Working Papers SMART - LERECO

Success factors of innovations

Sterenn LUCAS, Louis-Georges SOLER, Etienne ROUVIN

Working Paper SMART – LERECO N°20-04

March 2020

UMR INRAE-Agrocampus Ouest **SMART - LERECO**

(Laboratoires d'Etudes et de Recherches en Economie sur les Structures et Marchés Agricoles, Ressources et Territoires)

Les Working Papers SMART-LERECO ont pour vocation de diffuser les recherches conduites au sein des unités SMART et LERECO dans une forme préliminaire permettant la discussion et avant publication définitive. Selon les cas, il s'agit de travaux qui ont été acceptés ou ont déjà fait l'objet d'une présentation lors d'une conférence scientifique nationale ou internationale, qui ont été soumis pour publication dans une revue académique à comité de lecture, ou encore qui constituent un chapitre d'ouvrage académique. Bien que non revus par les pairs, chaque working paper a fait l'objet d'une relecture interne par un des scientifiques de SMART ou du LERECO et par l'un des deux éditeurs de la série. Les Working Papers SMART-LERECO n'engagent cependant que leurs auteurs.

The SMART-LERECO Working Papers are meant to promote discussion by disseminating the research of the SMART and LERECO members in a preliminary form and before their final publication. They may be papers which have been accepted or already presented in a national or international scientific conference, articles which have been submitted to a peer-reviewed academic journal, or chapters of an academic book. While not peer-reviewed, each of them has been read over by one of the scientists of SMART or LERECO and by one of the two editors of the series. However, the views expressed in the SMART-LERECO Working Papers are solely those of their authors.

Success factors of innovations

Sterenn LUCAS

AGROCAMPUS OUEST, INRAE, SMART-LERECO, F-35000, Rennes, France

Louis-Georges SOLER

ALISS, INRAE, 94200, Ivry sur Seine, France

Etienne ROUVIN

ALISS, INRAE, 94200, Ivry sur Seine, France

Corresponding author

Sterenn Lucas
AGROCAMPUS OUEST, UMR SMART-LERECO
65 rue de Saint-Brieuc, CS84215
35042 Rennes cedex, France
Email: sterenn.lucas@agrocampus-ouest.fr
Phone: +33 (0)2 23 48 54 19

Success factors of innovations

Abstract

The French seafood sector is currently confronted with increasing competition from imported products, price fluctuations and new challenges such as environmental issues. In the face of these issues, producers may not be able to meet consumer expectations, and new products intended to boost growth in the seafood sector may not succeed. To clarify the drivers of competitiveness in the seafood sector, a greater understanding of the success factors behind seafood innovation is needed. We use an original database obtained from the merger of two databases. We combine Mintel's Global New Products Database, which identifies new products launched in France in 2010, 2011 and 2012, with consumption data spanning 2010 to 2014 from a household panel (Kantar). The data allow us to track the quantities of 246 new products purchased in the year after their launch. We run an ordered logit model to measure the impact of product, marketing and market variables on the probability of a product becoming successful. We identify three possibilities: success, i.e., the product is still on the market one year after its launch with an increased quantity; stagnation, i.e., the product is still on the market one year after its launch with a decreased quantity; and failure, i.e., the product is no longer on the market at all a year after its launch. We also run a Cox proportional hazards model with the products' time on the market as the dependent variable. The model estimates the time that elapses before the product disappears. The results show that three kinds of factors influence competitiveness: firm characteristics (size, specialization), market economic situation and, to a lesser extent, the marketing process.

Keywords: Innovation, measurement of success, seafood sector, ordered logit model, Cox model.

JEL classification: L1, Q31, L66, C25

Facteurs de succès des innovations

Résumé

Le secteur français des produits de la pêche et de l'aquaculture est confronté à une concurrence croissante des produits importés, aux fluctuations de prix et à de nouveaux défis tels que les enjeux environnementaux. Face à ces problèmes, les producteurs pourraient ne pas être en mesure de répondre aux attentes des consommateurs et les nouveaux produits destinés à stimuler la croissance pourraient ne pas réussir à trouver leur place sur ce marché. Pour mettre en avant les leviers de la compétitivité, une meilleure compréhension des facteurs de réussite de l'innovation est nécessaire. Nous utilisons une base de données originale issue de la fusion de deux bases de données. Nous combinons la base de données mondiale des nouveaux produits de Mintel, qui identifie les nouveaux produits lancés en France en 2010, 2011 et 2012, avec des données de consommation couvrant la période 2010 à 2014 à partir d'un panel de ménages (Kantar). Les données nous permettent de suivre les quantités de 246 nouveaux produits achetés dans l'année suivant leur lancement. Nous utilisons un modèle Logit ordonné pour mesurer l'impact des variables de produit, de marketing et de marché sur la probabilité de réussite d'un produit. Nous identifions trois possibilités : succès, stagnation et échec. Pour compléter ce modèle, nous utilisons également un modèle de risques proportionnels de Cox avec la durée des produits sur le marché comme variable dépendante. Les résultats montrent que trois types de facteurs influencent la compétitivité : les caractéristiques des entreprises, la situation économique du marché et, dans une moindre mesure, les variables marketing.

Mots-clés : Innovation, mesures du succès, Secteur de produits de la pêche et de l'aquaculture, modèle Logit ordonné, Modèle de Cox**.**

Classification JEL : L1, Q31, L66, C25

Success factors of innovations

1. Introduction

In the years ahead, the agri-food sector will need to react to key challenges such as demographic trends, climate change, biodiversity protection, and the use of sustainable resources. At the same time, the sector will also need to respond to new consumer expectations regarding, for example, welfare, convenience, natural and organic products and, of course, pleasure. To address both sets of issues simultaneously, innovation is key. In recent years, the agri-food industry has innovated more than any other manufacturing sector. From 2010 to 2012, innovative firms represented 61% of the agri-food sector versus 57% of the manufacturing sector (excluding agri-food) (French ministry for agriculture and food, 2016). Innovation is fundamental for firms. It influences the demand for firms' products while structuring their strategy in terms of product commercialization and shaping market organization (firm positioning).

