.9 new products per firm in 2005, with all non-responses counted as zero. Counting only those firms responding to the question, the average number of new products introduced in 2005 was 138.3, and ranged from 0 to 5000 (see table 3.2). This apparently large number is influenced by the predominance of retailers and unspecialised firms.

Table 3.2. Basic data on firms

	Number of firms	minimum	mean	maximum
2005 Sales (million DKK)	120	1.0	812.5	46,400
2005 Number of employees	130	1.0	333.4	20,000
New products introduced/firm in 2005 (disregarding no response)	123	0	138.3	5,000
New products introduced/firm in 2005 (including no response)	131	0	129.9	5,000

All firms in the survey display a statistically significant increase in numbers of new product introductions between 2000 and 2005 (see table 3.3). This includes the raw measure of new products introduced, as well as new products per employee and per million DKK of sales.

Table 3.3. New product introductions by all firms

	2005	2000	
	Numbers of products		
New products introduced	129.9	56.4	***
New products per employee	2.4	1.4	***
New products per mil. DKK sales	1.7	1.2	**

Level of statistical test * 10%, **5% and ***1%.

Although larger firms introduced more new products than smaller firms in both 2000 and 2005, firms in the middle ranges of sales and employee numbers exhibit the highest numbers of new products per unit of sales and per employee (table 3.4, 3.5). When change between 2000 and 2005 is considered, the largest firms show the largest increases in numbers of new products introduced. The very smallest firms show a decline in new products per employee and per unit of sales between 2000 and 2005.

Table 3.4. New product introductions by sales size group

	<10 mill.	10-50 mill.	50-250 mill.	250-500 mill.	500-1000 mill.	>1000 mill.	All firms
			Numbers of products				
New products 2005	12.7	37.4	243.0	11.1	303.6	280.4	129.8
New products 2000	12.5	16.0	111.0	7.7	88.3	115.7	56.4
New products 2005 (resp only)	13.4	38.4	243.0	12.3	425.0	373.9	69.7
New products 2000 (resp only)	12.7	19.9	124.0	9.6	123.6	173.5	73.4
Change in new products 2005	0.2	21.4	131.3	3.4	215.2	164.7	138.3
New products per employee 2005	1.5	1.7	5.2	0.1	1.6	0.5	2.4
New products per employee 2000	1.9	0.9	2.6	0.1	1.0	0.2	1.4
New products per mil. DKK sales 2005	1.7	1.9	2.6	0.0	0.4	0.1	1.7
New products per mil. DKK sales 2000	3.0	1.2	1.5	0.0	0.3	0.1	1.2

Table 3.5. New product introductions by numbers of employees

	<5	5-20	20-100	100-250	250-1000	>1000	All firms
			Numbers of products				
New products 2005	1.5	25.8	231.7	194.0	207.4	321.0	129.8
New products 2000	3.5	11.3	108.9	65.4	75.1	130.6	56.4
New products 2005 (resp only)	1.5	27.9	231.7	194.0	296.3	401.2	69.7
New products 2000 (resp only)	4.0	14.2	131.3	65.4	125.2	217.7	73.4
Change in new products 2005	-2.0	14.5	122.8	128.6	132.3	190.4	138.3
New products per employee 2005	0.6	2.1	4.3	1.0	0.5	0.2	2.4
New products per employee 2000	0.9	1.1	2.5	0.7	0.2	0.1	1.4
New products per mil. DKK sales 2005	0.3	1.9	2.8	0.3	3.7	0.1	1.7
New products per mil. DKK sales 2000	1.2	1.0	1.8	0.2	2.3	0.1	1.2

Firms from all major chain stages have increased their new product introductions between 2000 and 2005 (see table 3.6). The largest % increases were by processors, where the average rose from 3.7 new products to 22.6, an increase of over 500%. Retailers, by comparison, doubled their number of new product introductions in the

same period. However, retailers' numbers of new products, and new products per employee and per unit of sales were by far the highest amongst chain stages.

Table 3.6. New product introductions by stage of marketing chain

	Processing	Wholesale	Retail	Ingredients	All firms
	Numbers of products				
New products 2005	22.6	150.5	360.7	35.6	129.8
New products 2000	3.7	53.6	182.3	33.4	56.4
New products 2005 (resp only)	24.0	167.7	360.7	35.6	69.7
New products 2000 (resp only)	4.7	67.4	205.0	41.8	73.4
Change in new products 2005	19.0	96.9	178.4	2.2	138.3
New products per employee 2005	0.3	2.7	7.2	0.5	2.4
New products per employee 2000	0.1	1.4	4.3	0.5	1.4
New products per mil. DKK sales 2005	0.2	1.9	4.7	0.2	1.7
New products per mil. DKK sales 2000	0.2	1.2	3.6	0.2	1.2

Amongst major commodity groups, unspecialised firms introduced by far the greatest numbers of new products in both 2000 and 2005 (see table 3.7). While pork and poultry firms have increased their numbers of new products over this period, they lag far behind dairy and fruits and vegetables firms.

Table 3.7. New product introductions by sector

	Fruits and vegetables	Dairy	Pork	Poultry	Unspec meat	Unspeciali-sed	All firms
	Numbers of products						
New products 2005	19.8	56.7	3.0	16.7	20.0	265.2	129.8
New products 2000	7.7	8.9	1.0	8.3	13.1	119.8	56.4
New products 2005 (resp only)	19.8	59.3	3.0	16.7	20.8	297.0	69.7
New products 2000 (resp only)	9.3	12.0	1.5	8.3	18.7	152.0	73.4
Change in new products 2005	12.1	47.9	2.0	8.3	6.8	145.4	138.3
New products per employee 2005	0.5	1.7	0.1	0.0	1.5	4.2	2.4
New products per employee 2000	0.2	0.7	0.0	0.0	1.3	2.3	1.4
New products per mil. DKK sales 2005	0.2	0.6	0.1	0.0	1.1	3.3	1.7
New products per mil. DKK sales 2000	0.1	0.5	0.0	0.0	1.4	2.0	1.2

3.3. Product removals

Table 3.8 presents averages of firms' claims about product removals and products' survival. All evidence points to a lengthened product life cycle. For 2005 firms removed an average of 96.1 products each from the market. This is a statistically significant increase over the 40.1 recorded for 2000. This meant that the product balance (introductions minus removals) doubled between 2000 and 2005 from 16.3 per firm to 33.8. This change is also statistically significant.

The reported average age of products at removal increased from 17.3 months to 23.0, which is also a statistically significant change. Furthermore, firms reported that on average the number of their products lasting longer than 6 months on the market had increased from 44% in 2000 to 55% in 2005.

Table 3.8. Product removals and survival

	2005	2000	
Number of products withdrawn (products)	96.1	40.1	**
Balance of introductions minus removals (products)	33.8	16.3	*
Average age at removal (months)	23.0	17.3	***
Proportion of products lasting ≥6 months (% of all products)	55%	44%	***

3.4. Barriers to new product development

Firms were offered 20 possible responses to a question about barriers to new product development, of which they could use more than one. Firms could also state that there were no significant barriers to new product introduction. Results are shown in figures 3.6-3.8.

Figure 3.6 presents figures for all firms, for the years 2000 and 2005. Firms' impressions of conditions for product development and introduction in both years are similar. However, significant changes are seen for regulatory conditions: for 2005 some 2-10% more firms claim that regulations are a barrier. More firms claim that 2005's market is saturated with new products than make this claim for 2000 (see first three categories in figure 3.6). Competitive conditions and relations with retailers also appear to be of greater concern to firms in 2005 than they were in 2000. For both years, about 33% of firms claim that there are no significant barriers to new product development: this is the largest share of firms responding to any of the available categories.

Figure 3.7 presents the same data for 2005 only, disaggregated by stage of the food marketing chain. The overall pattern of responses is similar to that shown in figure 3.6. Exceptions include firms' perceptions of the barrier posed by regulation: retailers appear to be more concerned about food safety, environmental and labelling regulations than are other firms. Wholesalers (at 8-20% of firms) appear to be the most concerned about the potential for new products in the Danish market, while retailers are far less concerned about it (3-15%). Another notable result is that 12% of retailers claim that the cost of acquiring supply chain information is a major barrier, while just a few firms from other stages make this claim. Processors' biggest concerns appear related to competitive conditions and the degree to which introduction costs need to be borne by the firm developing the product: these views are not shared at all by retailers.

When the 2005 data is disaggregated by commodity sector (figure 3.8), some different patterns emerge than were evident in the aggregate results. Pork and poultry firms appear to be more concerned about most of the 20 categories of potential barrier presented here than are firms from the other commodity sectors. Poultry firms, in particular, claim that regulations are a major barrier to product development. Pork firms focus their concerns to some extent on domestic markets, while poultry firms are concerned about conditions in foreign markets. A majority of pork and poultry firms claim that product development costs are a significant barrier, while only pork firms carry this claim through to the costs of product introduction. Retailers' own-label brands provoke few claims from firms in any commodity sector. In general, unspecialised firms and unspecialised meat firms make few claims about barriers to new product development.

Figure 3.6. Identified barriers to new product development (all firms)

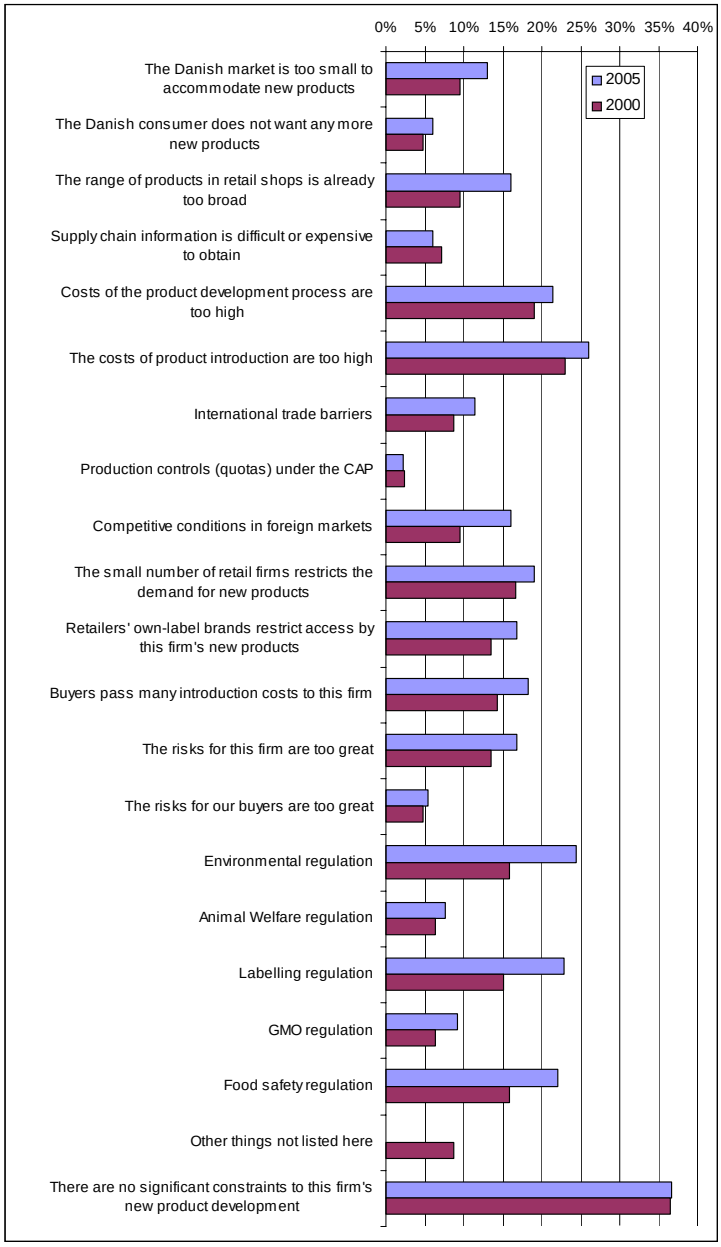


Figure 3.7. Identified barriers to new product development (stage of chain)