The notion of innovation covers product, process, marketing and organizational innovations (OCDE, 2005). All of those innovations are important instruments that help companies in the food industries to distinguish themselves from competitors as much as to satisfy consumer expectations (Menrad, 2004). However, not all innovations are perceptible by the consumer, and they do not all yield new products on the market, not because they fail in the innovative path, but because they are not intended to be visible by the final consumer. Such is the case for organizational innovations. Furthermore, innovations are not necessarily disruptive but can be incremental (OCDE, 2005). Finally, the concept of innovation can be firm dependent. A new product or an innovation for a firm is not necessarily a new product for the market. Innovation is a long process that depends on firm strategy (Cooper and Kleinschmidt, 1993; de Brentani, 2001; Dziallas and Blind, 2019; Hittmar et *al.*, 2015), market competitiveness (Evanschitzky et *al*., 2012) and market organization (Baptista and Swann, 1998; Tomlinson, 2010). Additionally, it depends on the institutional and public policy environment (Buesa et *al*., 2010; Czarnitzki et *al*., 2011; Evanschitzky et *al*., 2012; Menrad, 2004). In the framework of this paper, we focus our interest on innovations (either incremental or disruptive) that aim to become new products at the firm level. Thus, we refer only to product innovation.

Innovative firms are not homogenously distributed across the agri-food sector. The share of turnover used for innovation varies from 1.6% for seeds to 0.5% for meat. The seafood sector uses only 0.8% of turnover for innovation, but the opportunity to innovate is decisive (French

ministry for agriculture and food, 2016). Indeed, this sector is a competitive market at the European level and worldwide, and it must address key issues of sustainability while remaining competitive. Seafood products, as a renewable resource, can be part of the answer to the aforementioned key issues facing the agri-food sector. The health benefits from fish consumption are well known (Lund, 2013; Ruxton et *al.*, 2004) and positively perceived by the consumer (Mesnildrey et *al.*, 2009; Myrland et *al.*, 2000; Washington, 2008). The market in health and well-being is expanding, and it has attracted innovative firms in recent years (Bigliardi and Galati, 2013).

Innovative seafood products seem to have an advantage in this market if sustainability issues are also taken into consideration. Indeed, 31.4% of fish stocks are estimated to be overfished (i.e., fished at a biologically unsustainable level), whereas only 10.5% are underfished (FAO, 2016). Consumers feel increasingly concerned about these environmental issues, and the numbers of new products with environmental labels are increasing in the seafood sector (Roheim, 2009; Steinar Valle et *al.*, 2016), highlighting the usefulness of such labels for attractive product differentiation.

In addition to environmental and health issues, innovative seafood products need to address new consumers' expectations. Preparing seafood products is often assumed to be a lengthy and difficult process (Olsen, 2003), so innovative seafood products must address consumer needs, including the steadily increasing demand for convenience food products (Brunner et *al.*, 2010). Consumers have a diverse set of expectations, but new products must fit consumer budget constraints. Price remains a major driver of consumer behaviour.

The seafood sector is thus representative of the more general challenge that the agri-food sector will have to address in the coming years in terms of social and individual expectations. Fostering a strong innovation policy seems important for these firms given the competitiveness of the seafood sector. Although stakeholders may perceive an overall low level of innovation in fishery and aquaculture products, more innovation in the sector is a driver of consumption and presents an opportunity to offer products adapted to all lifestyles (Eumofa, 2017) by making seafood more convenient and attractive (Thong and Solgaard, 2017). To this end, innovation-related issues have been nationally supported through the development of food innovation centres, some of which specialize in seafood innovation (e.g., Pôle Aquimer in France) (Audiar, 2018).

To evaluate the impact of an innovation, it is important to be able to measure indicators of success and to highlight the key characteristics of a successful innovation (Dziallas and Blind,

2019). To the best of our knowledge, no analyses of innovation have been done at the sector level for agri-food. Here, we are looking to highlight the factors driving the success of innovative seafood products with an original methodology. Success is considered the successful commercialization of an innovation in terms of sales rate (Åstebro and Michela, 2005). Drawing on data from an original merger of two databases (GNPD and Kantar), we measure success in two ways. First, we consider the volume of sales one year after the product's launch. Second, we consider the product's survival time, meaning the time it remains on the market. Several variables are used to evaluate the success factors, such as internal factors, contextual factors and product factors (Becheikh et *al.*, 2006). Furthermore, the influence of consumer expectations on product success has rarely been investigated, and we aim to fill this gap.

The rest of this paper is organized as follows. In the next section, we present the different methodologies to evaluate the degree of success of an innovation. In the third section, the database and the methodology used to highlight successful innovation are presented. The fourth section reports the results of the data analysis. In the final section, the paper consolidates the findings and ends with the main conclusion.

2. New product success measure

The innovative path is long. Innovators have to take into account several factors that affect innovation at different steps of the innovative process, from the early steps in product creation to the assessment of market success. There are obstacles for firms to move an innovation to commercialization. At each step, relevant indicators must be used to evaluate the innovative process.

Once a new product is commercialized, its chances of success are not guaranteed; success rates are generally below 25% (Evanschitzky et *al.*, 2012). Nonetheless, defining success remains a tricky exercise. Several factors can be considered, and there is no common overall measurement framework in academic research (Dziallas and Blind, 2019). Indicators are either direct or indirect measures of success. Among the indirect measures, patents or R&D activities are commonly used in the literature to evaluate the success of an innovation. Nonetheless, both the propensity to patent and the extent of R&D activity differs across sectors and depends on company size (Becheikh et *al.*, 2006). Indeed, the rate of R&D spending over turnover in the food sector was approximately 0.5% in 2013, while it

represented 2.6% for the manufacturing sector (French ministry for agriculture and food, 2017).

Direct indicators of success based on the market impact of the new product are also commonly used. While some authors have evaluated innovation through the number of products launched on the market (Baptista and Swann, 1998; Stock et *al.*, 2002), it seems that the launch of a new product is not synonymous with success (beyond the fact that it indicates all previous innovation steps have succeeded). Penetration rates, sales or return on investment can be useful indicators to measure success. To that end, two types of data can be used: internal firm data and market data. Data internal to the firm allow us to construct, albeit non-exhaustively, financial product estimation, profitability and return on investment. Nevertheless, market data enable us to precisely determine, although again non-exhaustively, the number of products launched, estimate the penetration rate, and follow the evolution of sales. Obviously, firms, especially the largest ones, know the market data.

For those measures, market success can be estimated objectively or subjectively (Henard and Szymanski, 2001). Subjective measures of success are generally constructed through surveys of firm managers (Cooper and Kleinschmidt, 1993; Czarnitzki et *al.*, 2011; de Brentani, 2001; Suwannaporn and Speece, 2010). Surveys capture a large variety of dimensions of the innovation path. In addition to an innovation's successfulness, surveys allow us to consider failure in our assessment of success factors. Nevertheless, the evaluation of success based on subjective indicators is dependent on the respondent's position in the firm (Henard and Szymanski, 2001).

To avoid such biases, it is interesting to use objective measures of success. Once a product is on the market, several indicators may be used to objectively estimate its success. While firms have information on their own product performance, it is more complicated, especially for SMEs, to obtain a broader view. For that, indicators based on market data can be constructed. The penetration rate is an evaluation of success, but it is still dependent on firm size. Indeed, SMEs can have successful product innovation for them but remain in a niche market and thus have a low penetration rate. This is particularly true in the food industries, where SMEs are numerous (76% of the 17,647 companies in the French food sector have fewer than 10 employees (French ministry for agriculture and food, 2017)). Another objective and direct measure is the innovation's length of sales. The length of time a product remains on the market is also a suitable indicator of success because this duration has an impact on the financial success of new products (Åstebro and Michela, 2005; Palmberg, 2006). Indeed, if a

product remains on the market, it means that the level of consumption is sufficient for the profitability of the company and that the new product is achieving its objectives and thus is successful. Menrad (Menrad, 2004) evaluates the innovation system of the food industry in Germany based on the withdrawal of products during the first year after the product launch. Furthermore, thinking about the construction of indicators at the sector level allows us to understand sectoral dynamics, which is needed to implement accurate and efficient public and private support.

The original database we use in this paper increases the accuracy of our definition of success. Indeed, evaluating success as a binary choice remains reductive, as there are differing degrees of success. Staying on the market for one month and staying on the market for eleven months are not the same, and taking this shade of difference into account is important to understand the keys to new product success. In our case, we consider not only success or failure. We study different paths of product trends (success, standstill and failure) to more closely capture market reality. Comparing the level of sales of a new product both immediately after and a year after the launch helps us to validate product success in the long term. Like this, we distinguish among successful products (those that have an increase in sales over the years), standstill products (those that have constant sales), and failure products (those that have a decrease in sales or are withdrawn). Furthermore, using the precise timing of withdrawal can complement our analysis of new product success. Indeed, based on the original database, we can also observe the time elapsed before a product exits the market. Åstebro and Michela (Åstebro and Michela, 2005) use a survival model to predict the survival of an innovation, but to the best of our knowledge, this methodology has not yet been used in the case of food products. Observing these details of success allows us to be more accurate in analysing the factors behind new product success. Based on the multiple market states of new products (success, standstill and failure) and the precise timings of withdrawals, we contribute to increasing knowledge on new product success factors.

3. Data and methods

3.1. Database construction

To investigate success factors related to seafood innovations, we use an original database constructed by the merger of two data sets. These data allow us to analyse success more precisely, with new variables that have never been studied in relation to New Products Success (NPS) at the sector level. First, we use the Mintel GNPD database, which has the

main objective of providing resources with sufficient depth to track trends in product innovation. This database offers a wealth of information on the impact of marketing and product characteristics on market trends, as the information is detailed at the product level. Second, we use the Kantar Worldpanel household database, which allows us to track seafood consumption in France. Kantar allows us to work with actual purchase data, corresponding to at-home consumption. Merging the two data sets allows us to track the innovative products' share of the GNPD in real market consumption based on the Kantar database.

Mintel, a market intelligence agency working across 34 countries, constructs the GNPD. Innovative products are tracked from shops and online across 62 of the world's major economies, and approximately 33,000 new products are added to the database each month. Eighty data fields ranging from companies' information to product flavour, packaging and positioning are noted. This database gives access to information on product characteristics, market positioning and launch type, but it only concerns packaged products, as fresh products are excluded. The detailed data cover new products launched in the food, beverage, beauty and personal care, healthcare, household goods and pet care markets. Given the framework of this analysis, we observe data on food products containing seafood as a major ingredient (seafood has to be in the five main ingredients)[1]. The innovation taken into account in the database can be from five different launch types: new product, new packaging, new recipe, range extension and product relaunch. A new product corresponds to a new line or a new family of products for the firm, and thus, this kind of launch is firm dependent. New packaging is based on the product's visual aspect and corresponds to products labelled "new look", "new size" or "new packaging" (Mintel International Group Ltd. 2012). A new recipe involves new ingredients in the formulation or a change in the ingredient proportion of an existing product. An extension of the range depends on the assigned brand line; an innovation is the horizontal extension of an existing line (Mintel International Group Ltd. 2012). Finally, a relaunch is classed as an innovation when the product packaging indicates or when a secondary information source informs consumers (trade show, website or press) that the product is a relaunch. Relaunches are also classified as innovations when both the product has been reformulated and it has a new package (Mintel International Group Ltd. 2012). Thus, this database primarily accounts for product and marketing innovations, as major process or organizational innovations are not necessarily highlighted to the shopper. Hence, we refer to all products found in the GNPD database as innovative or new products. We identify 73,751

[1] We exclude from this analysis products containing seafood but not included in the seafood product category.

innovative products that appeared in the food and beverage markets in France from 1996 to June 2015. Seafood products represent 6.8% of the total innovative products, i.e., 4,921 products. Although the GNPD provides valuable information on innovative products (e.g., brand, type of launch, product categories, claims, composition), it does not indicate whether the new product has been successful. In our case, we only examine innovative products launched in 2010, 2011, and 2012, i.e., 863 products, because we want to connect them with the Kantar database (observed purchase data) to quantify their success.

Indeed, we know for the first database which products were launched in France, but we do not know if they were successes or failures. To measure the success of a product, we use a second database, the household Kantar Worldpanel. This database records daily purchases for 12,000 households in France. It provides useful information on quantity and price for every product bought by the panel, which is representative of French consumers and used to draw inferences on consumer behaviour. We consider purchases of seafood products for four years (2010, 2011, 2012, and 2013); over the period, there were more than 6,000,000 purchases of more than 36,140 different products. Based on these data, we are able to estimate the quantity sold in one period for a particular product and then to observe the sales evolution.

Consequently, matching the two databases allows us to observe the innovative market for seafood products, to observe the sale trends for those products and thus to measure the success of an innovative seafood product. Thus, we need to find the innovative products present in the GNPD database in the Kantar Worldpanel database. Finally, we attempt to match the 863 innovative seafood-based products launched in 2010, 2011 and 2012 from the GNPD database with the Kantar Worldpanel, and we succeed for 266 products. These products are representative of the original GNPD database (cf. Table A.1 for descriptive statistics). Next, based on the matched database, we are able to measure the successfulness of a product and to identify the factors that positively or negatively influence the probability of success.