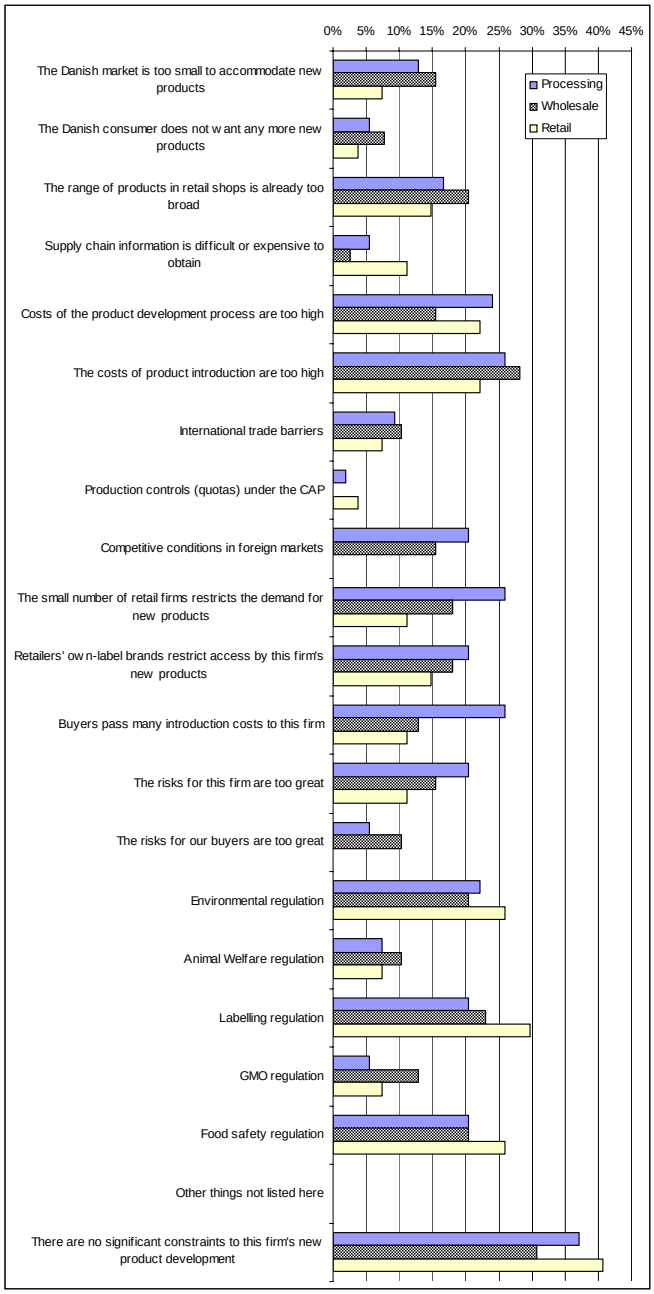
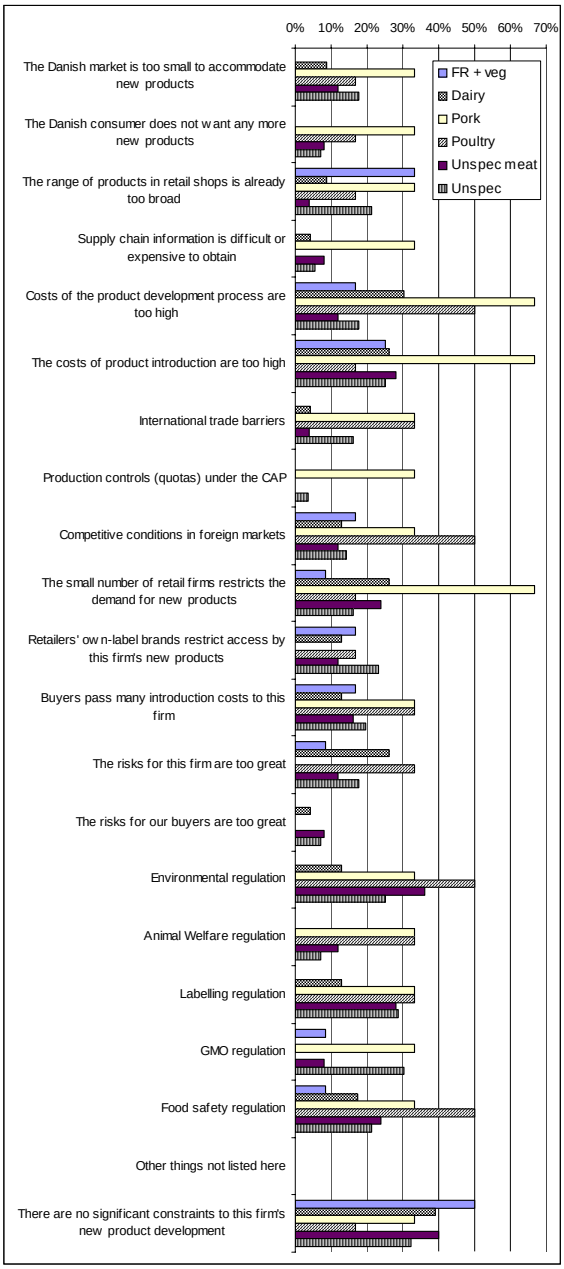


Figure 3.8. Identified barriers to new product development (sector)



3.5. Brand ownership and new product introductions

Patterns of sales arising from different brand types are shown in table 3.9. Shares of sales from retailers' own-label brands has increased by 2 percentage points, which is the only statistically significant change observed.

Table 3.9. Sales and brand ownership

	2005	2000	
Sales from brands owned by the firm (% of all sales)	44.4	44.3	
Sales from brands owned by other firms (% of all sales)	34.8	33.2	
Sales from retailers' own-label brands (% of all sales)	8.4	6.4	**

Level of statistical test * 10%, **5% and ***1%.

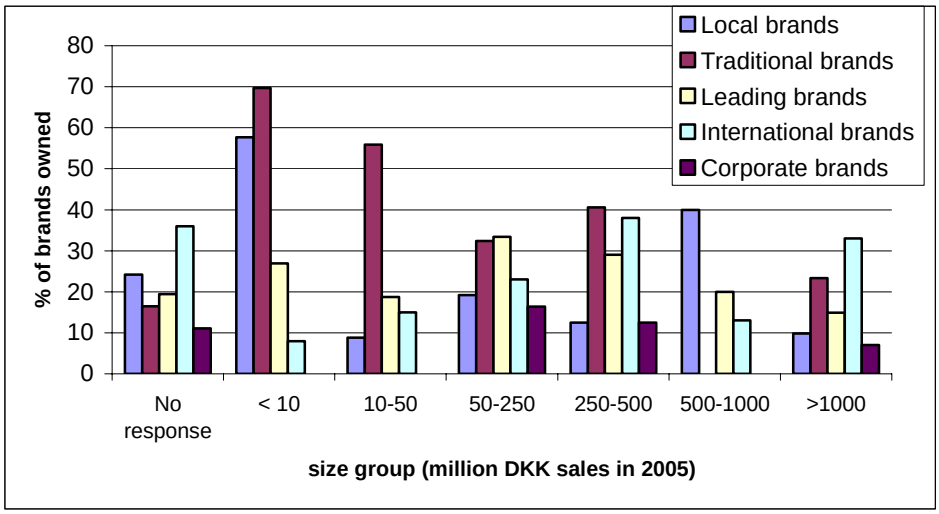
Surveyed firms averaged slightly higher patent and brand ownership in 2005 than in 2000 (table 3.10). While the composition of firms' brand portfolios changed slightly in this period, the only statistically significant change was in the use of "corporate" brands. It should be noted that this classification into four brand types is arbitrary and left to firms themselves to define. Firms could also classify their brands as more than one of these, or none of them, so shares of brands need not sum to 100%. It appears that local and traditional brands are favoured by the smallest firms, while leading and corporate brands are claimed by the medium and large sized firms (Figure 3.9).

Table 3.10. Patent and brand ownership, by type

	2005	2000	
Number of patents owned (average/firm)	8.6	8.4	**
Number of brands owned (average/firm)	11.4	10.7	**
Average share of brands that are (% of brands owned):			
"local brands"	23.0	25.4	
"traditional brands"	34.8	34.4	
"leading brands"	25.5	24.5	
"international brands"	22.3	21.7	
"corporate brands"	8.3	3.8	**

Level of statistical test * 10%, **5% and ***1%.

Figure 3.9. Relationship between firm size and type of brand owned (2005)



The numbers of products per brand reported by firms are presented in table 3.11. For both years, the majority of brands feature 10 products or more, with the only statistically-significant change being an increase in products assigned to that category. Missing responses, and the fact that firms' products have multiple profiles, mean that shares of brands do not necessarily sum to 100%.

Table 3.11. Products per brand

Number of products per brand	2005	2000	
	% of all brands		
1 only	12.2	10.2	
2-9	27.2	27.8	
10 or more	75.9	58.2	**

Level of statistical test * 10%, **5% and ***1%.

3.6. Forms of new product introduced

The "newness" of products introduced by surveyed firms is presented in tables 3.12 and 3.13. An average of around 10% of firms' brands are introduced as "new brands", while four times that number (around 40%) are introduced under existing brands.

There have been small declines in the number of products being introduced as unbranded products and as other firms' brands. The only statistically significant change is the almost doubled share of new products introduced that are retailers' own-label brands.

Table 3.12. Utilisation of brands in new product development

New products that are (% of new products)	2005	2000	
"new brands"	10.8	9.04	
"under existing brands"	39.5	39.4	
"retailers' own-label brands"	15.7	8.3	**
"other firms' brands"	23.3	27.9	
"brands purchased from other firms"	1.1	0.9	
"unbranded"	6.7	8.9	

Level of statistical test * 10%, **5% and ***1%.

On average, firms claim that around 40% of new products introduced in both 2000 and 2005 were "truly new" (a term also left to firms to define, relative to other options in table 3.13). The only statistically-significant change is that firms' shares of new products that are introduced as significant changes to existing products have increased, on average, by less than 1% to around 18%.

Table 3.13. "Newness" of new products

New products that are (% of new products)	2005	2000	
Small changes to existing products	26.0	25.0	
Significant changes to existing products	18.1	17.9	**
Substitutes for existing products	13.2	11.9	
Products that are truly new	40.9	38.6	

Level of statistical test * 10%, **5% and ***1%.

3.7. The new product development cycle

Table 3.14 presents average and maximum values for survey data on firms' new product introduction cycles. Dealing first with averages, the length of almost all stages of the product development cycle shows an increase between 2000 and 2005, although just one increase (the initial one, between project idea and technical development) is statistically significant. Although not statistically significant, it is a notable result that the increase in firms' estimates of "total cycle" has increased 25% in length and the legal and regulatory actions stage has increased 58%. The lack of statistical power in these comparisons is due to missing values and the large variation reported by firms.

Firms' reported maximum values (right hand side of table 3.14) support this instability. In all cases the increases in maximum length of development stage far exceed the changes in average lengths.

The bottom rows of table 3.14 assess firms' ability to overlap stages to accelerate product development cycles. The author's calculation is to sum the time periods for the stages of development and then calculate the percentage by which this total exceeds firms' reported length of the total cycle. This measure has declined from 49% to 46%, indicating that overlapping is slightly more effective for 2005 than for 2000.

Table 3.14. Lengths of product development cycles

	Mean				Maximum		
Stages	2005	2000	% change		2005	2000	% change
	months				Months		
Product idea to start of technical development	2.3	1.6	44%	*	30.0	7.0	329%
Market research	1.2	1.1	9%		6.0	4.5	33%
Technical product development	3.1	1.8	72%		36.0	7.0	414%
Consumer testing	0.6	0.6	0%		3.0	3.0	0%
Negotiations with buyers	2.4	2.2	9%		18.0	18.0	0%
Legal and regulatory actions	1.9	1.2	58%		36.0	14.0	157%
Introduction as trial	2.4	2.0	20%		21.0	12.0	75%
Total cycle	6.4	5.1	25%		36.0	18.0	100%
Derived measures of stage overlap							
Sum of stages (months)	13.9	10.5	32%				
Sum of stages as % of total cycle time	46%	49%					

Level of statistical test * 10%, **5% and ***1%.