3.2. Models variables

To analyse innovative product success or failure, we construct from our new database several variables that either have been highlighted in previous literature or are original to this study as factors of new product success (NPS). We classify these factors into three categories: product

factors, internal factors, and contextual factors (Becheikh et *al.*, 2006; Dziallas and Blind, 2019).

Internal factors

The first variable we use is firm size. To categorize firm size, we consider large companies to be those selling more than 100 kg in the first six months of market appearance. Large companies launched 65% of the products in the matched database (see Table A.2), although they represent only one-third of the firms in the seafood market. Based on previous literature, we might expect that firm size positively influences the probability of launching successful products (Becheikh et *al.*, 2006; Traill and Meulenberg, 2002). To evaluate the impact of internal factors on innovation, we constructed a second variable based on the share of seafood products in the total product innovation within each firm, i.e., to assess whether the firm is specialized in seafood products. The firm's specialization in the seafood sector was determined by extracting data from information in the GNPD database on all food product innovations, regardless of sector. Based on that, we construct for each firm (j) in the seafood sector an indicator of specialization (Spe), which is the share of seafood products launched by firm *j* (SF_j) among all firm *j* products (AP_j):

$$Spe_j = \frac{SF_j}{AP_j} \quad (1)$$

If Spe_j exceeds 50%, we consider the firm to be specialized in the seafood sector (see Table A.2). We might expect that firm specialization positively influences the probability of launching successful products through a better knowledge of the market.

Furthermore, we construct a variable to measure the firm's specialization in one category/family of seafood products. The groups used to construct this indicator are the following: frozen; shellfish, cephalopod and crustacean (frozen excluded); dried, smoked and salted fish; fresh fish; battered fish; soups; canned; and crabsticks (surimi). For each firm (*j*) present in the seafood sector, an indicator of family specialization (Spe_{fj}) represents the share of seafood products launched in one product family (*f*) by firm *j* (SF_{fj}) among all seafood firm *j* products (SF_j)

$$Spe_{fj} = \frac{SF_{fj}}{SF_j} \quad (2)$$

If Spe_{fj} exceeds 75% in one family of products, we consider that the firm specializes in this category of seafood (see Table A.2). This more precise specialization should positively influence the probability of launching successful products.

*External factors***.** To catch market indicators, we use two indicators. The first is based on the market share for a family of products. For each firm (*j*) present in the seafood sector, an indicator of market share (MS_{fj}) represents the market share of seafood products in one family (*f*). It is estimated by the share of products in family *f* from firm *j* (SF_{fj}) among all products launched in this product family (TS_f):

$$MS_{fj} = \frac{SF_{fj}}{TS_f} \quad (3)$$

We suppose that the four firms with higher MS_{fj} are the leading firms in the category (see Table A.3). We suppose that leaders in one category have a higher chance of success in the innovative path.

To evaluate the concentration of firms, we also use a more classical measurement, i.e., the Herfindahl-Hirschman index (HHI). We do not have the firm's global market share, so we use the market share in terms of number of innovative products. This variable gives us a measure of concentration in each family of seafood products.

$$HHI = \sum_{j=1}^{n} S_j^2 \quad (4)$$

The number of firms in the market is *n*, and *j* is the firm. Drawing on the literature, which considers a market to be concentrated if its HHI exceeds 1800, here we split the concentration into three categories. We consider a market not very concentrated if its HHI is below 1000, slightly concentrated if the HHI is between 1000 and 1800, and concentrated if the HHI is over 1800 (see Table A.3 and Table A.4). Market concentration can be either an opportunity for leaders or an obstacle for non-leader firms.

The year of launch is used to control for the environment (economic, social, political, and so on) at the time the product launch takes place (see Table A.3).

Product factors.

These variables characterize the product itself, and thus, the characteristics relate to consumer expectations and perceptions of the product. First, we use information on the GNPD to sort by category depending on the type of product. We create several factors to group products into

categories. First, we use the same categorization scheme used to construct the external and internal indicators based on product family, but with some category merges. The product family factor consists of three categories: transformed fish, main courses, and soups (see Table A.5).

For each sector, specific factors influence the probability of success. As this work focuses on seafood products, it is interesting to look at the impact on the NPS of the species used in the product. The species variable is made up of five categories. The most frequent is salmonid (salmon, trout and other salmonids), with 29% of products (which aligns with the fact that salmon is the most consumed species in France (FranceAgriMer, 2018)) (see Table A.5).

We also use information in the GNPD based on the storage type (frozen, ambient, or fresh), the type of launch (new product/relaunch, new packaging, new recipe/extension of the range), and the brand type (retailer brand versus national brand) (see Table A.5). One limit of the GNPD database is that price cannot be used, as it is not necessarily representative of the product price. To include a price variable in our analysis, we use the price data from Kantar, constructing the average price observed for one product across retailers in France. Due to endogeneity issues, we cannot use the price variable directly. Thus, we construct a relative price depending on the product family. Some products are expensive (if the price is at least twice the average price for the product family), and some are cheap (if the price is less than half the average price for the product family) (see Table A.5).

Finally, the original database used allows for the inclusion of some marketing variables that are never used at the sector level. The first one is claims, representing the product positioning and categorized as follows: natural, sustainable, convenient, healthy, sociodemographic, fair trade and others (see Table A.5). Second, we use pictures of the packaging, available in the GNPD database, to construct a colour variable, a picture variable (presence of a picture on the packaging), and a window display pack variable. Based on marketing work on colour, we define five colour groups (Lendrevie and Lévy, 2009; Singh, 2006), as each colour displays a different meaning and influences consumer perception (see Table A.5). Black and purple evoke nobility, luxury and distinction and are currently used in top-of-the-line products. Green and yellow represent vegetal qualities and nature and are often associated with organic products. White and blue are associated with propriety, hygiene, seriousness and tradition; these are reassuring colours in the seafood sector. Flashy and fluorescent colours are often associated with innovative products, suggest novelty and attract young consumers. Red and orange bring up generosity, conviviality, dynamism and cooked foods. Seafood products are

perceived as delicate and quickly perishable; thus, white and blue, linked with propriety and hygiene, are the traditional marketing colours used in the seafood category. However, for innovative products, we might expect that staying with the traditional packaging colour may not be the best way to increase the probability of success. Thus, it is difficult to hypothesize the sign of these parameters, but we predict that some of them will positively or negatively influence the probability of success.