3.8. Firms' expenses and strategy

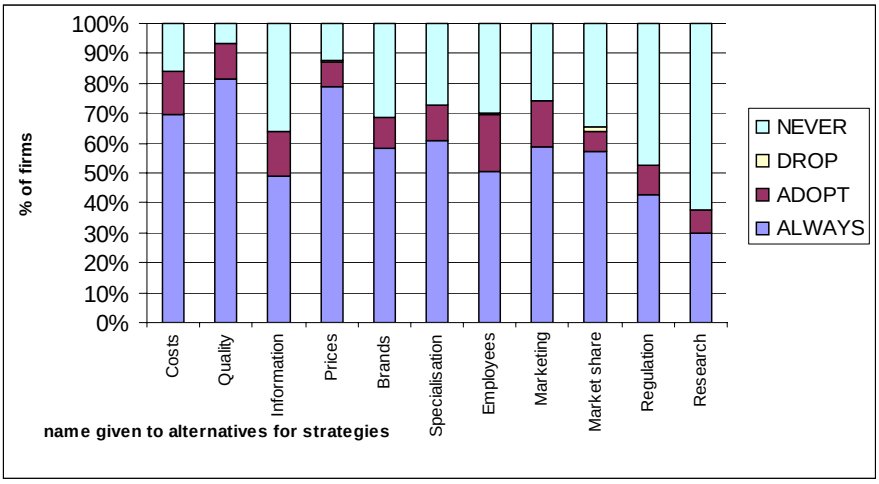
Surveyed firms reported spending, on average, 2-3% of all expenses on new product introductions and around 2% on research and development (table 3.15). There was substantial variation amongst firms, with a large number recording zero responses.

Table 3.15. Firms' expenditures

Expenditures as % of all expenses	2005	2000
New product introductions	2.6	2.7
Research and development	2.1	1.9

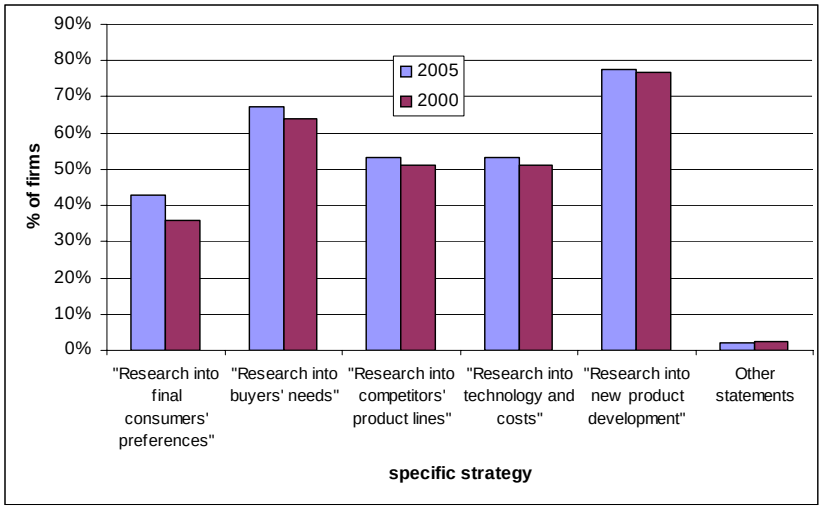
In response to survey questions, firms reported strategy at two levels: first they indicated which strategic orientation the firm maintained, of 11 options, for both 2000 and 2005; secondly they indicated one or more actual strategies from a list of 4-8 options within each strategic orientation. Figure 3.10 shows the first result: over 60% of firms in the survey had never (i.e. neither in 2000 nor in 2005: designated "NEVER") had a strategy geared to research and development: the highest of any of the strategic areas on offer. Some 8% of firms adopted an R&D strategy between 2000 and 2005 (see "ADOPT") and 30% had always had one ("ALWAYS"). Just over 32% of firms reported never having pursued a strategy involving brands.

Figure 3.10. Firms' strategic emphasis



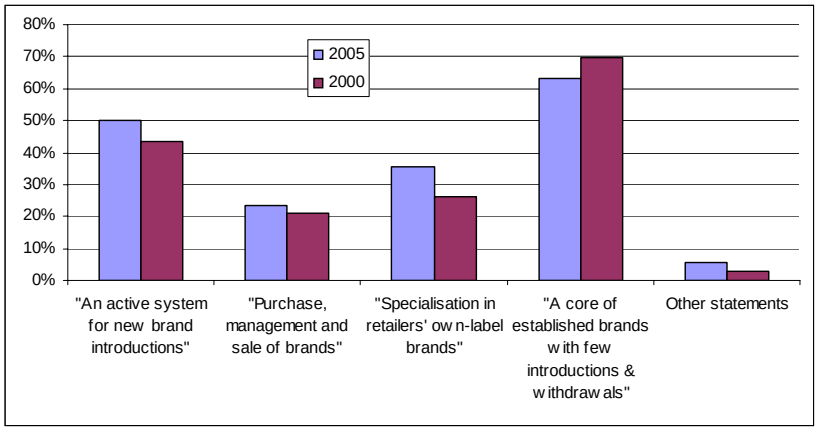
Of the 30% of surveyed firms claiming to have a research and development strategy, the great majority (around 78%) claimed to carry out research into new product development. 50-70% of such firms also claimed research into buyers needs, competitors' product lines and technologies. A minority claimed to carry out research into final consumers' preferences.

Figure 3.11. Firms' R&D-related strategies



Of the 70% of firms claiming to pursue a brand-related strategy, a significant majority claims to implement a strategy involving few new brands and few withdrawals of existing brands (figure 3.12). There has been an increase in the number of firms implementing a strategy of specialisation in retailers' own label brands. Just 50% of firms claim an "active system for new brand introductions" in 2005, although this is an increase over the figure for 2000.

Figure 3.12. Firms' brand-related strategies



4. Discussion

The development and introduction of new products has been afforded considerable attention amongst researchers, and has been identified as a key part of the modern innovative economy. However, two shortcomings of the empirical research literature are apparent. First, remarkably few empirical studies of new food product introduction have been attempted. Second, models of new product development have been shown to have limited application to some modern trends, particularly the incremental, as opposed to truly innovative, nature of new products.

Survey results in the current study indicate that the number of new products introduced by Danish food industry firms has increased between 2000 and 2005. In absolute terms the number of new products introduced was greatest amongst the largest firms, but the medium sized firms introduced the most new products per unit of sales and per employee. Firms are also actively removing products from the market, with an overall positive balance that indicates that the number of products in the market is increasing.

Surveyed firms claim that their time-to-market has slowed down, by 25% on average, between 2000 and 2005. Although this difference is not statistically significant, it contradicts much contemporary commentary which suggests such "introduction cycles" are speeding up. The slowing down of the initial stage of the cycle ("from product idea to start of technical development") is statistically significant, and this has been identified as the stage of the cycle where changes and delays can be accommodated at lowest cost (Smith and Reinerstein, 1998). It is also apparent that substantial overlapping of stages occurs, suggesting an organised and coherent procedure within firms. This study's results' apparent departure from the received wisdom (a slowdown in product development cycles) is notable, and requires further examination by researchers. In particular, it is of interest to know whether Danish food industry firms are at the forefront of a new trend, occupy some identifiable position within an existing distribution of cycles, or are in some way lagging international developments.