3.3. Success measurement

Thanks to our original database, we are able to observe the sales of innovative products. Thus, we use the volume sold (observed on market) to construct our success measurement variables. We decide to keep two specifications of the measure of success, which are analysed through two models. First, we construct a three-level success variable (Yi) for each product (i), analysed later with a multinomial logistic regression (Cameron and Trivedi, 2005; Long and Freese, 2014). Denoting as Q1 the quantity bought during the first three months following the innovative product's launch and as Q2 the quantity of the same product purchased in a three-month period one year later, we define the following parameters:

$$Y_i = \begin{cases} 0 \quad if \quad Q1 < Q2 \\ 1 \quad if \quad \frac{1}{2}Q1 < Q2 \\ 2 \quad if \quad \frac{1}{2}Q1 > Q2; or\ Q2 = 0 \end{cases} \tag{5}$$

Each product can be either a success (Yi=0), a standstill (Yi=1) or a failure (Yi=2), depending on the sales path. A three-month period is used to avoid weekly or monthly variations. Therefore, a successful product is an innovation with increased quantities one year later. A standstill product displays a diminished quantity, albeit by less than half, one year later. Finally, a product that fails in the market has a quantity that falls by more than half one year later or even disappears from the market entirely. That will be *Model* 1. Furthermore, as the sales volumes used are the purchased quantities by household, we keep only households that were active for more than 40 weeks over the period. Furthermore, as we need to be able to observe sales one year after the launch, products launched in late 2012 are not taken into account[2]. Thus, we study 237 products. Using this classification of success, 101 products are successful, 63 are standstills and 73 are failures. Thus, 42.62% of our observed products are

[2] For Kantar, the database we use is from 2009 to 2013.

considered successful innovations, a result in line with, although slightly higher than, the success rates found in previous literature (Evanschitzky et *al.*, 2012). The one-year lag has been chosen to catch trends linked with product performance. Over a longer period, product adaptation to market change can be implemented by companies even if the product has succeeded. In that case, the product is removed from the market even if it is not a failure.

In a second model, we use a different estimation of successfulness still linked with sales volume, but we now consider the time that the product stayed on the market. Indeed, among the number of products launched, a portion disappears shortly after the launch. Thus, we try to analyse product longevity in the market. To do so, we use a survival model (or Cox model) (Cleves et *al.*, 2010; Cox and Oakes, 1984). These survival models use the time that elapses before an event occurs to estimate the effect of variables on the probability of that event. In our model, the event is the product's extinction. This is *Model* 2. Using survival models is a way to validate (or not) previous results, diminishing bias linked to the chosen definition of success in *Model 1*.

4. Results and discussion

4.1. Results and discussion of Model 1

We test twenty independent variables to explain innovative product success in the seafood sector (the dependent variable) as operationalized through two measures. First, we consider the variable influencing the product's probability of being a success, a standstill or a failure. We test two hundred and fifty-five combinations and retain the model that minimizes the AIC and BIC (Model 1)[3].

It is interesting to highlight that most of the significant marginal coefficients of successful products are higher than those of standstill products. This means a higher impact of highlighted variables on success than on standstill products compared to failed products. Nonetheless, the majority of the significant marginal effects go in the same direction for all variables for both categories, success and standstill. The variables influencing the probability

[3] We test all variables together and suppress methodically the non-significant variables in order at each step to minimize the AIC and BIC. The AIC and BIC are 442.07 and 498.16, respectively, in the final estimation model, that is, Model 1.

of a product being successful, positively or negatively, influence the probability of its being at a standstill in the same way but to a lesser extent.

Table 1: Model 1. Determinants of a new product innovation success, standstill or failure

Variables (ref: Failure)		Success (se)	Standstill (se)
Internal Factors			
Firm Size (ref=Large firm)			
Small and medium firm		0.010 (0.067)	-0.183*** (0.063)
External Factors			
Years			
2010		0.131** (0.063)	0.063 (0.057)
Product Factors			
Storage (ref: ambient)			
	Fresh	-0.225** (0.092)	-0.176** (0.082)
	Frozen	-0.072 (0.080)	-0.112 (0.069)
Window display pack		0.227*** (0.083)	0.061 (0.076)
Colour			
Black/purple		-0.295*** (0.101)	0.134* (0.079)
Number of Observation		237	

The reported coefficients are marginal effects derived from a multinomial logistic regression. The significance thresholds are 1% (***), 5% (**) and 10% (*), respectively, for the marginal effect.

Internal Factors

One important factor currently highlighted in the literature is firm size (Dziallas and Blind, 2019; Evanschitzky et *al.*, 2012; Stock et *al.*, 2002; Traill and Meulenberg, 2002), underlining that larger firms generally have a higher degree of innovation. In our case, innovations launched by larger firms are more likely to be at a standstill, while firm size does not influence the probability of being successful. This result conveys the greater strength of larger firms to invest in R&D and be able to maintain innovation in the market even if they do not perform at their maximum. Indeed, it could be interesting for a company to support a standstill product to maintain facing and thus to increase brand visibility, a strategy that is

easier to apply for a larger company. Finally, the specialization of firms in the seafood sector or in one category of variables was not relevant.

External factors

The only external factor that stays relevant in the multinomial logistic regression is the launch year. The probability of a product being successful was higher in 2010 than in 2011 and 2012. The year 2011 was difficult in the fisheries and aquaculture sector. Due to an increase in international demand for seafood products, the price of fish increased, affecting the entire seafood sector. This situation resulted in a decrease in the consumption of seafood products in France (FranceAgriMer, 2011), which may have lasted through 2012. This result underlines the importance of the economic environment for a new product's success, which implies a knowledge of economic influences for increasing a product's success probability (Brem and Voigt, 2009). While these results give us some interesting insights into the importance of knowledge of the economic environment, we need to take them cautiously, as we only have three years in our analysis.

Product Factors

Making a claim (convenient, natural, sustainable, healthy, sociodemographic or other) is not enough to increase the probability of being a successful or standstill product, as neither the presence nor absence of claims is significant. Fresh products have a lower probability of succeeding or being at a standstill than ambient products. Fresh deli products are the most dynamic market segment compared to ambient and frozen storage; it is the only segment in the seafood sector that increases in volume and in value during the studied period (KantarWord Panel, 2014). Thus, competition is higher in this segment, leading to more failure than in other storage segments. Regarding marketing variables, only a few are significant. Products with window display packs have a higher probability of being successful, illustrating consumers' need for reassurance regarding seafood products. The colour black/purple negatively affects the probability of not failing. These colours are generally synonymous with luxury and premium products. Thus, we can infer that top-of-range positioning is not necessarily the most relevant for seafood products. Finally, a number of variables are not relevant, including price-related variables, product family, and species.

4.2. Result and discussion of Model 2

To reinforce these results, we run a second model considering the time an innovation stays on the market. Based on a Cox model, we analyse an innovative product's probability of staying on the market longer (Model 2). In our case, survival models use the time that elapses before a product disappears from the market to estimate the influence of variables on the probability of that disappearance. We observe how long each product remains on the market after its launch. If it remains on the market one year later, we consider the product a success, but if it disappears during this year, it is a failure. Based on this definition, we see a larger number of successful innovations than in the previous model, as 91% of products succeed. The same variables from Model 1 are tested, but not all of them remain significant for the Cox model.

Table 2: Model 2. Determinants of a failure (Cox model)

Variables	Hazard Ratio (SE)
Internal Factors	
Specialization in product family (Spe_{fj})	0.001*** (0.001)
External Factors	
Years *(ref=2012 et 2011)*	
2010	0.251** (0.165)
Product Factors	
Storage fresh deli	10.345*** (5.432)
New recipe or extension of the range	3.133** (1.548)
Retailer brand	0.248*** (0.113)
Claims	
Natural	0.110*** (0.079)
Sustainable	0.386* (0.281)
Picture	3.074* (1.989)
Windows display pack	0.330* (0.215)
Colour	
Black /Purple	0.223* (0.191)
Blue / White	0.281* (0.183)

The significance thresholds are 1% (***), 5% (**) and 10% (*), respectively, with robust estimates of variance. 236 observations.

Internal Factors. Regarding internal indicators, we find that for specialized firms, the estimated risk of failure falls by 99% compared to a diversified company, underlining the resilience of specialized firms. This result chimes with the literature on multi-product firm competition on the global market (Eckel and Neary, 2010; Mayer et *al.*, 2014). Firm size is not relevant in this model.

External Factors

As in Model 1, only year 2010 is relevant in explaining the determinant of failure. Products launched in 2010 display a decrease by 75% in the risk of failure, reinforcing the previous result of Model 1.

Product Factors

In Model 2, the majority of relevant variables are product factors. Fresh deli seafood products have a rate of failure of more than ten times the rate of other kinds of storage, reinforcing previous results. In both specifications, fresh deli products seem to be less successful, emphasizing the idea that this sector is more competitive: more innovative products are launched in this market, leading to a higher degree of failure. Launches of a new recipe or extensions of a range have a rate of failure three times higher than that of other kinds of launch. In this category of launch, companies often release several products at the same time in different recipes and keep only the more successful ones. Furthermore, companies can launch seasonal products that do not aim to stay on the market for the long term. Retail-branded products have a risk of failure that is 76% lower than that of national brands, emphasizing the strength of retailers in guiding innovative products with relevant price, promotion, and distribution policies, thanks to their double role (production and sales).

The influence of claims depends on the kind of claim. Making a claim (convenient, natural, sustainable, healthy, sociodemographic or other) is not enough to increase the probability of being a successful or standstill product because not all claims are significant. However, the estimated chance of failure for products with natural claims decreases by 89%. Natural claims were not relevant in the previous model. We might attribute that link to the fact that natural claims do not make a difference in terms of volume and thus do not influence the probability of success; but overall, products with natural claims do stay longer on the market. The second claim that influences the risk of failure is that related to sustainability. Indeed, in the previous

literature, consumer demand for sustainable attributes of products was often highlighted, and sustainability is one of the key issues for food (Blezat Consulting et *al.*, 2016). In our case, making a claim about sustainability decreases the risk of failure by 62%. Seafood products are indeed dependent on exploitation, as are all renewable resources. Thus, consumers are sensitive to seafood environmental issues, and this concern is often highlighted in the case of fresh seafood products (Brécard et *al.*, 2009; Johnston and Roheim, 2006; Salladarré et *al.*, 2016).

Regarding marketing factors, one more variable is relevant compared to the previous model: the presence of pictures on the front pack increases the risk of failure threefold, while window display packs decrease the risk of failure by 66%. These results emphasize consumers' need for reassurance regarding seafood products, with the diversion of consumer attention using pictures often perceived as unrealistic and a source of disappointment. Furthermore, this need for reassurance from consumers is emphasized by the influence of colour on the probability of failure, as blue or white products decrease the risk of failure by 72%. Blue and white colours are associated with propriety, hygiene, seriousness, and tradition; these are reassuring colours in the seafood sector. At the same time, the influence of black and purple differs from that in Model 1. We can infer that sellers of luxury colour products do not aim for a high sales volume; thus, these products do not stand in the success category, but overall, they stay longer on the market.

5. Conclusion

There is no unique measurement of success, and notions of what constitutes success can diverge. Different indicators can be used, and each of them has been discussed in the literature (Dziallas and Blind, 2019). However, in this scenario, we wanted to use a direct and objective measurement of success, as it is important to have the most accurate description of success possible. However, measurements that are more detailed have not yet been analysed precisely. Our work can help enhance knowledge on how to capture the complexity of a new product's success and develop new indicators. Understanding the innovation path is important to grasp the competitiveness of the seafood sector in France.

We use an original database obtained from the merger of two databases (Mintel's Global New Products Database (GNPD) and the Kantar Worldpanel). These databases enable us to construct detailed indicators of success based on real consumption market data to evaluate the

success of an innovation. The GNPD database is used to detect new products on the market, while the Kantar database is used to follow the volume sold in the year after the launch. Two indicators of success are constructed. One operationalizes the notion of success in three categories (success, standstill and failure), while the other takes into account the time in months that the product remains on the market.