A surprisingly small number of surveyed firms claim to have an explicit strategy for new product development introduction; nor for research and development. Of the 70% of surveyed firms with a stated "brand-related" strategic focus, most (about 65%) claim to pursue a strategy of "a core of established brands with few introductions and withdrawals". Of the 40% of firms that claim to have a strategic focus on research and development, about 75% (that is, 30% of all firms surveyed) claim to

conduct research into new product development. Surveyed firms report spending, on average, just 2% of all costs on research and development, and about 2.6% on new product introduction.

Surveyed firms report that around 40% of new products are “truly new”, while a quarter are “small changes to existing products”. About 12% are copy-cat products. These are substantial departures from reported food industry norms in other countries (e.g. Harris (2002) on U.S. trends, Ozimek (1995) on Canada and ILO (2006) for Europe).

Surveyed firms identified relatively few barriers to new product introduction. For both 2000 and 2005, over one third of firms claimed that there are no significant barriers to product introductions. Firms’ claims about barriers to new product introductions had changed little between 2000 and 2005, although regulation is seen as a more significant barrier in 2005 than it was in 2000. Dis-aggregation by stage of the marketing chain provides remarkably little insight into firms’ view of barriers to new product introduction: firms from all stages apparently express similar views on average. Dis-aggregation by commodity sector, however, reveals substantial differences in firms’ views of such barriers. Predictably, sectoral differences appear in association with policies. Less predictably, sectoral differences are associated with views on the role of industry structure and competition in new product introduction.

Although recent literature indicates a substantial role for brands and branding in new product development (McLaughlin and Rao, 1990; Baker et al., 2006; Asplund and Sandin, 1999), surveyed firms appear to have increased the numbers of brands owned just slightly between 2000 and 2005. Firms have altered their brand profiles in terms of “local”, international” and other types of brand: the share of brands described as “corporate” has risen significantly. The share of sales arising from retailers’ own-label brands has risen significantly between 2000 and 2006, but there are no other apparent changes in the ownership of brands used by the surveyed firms. The number of products per brand has also changed between 2000 and 2005, with an increasing proportion of brands now covering 10 or more products.

Across the survey sample, new products that are new brands represent about 10% of all new products, a proportion that is unchanged from 2000. New products that are introduced as retailers’ own-label brands stand at about 16% of all new products, which is double the figure for 2000. The largest proportion of new products (around 40%) is introduced using existing brands.

The literature review conducted as part of this study offers surprisingly few clues towards modelling the behaviour of Danish food industry firms with regard to new product development and new product introductions. Several key issues are poorly addressed in that literature. The first, and of most fundamental concern, is the definition of new products. Although it is commonly observed that new products may be of limited "newness" and may in fact mostly be copy-cat products, these still are treated as part of firms' innovative activities. This study indicates that firms produce a surprisingly large number of new products each year, and that a large proportion of new products are neither copy-cat products, nor "small changes to existing products", but rather are "truly new" products.

A second area of concern is the role, and emphasis, of new product introduction in the food industry. Some commentators have remarked that the food industry is a user of innovation rather than a developer of it (Traill and Grunert, 1997). Although this study cannot contribute to that argument, it has identified the fact that food industry firms are willing and able to introduce other firms' products. The survey conducted within this study is one of the first to address retail and wholesale firms, and these firms face identifiable decisions about whether to develop their own products for introduction or to introduce other firms' products. While advocates of food industry innovation identify small and large firms (as opposed to medium-sized ones) as likely sources of new products targeted at different market segments, this study has shown that medium-sized firms introduce the most new products per unit of sales and per employee: indeed, new product introduction by small firms is rare. While large firms do introduce many new products, this is associated with the fact that they are retailers or wholesalers. Both retailers and wholesalers introduce a significant number of new products that are "other firms' brands" every year, which further weakens linkages to the bulk of theory that associates new product introduction with innovation. Braadland's (2000) observation that innovations that differentiate products may be designed to maintain a product range and profile, rather than change it, may be an explanation.

To the authors' knowledge, this study is the first empirically to examine food industry firms' new product introductions in the light of branding behaviour and of the overall dynamics of product introductions as reported by firms in a survey. Although a formal econometric model is still in development, firms introducing the most new products appear to be those whose brand profile does not include "local brands" and features more than 10 products per brand. It is also clear from the survey results that the growth areas in branding are international and corporate brands, rather than local ones. Firms actively introducing new products do so using large numbers of products

per brand. A further trend uncovered, in this case a predictable one, is that retailers' own-label brands represent an increasing share of sales by firms.

A surprising inference from the survey results is the low importance that Danish food industry firms apparently place on new product introduction and research and development. They report very low expenditure shares on these items, and those shares are unchanged between 2000 and 2005. For the longer term, the majority of firms surveyed describe their strategy as involving few product introductions or removals. In addition, few firms report a strategy involving active research on new product development. While it is recognised that the Danish food industry has a long history of innovative organisation, it is possible that this innovative stance does not extend to new product development.

One logical explanation for low priority assigned to new product development might be that Danish food industry firms face substantial barriers to new product introductions, but survey results refute this. Overall, the firms claim that few barriers to new product introduction exist in Denmark. Moreover, traditional Danish strengths would be expected to lie with food processors, whose views on barriers to new product introduction are little different from either retailers' or wholesalers'. Traditional Danish strengths in the pork and dairy sectors provide a few clues, as their views on barriers to new product introductions are somewhat different from that of firms in other sectors. The pork sector firms (numbering just three amongst survey respondents, all of them processors) report a saturated Danish retail market, as well as poor competitive conditions and high product development costs, as significant barriers to new product development. All the survey respondents in the "unspecialised meat" commodity sector handle pork, but the views of those firms on barriers to new product introduction follows quite a different pattern to that of "pork" sector firms.

These survey results do not address the extent of innovation, but do offer some indicators of its progress. The period 2000-2005 has seen significant increases in both the (average) number of patents and (average) number of brands owned by firms. It also shows that firms' brand profiles are changing, as described above. It is possible that the forms and tasks of innovation necessary to introduce new products under the new brand profiles are quite different from those used previously. This may well be reflected in low strategic priorities as expressed in survey results.

Much comment from researchers and industry commentators focuses on the changed competitive environment for food industry firms. Few firms identify this as a barrier to new product introduction in this study, and it appears not to have been empirically tested for the food industry in any past study. One possibility is that food industry firms require a differentiated product market in order to generate benefits from new product introductions that will cover the costs of development and introduction. The reasoning may extend to the supposition that the same firms will be assisted in new product development by being able to source undifferentiated inputs that meet various firm-specific specifications at minimal transaction and search costs. Volumes are higher on competitive, than non-competitive, markets and this may explain some firms' pessimism about the scope for new products on Danish retail markets, in terms of barriers to new product introductions. Conversely, firms are likely to view their own market power as buyers as a source of additional profits that might be directed toward new product development and introduction.

The motivation for foreign ownership of Danish food industry firms may well be market access either to raw material as input, or to a consumer or customer base. Although this does not exclude new product introductions, market access may emphasise existing brands. This explanation is not strong, however, as survey results indicate that many new products are introduced under existing brands.

The information generated about the timing of stages of new product development throws up several points for discussion, particularly concerning the observation that the process is slowing down, so that it is 25% longer on average in 2005 than it was in 2000. The stages that have slowed down the most are the product idea stage (44% longer on average) technical product development (72%), and legal and regulatory actions (58%). Notably, the length of time for negotiations with buyers (2.4 months on average) has changed little between 2000 and 2005, as has the time taken in market research (1.2 months). Because there are no empirical measures of food product development cycles to compare these results with, it is not possible to claim categorically that this result is an unusual one. However, it is unexpected. One possible explanation is that the Danish food industry has developed to a point where time-to-market has become less important than other features of products, projects, markets and firms. A second possible explanation is that the fundamental form of products has changed in the Danish food industry: for example featuring a move toward within-chain relationships that focus on elements such as convenience, information provision and delivery conditions. This explanation is supported by reports of the increasingly

demanding within-chain requirements of large retailers, possibly accentuated by increases in their market power.

Although the number of products withdrawn from the market averaged 96 per firm in 2005 and just 40 in 2000, this is more than compensated for by increases in the numbers of new products introduced per firm. In addition, the age at which products are being withdrawn has, on average, increased from 17 months in 2000 to 23 months in 2005. Finally, some 55% of new products survive for more than 6 months, an increase over 2000's average figure of 44%. The food industry critics claiming that variety and consumer choice are declining may be contradicted by this result, especially since the survey results also show that over half of the new products are either completely new or are significant changes to existing products. The apparent lengthening of product life cycles is consistent with slower development and introduction cycles as described above. Longer product life cycles are consistent with firms' stated strategies, namely maintaining a core of established products. Lastly, product life cycles are rather poorly documented, and are likely to differ significantly between consumer markets and amongst market segments. No such information had previously been gathered in Denmark.

On average, the time from beginning to end of new product development is 46% shorter than the sum of time taken with each stage of development. Moreover, this figure has improved slightly, from 49% in 2000. This indicates that Danish food industry firms employ substantial overlapping of stages in new product development. Although apparent at the level of average, it is not clear to what extent all Danish food industry firms can allocate resources in such an efficient way: it may well be the preserve of only the largest firms or those that introduce many new products; alternatively it may be influenced by the form of product introduced or use of retailers' own-label brands.

5. Conclusions

5.1. Conclusions for commercial firms

Firms' primary interest in new product development concerns success of new products, and more specifically success relative to existing products. This study has not attempted to measure success directly, given the lack of available metrics for that purpose. The study has focused on relationships between the attributes of firms and their new product introduction. Commodity sector and firm size have been shown to be influential. Amongst long term considerations is the revelation that a majority of firms do not embrace new product introductions, nor new product development, as part of their strategies. This provides further benchmarking for firms, allowing them to place themselves more fully within the spectrum of food industry firms. Influences such as vertical integration, foreign linkages, export intensity and competition are currently the topics of active research using this study's data. Although empirical studies of new product development are not generally available, management-related reports summarised in this report offer substantial guidance. Factors affecting success of new product development have been grouped into four categories: project; product; firm and market (van der Panne et al., 2003).

The new project development project is usually characterised by a set of development-related activities with decision-points interspersed over a time frame. Such projects can address one or more new products, or it can require several projects to arrive at a new product. Using a set of generic names for the development stages, this study has characterised their duration for the first time in the Danish food industry. The existing literature identifies several key elements of successful development projects, particularly their compatibility and synergy with existing or past projects, and their interface with the firms' management: particularly the extent to which cross-disciplinary teams are able to work on projects. The apparent extent of overlapping of development stages, as measured in the survey, indicates a well-implemented development process amongst Danish food industry firms.

Product-related factors in new products' success are much less transparent, as the literature tends to ignore the fact that so many food industry products are "me-too" or "copy-cat" products. Recurrent themes are synergies with other products (Cooper, 1998), with technology (Hamilton-Howard, 2000), with development processes (van der Panne et al., 2003), with networks (Love and Roper, 1999) and with marketing and distribution systems (Link, 1987). One study identifies, as a salient feature of

food industry firms, the importance of chain access in new product development. The current study identifies trends in brand profiling that indicates synergy amongst products, but a clear link is not established with new product development. It is clear that firms in the survey have increased their use of retailers' own-label brands between 2000 and 2005, but again this could not be linked to change in numbers of new products introduced.

Within the firm, past studies focus on the culture and the role of "intra-preneurs": particularly conditions for their motivation and mobilisation (Nicholas and Ledwith, 2006). A more empirical basis is added by studies that focus on R&D intensity and resources devoted to new product development and introduction (Griffin, 1997). In the current study, these cost-based variables were found to have little influence on numbers of new products introduced.

Elements of the market, particularly its competitiveness, susceptibility to technological change, seasonality and other factors have also been identified in past studies as influential in new product introductions. The current study provides an empirical basis for comments on competitiveness and for role of various forms of vertical coordination (including vertical integration). This has received very little attention in the literature, and is the topic of current active research by the author.