The results show that three kinds of factors influence competitiveness. First, firm characteristics are significant for success. Larger firms are more likely to launch successful products, which is a finding in line with the previous literature (Becheikh et *al.*, 2006; Traill and Meulenberg, 2002). Furthermore, specialization in one specific market influences the probability of success, again consistent with previous results (Mayer et *al.*, 2014; Eckel and Neary, 2010), as being specialized facilitates access to market knowledge. Second, the marketing process in the seafood sector is the least important factor influencing the innovative path. Third, it must not be forgotten that the market situation is an important factor, a finding that is also in line with the previous literature (Buesa et *al.*, 2010; Czarnitzki et *al.*, 2011; Evanschitzky et *al.*, 2012; Menrad, 2004). The year in which the product is launched or consumer expectations influence the probability of success, highlighting the key role of market knowledge in competitiveness.

Other variables would be interesting to consider. In the previous literature, price variables are fundamental to the probability of success. None of the price variables we construct are significant, but it would be interesting to look at the effect of promotions by comparing starting price over later price, as the timing of launch and promotional strategies can have an influence on product success (Delre et *al.*, 2007).

Nevertheless, while this work provides useful information on the innovative path in the seafood sector, several complements could be interesting. First, we take only a set of variables from the original database to allow for a better understanding of success factors at the sector level. However, we could consider other important variables to complement this analysis. Second, here, only one sector is studied, limiting the extent to which the results can be generalized. It would be interesting to complete this work with a cross-sector or cross-country analysis using the same methodology and variables.

References

Åstebro, T., Michela, J.L. (2005). Predictors of the Survival of Innovations. *Journal of Product Innovation Management*, 22(4): 322–335.

Audiar. (2018). *L'écosystème de l'alimentation en Ille-et-Vilaine, Diagnostiques, enjeux et perspectives*. Rapport Observatoire Economique, 92 p.

Baptista, R., Swann, P. (1998). Do firms in clusters innovate more? *Research Policy*, 27(5): 525–540.

Becheikh, N., Landry, R., Amara, N. (2006). Lessons from innovation empirical studies in the manufacturing sector: A systematic review of the literature from 1993–2003. *Technovation*, 26(5-6): 644–664.

Bigliardi, B., Galati, F. (2013). Innovation trends in the food industry: The case of functional foods. *Trends in Food Science & Technology*, 31(2): 118–129.

Blezat Consulting, Credoc, Deloitte Développement Durable. (2016). *Tendances et Impacts - Alimentation durable, Comportement alimentaires en 2025.* Etude commandée dans le cadre du Contrat de Filière Agroalimentaire (Action N°36) par le ministère de l'Agriculture, de l'Agroalimentaire et de la Forêt, l'ANIA, la CGAD, la CGI, Coop de France, la FCD et FranceAgriMer, 12 p.

Brécard, D., Hlaimi, B., Lucas, S., Perraudeau, Y., Salladarré, F. (2009). Determinants of demand for green products: An application to eco-label demand for fish in Europe. *Ecological Economic*, 69(1): 115–125.

Brem, A., Voigt, K.I. (2009). Integration of market pill and technology push in the corporate front end and innovation management - Insights from the German software industry. *Technovation*, 29: 351–367.

Brunner, T.A., Van der Horst, K., Siegrist, M. (2010). Convenience food products. Drivers for consumption. *Appetite*, 55(3): 498–506.

Buesa, M., Heijs, J., Baumert, T. (2010). The determinants of regional innovation in Europe : A combined factorial and regression knowledge production function approach. *Research Policy*, 39(6): 722–735.

Cameron, A., Trivedi, P. (2005). *Microeconometrics: methods and applications.* Cambridge University Press, New-York, USA. First. Ed, 1034 p, available at http://www.centroportici.unina.it/centro/Cameron&Trivedi.pdf

Cleves, M., Gould, W.W., Marchenko, Y.V. (2010). *An introduction to survival analysis using Stata*. Stata Press. Third Edition, 412 p.

Cooper, R.G., Kleinschmidt, E.J. (1993). New-product success in the chemical industry. *Industrial Marketing Management*, 22(2): 85–99.

Cox, D.R., Oakes, D. (1984). *Analysis of survival data. Chapman and Hall*. First Edition, 208 p.

Czarnitzki, D., Hanel, P., Miguel, J. (2011). Evaluating the impact of R & D tax credits on innovation : A microeconometric study on Canadian firms. *Research Policy*, 40(2): 217–229.

De Brentani, U. (2001). Innovative versus incremental new business services: different keys for achieving success. *Journal of Product Innovation Management*, 18(3): 169–187.

Delre, S., Jager, W., Bijmolt, T., Janssen, M.A. (2007). Targeting and timing promotional activities: An agent-based model for the takeoff of new products. *Journal of Business Research*, 60(8): 826–835.

Dziallas, M., Blind, K. (2019). Innovation indicators throughout the innovation process: An extensive literature analysis. *Technovation*, 80-81: 3-29.

Eckel, C., Neary, J.P. (2010). Multi-product Firms and Flexible Manufacturing in the Global Economy. *The Review of Economic Studies*, 77(1): 188-217.

EUMOFA. (2017). Eu Consumer Habits Regarding Fishery and Aquaculture Products. Report, 66p.

Evanschitzky, H., Eisend, M., Calantone, R.J., Jiang, Y. (2012). Success Factors of Product Innovation: An Updated Meta-Analysis. *Journal of Product Innovation Management*, 29(51): 21–37.

FAO. (2016). *The State if World Fisheries and Aquaculture 2016*. Contributing to food security and nutrition for all. Rome, 200 p.

FranceAgriMer. (2018). *Conjoncture du marché des produits de la pêche et de l ’aquaculture*. Présentation pour la presse, 20 p.

FranceAgriMer. (2011). *Consommation des produits de la pêche et de l'aquaculture 2010*. Données et bilans. Données bilans. Etablissement National des Produits de l'agriculture et de la mer, 143 p.

Henard, D.H., Szymanski, D.M. (2001). Why some new products are more successful than others. *Journal of Marketing Research*, 38(3): 362-375.

Hittmar, S., Varmus, M., Lendel, V. (2015). Proposal of Evaluation System for Successful Application of Innovation Strategy through a Set of Indicators. *Procedia Economics and Finance*, 26: 17–22.

Johnston, R.J, Roheim, C.A. (2006). A battle of taste and environmental convictions for ecolabeled seafood: a contingent ranking experiment. *Journal of Agricultural and Resource Economics*, 31(2): 283–300.

Kantar WordPanel. (2014). *Bilan annuel 2014, Produits halieutiques– Données arrêtées au 31 décembre 2014.*

Lendrevie, J., Lévy, J. (2009). *Mercator - Théorie et pratique du marketing*. Dunod, Paris, ninth Edition, 1230 p.