Other vital market-related components that have been identified have more to do with the balance of market power than its extent. These elements have become increasingly important aspects of relationships between processors and retailers. The survey results show that "buyers pass introduction costs on to the firm" is identified by 25% of processors, and just 12% of retailers, as a major barrier to new product introduction. The balance is similar for the within-chain allocation of risk and for the role played by retail concentration.

This study provided firms with the opportunity to identify barriers to new product introductions, and "no barriers exist" was a popular response. Firms' concerns over policies, competition, costs, risks and the capacity if of the Danish consumer to absorb new products were all recorded in the survey. When these results were dis-aggregated by sector and stage of the food marketing chain, references to barriers become somewhat more focused. However, it is likely that specific product introductions, or product development projects, face specific barriers and the survey results have made just the first attempt to quantify those concerns.

Examination of firms' strategies reveals that Danish food industry firms assign a low priority to new product introduction, especially relative to pricing, quality and branding. The low priority, along with very low expenditures on these items and no strongly-expressed perceptions of barriers to new product development, indicate that firms are content with their new product development and introduction processes.

5.2. Conclusions for policy

If, as suggested above, firms are content with arrangements for, and their achieved levels of, new product introductions then a problem can be defined only if society demands new product introduction that is different to that delivered at present. In fact, no coherent summaries of social preferences on this subject are available. On a related topic, public sentiment has not formally been assessed regarding the available brand profiles and types on the Danish market.

The current study sought indications of such problems from the firms' point of view. Barriers to new product introduction were specifically addressed, with few strong conclusions to be drawn (discussed above). According to a small number of firms, existing policies provide barriers to new product introduction in Denmark. About 20-25% of firms claim that regulations on the environmental, food safety and labelling are a serious barrier to new product introduction. It might be expected that processing firms and livestock-related firms provided the most pronounced criticism of those policies, but in fact retail firms are the most concerned. It is a distinct possibility that these concerns are being passed back to the processing firms, so contributing to processing firms' more pronounced concerns about competition in the food chain and the allocation of costs of new product introductions.

Further evidence of policy as a barrier to new product introductions was found during the study. Firms claim that the time they spend on "legal and regulatory actions" for development of a new product has increased from 1.2 months per product in 2000 to 1.9 months in 2005, on average. A further indicator concerns the maximum time firms had spent on this stage of a new product introduction: 14 months in 2000, increasing to 36 months in 2005. The study did not extend to enquiry as to which legal regulatory items consumed the time, nor which were associated with the changes between 2000 and 2005.

In the presence of a defined problem regarding new product introductions, a question remains as to what government can do to remedy it. Subsidisation of research and development, or directed product development activities, is one option. However, the current study has shown that these expenditure items constitute small shares of firms' total costs. Policy action to improve the competitive environment may be called for, but several qualifying statements must accompany any such call. First, the relationship between competitiveness of markets and new product introductions is complex, and this study has shown that firms' claims differ on this subject. A second qualification is that the degree or extent of competition is probably less important than its balance between trading partners within the food marketing chain. A significant number of firms identify the actions of buyers and/or retailers as being significant barriers to new product introduction, without referring directly to competitiveness of markets *per se*. Finally, food retailers may claim that they alone face the shifting mass and pattern of consumer demand and act within the food marketing chain so as to serve that demand: their signals and actions within the chain are then driven by competitive forces and should not be interfered with.

Of particular relevance to the pork and dairy industries, for whom the domestic market represents a small share of sales, are the relationships that must be maintained and expanded with a small number of powerful retailers. These relationships no doubt include elements to foster new product introduction, but in a within-chain setting that removes some freedom from the processing firm. While exports may continue to play a major role in industry strategies, and be a goal for policies and programmes, these same policies may be selecting against new product development by exporting firms.

Although there appears to be limited scope for policy-induced new product development by firms, a different option is publicly-funded research, development and dissemination activities. Based on the current study, potential is identified in four main areas. The first is fundamental, and concerns nomenclature and measurement. Firms, researchers, consumers and government do not have access to consistent and unambiguous definitions of "new products", "brands" and terms relevant to the measurement and evaluation of new product development and introduction. Similarly, the performance of new products (not addressed in this study) is not being measured in any consistent way by firms, industry bodies, consumer groups or government agencies. A key research item for the future is then the development of metrics and performance measures. In studies such as the present one, metrics used are somewhat makeshift and had to be explained to surveyed firms at length: moreover, the study is the first to

attempt such measures for the Danish food industry and so suffers from a lack of comparability.

A public goods-oriented research activity would centre on consumers', firms' and society's sentiment and goals for new product introductions. This study has presented empirical evidence of strong growth in new product development amongst Danish food industry firms, but it has not assessed the extent of satisfaction amongst stakeholders with its extent, form or trend. The evidence presented here is that there is a net increase in new product introductions, but no information is available to compare it with foreign countries' food industries' performance, nor to track it over time.

The current study did not examine the origins of new products: firms' new product introductions include those of foreign origin as well as those that are copy-cat versions of foreign products. If there is public concern over the flow of new food products onto the Danish market, and as to the extent to which the modern domestic consumer is being served with new product introductions, then the origin of products is also a concern. A number of firms expressed concern over costs and risks of new product development: such firms may find it easier to develop products abroad for introduction in a number of markets of which Denmark is just one. Alternatively, foreign firms may bring their own products with them, both new and old. In either case, foreign firms entering the Danish market may place less importance on new product introductions than Danish firms. The study also found a significant decline in the use of "local" brands. It is proposed that there is substantial public interest in these issues, which the current study has empirically identified.

The study has identified a slowdown in time-to-market for Danish food industry firms and, in broad terms, the extent to which each stage of the cycle has slowed down. It is of public interest whether this slowdown embodies leadership by Danish firms (specifically whether food industry firms in other countries will follow this trend), or alternatively that it indicates some a reduction in Danish food industry competitiveness or vigour. To answer that question would require a deeper study of the strategy, reasoning, circumstances and decisions surrounding new product development and introductions that goes beyond the current study's goals and is the topic of current research by the author.

This study provides a sketch of firms' research and product development spending patterns, and generates a profile of product development activities by firms, including research and technical development items. The study does not examine the actual or

potential role played by public educational and research institutions. An intuitive divide exists between commercial elements (e.g. the evolution of product ideas, negotiations with buyers) and those with more use of, or contribution to, public knowledge (e.g. market trends, consumer preferences, ethics).

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