Long, J.S., Freese, J. (2014). Regression Models for Categorical Dependent Variables Using Stata. Stata Press. Third Edition, 589 p.

Lund, E.K. (2013). Health benefits of seafood; is it just the fatty acids? *Food Chemistry*. 140(3): 413–420.

Mayer, T., Melitz, M.J., Ottaviano G.I.P. (2014). Market Size, Competition, and the Product Mix of Exporters. *American Economic Review*, 104(2): 495-536.

Menrad, K. (2004). Innovations in the food industry in Germany. *Resource Policy*, 33(6-7): 845–878.

Mesnildrey, L., Hadouni, L., Quinton, C., Frounis, M., Lesueur, M., Gouin, S. (2009). *Analyse des attentes des consommateurs de produits de la mer frais*. Rapport final. Les Publications du Pôle Halieutiques Agrocampus-Ouest, 57 p.

French Ministry for Agriculture and Food. (2016). *Panorama des industries agroalimentaires*, 163 p.

French Ministry for Agriculture and Food. (2017). *Panorama des industries agroalimentaires-Chiffres et indicateurs clés*, 20 p.

Myrland, Ø., Trondsen, T., Johnston, R.S., Lund, E.. (2000). Determinants of seafood consumption in Norway: lifestyle, revealed preferences, and barriers to consumption. *Food Quality and Preference*, 11(3): 169–188.

OCDE. (2005). *Oslo Manual - Guidelines for collections and interpreting innovation data*. A joint publication of OECD and Eurostat. Third Edition, 166 p.

Olsen, S.O. (2003). Understanding the relationship between age and seafood consumption: The mediating role of attitude, health and involvement and convenience. *Food Quality and Preference*, 14(3): 199–209.

Palmberg, C. (2006). The sources and success of innovations — Determinants of commercialisation and break-even times. *Technovation*, 26(11): 1253–1267.

Roheim, C.A. (2009). An Evaluation of Sustainable Seafood Guides : Implications for Environmental Groups and the Seafood Industry Thalassorama An Evaluation of Sustainable Seafood Guides : Implications for Environmental Groups and the Seafood Industry. *Marine Resource Economics*, 24(3): 301–310.

Ruxton, C.H.S., Reed, S.C., Simpson, M.J.A., Millington, K.J. (2004). The health benefits of omega-3 polyunsaturated fatty acids: a review of the evidence. *Journal of Human Nutrition and Dietetics*, 17(5): 449–459.

Salladarré, F., Brécard, D., Lucas, S., Olivier, P. (2016). Are French consumers ready to pay a premium for eco-labeled seafood products ? A contingent valuation estimation with heterogeneous anchoring. *Agricultural Economics*, 47(2): 247-258.

Singh, S. (2006). Impact of color on marketing. *Management Decision*, 44(6): 783–789.

Steinar Valle, P., Dudinskaya, E., Taskov, D.A. (2016). *Industry study cases report : A collection of marketing successes and failures in the World based on clever product innovation and/or marketing activities*. Report D4.1 PRIMEFISH H2020 Project, 49 p.

Stock, G.N., Greis, N.P., Fischer, W.A. (2002). Firm size and dynamic technological innovation. *Technovation*, 22(9): 537–549.

Suwannaporn, P., Speece, M.W. (2010). Assessing new product development success factors in the Thai food industry. *British Food Journal*, 112(4): 364-386.

Thong, N.T., Solgaard, H.S. (2017). Consumer's food motives and seafood consumption. *Food Quality and Preference*, 56: 181–188.

Tomlinson, P.R. (2010). Co-operative ties and innovation : Some new evidence for UK manufacturing. *Research Policy*, 39(6): 762–775.

Traill, W.B., Meulenberg, M. (2002). Innovation in the food industry. *Agribusiness*, 18(1): 1–21.

Washington, S. (2008). Ecolabels and Marine Capture Fisheries : Current Practice and Emerging Issues. *GlobeFish Research Program*, 91: 1–62.

Appendix

Table A.1: Matched and original database description

	Percentage Matched base	Percentage GNPD (2011-2012)
Storage:		
Fresh	44%	46%
Frozen	34%	30%
Ambient	22%	24%
Categories		
New Product	19%	30%
New Packaging	28%	20%
New Formulation/Relaunch	11%	9%
New Variety	42%	41%
Brand:		
Retailer	48%	45%
National Brand	52%	55%
Claims[1]:		
Convenient	40%	37%
Sustainable	26%	28%
Natural	14%	18%
Healthy	9%	9%
Sociodemographic	2%	1%
Others	9%	14%
Number of observations	**266**	**699**

[1] A product can display several claims.
Source: Own elaboration based on GNPD and Kantar Word Panel, 2019

Table A.2: Internal factor variables

Variables	Newness	Descriptive statics	Expected sign	Models 1	Models 2
Firm size	No	**65%** of products come from large firms	+	Kept	Dropped
Specialization of firm in seafood sector	Original	**24.5%** of products come from firms specialized in seafood sector	+	Dropped	Dropped
Specialization of firm in one category	Original	**17.7%** of products come from firms specialized in one seafood category	+	Dropped	Kept

*Note: "**Newness**" indicates whether this variable has already been used in the literature. "**Descriptive statics**" describes the matched database, and "**Expected sign**" the expected impact on the probability of success. "**Models 1 and 2**" display whether the variable has been kept or dropped in the final models. Source: Authors, 2019; number of observations 237.*

Table A.3: External factor variables

Variables	Newness	Descriptive statics	Expected sign	Models 1	Models 2
Market concentration	Adapted	**40.08%** of products come from leaders	+	Dropped	Dropped
Market concentration HHI	Adapted	Low concentration: **72.16%** Medium concentration: **22.78%** High concentration: **5.06%**	+/-	Dropped	Dropped
Years	Original	**33.33%** of products launched in 2010 **44.73%** of products launched in 2011 **21.94%** of products launched in 2012	.	Kept	Kept

*Note: "**Newness**" represents whether this variable has already been used in the literature. "**Descriptive statics**" describes the matched database, and "**Expected sign**" the expected impact on the probability of success. "**Models 1 and 2**" display whether the variable has been kept or dropped in the final models. Source: Authors, 2019; number of observations 237*

Table A.4: Herfindahl-Hirschman Index by year

Family	HHI 2011	HHI 2012
Cephalopod, shellfish and crustacean	839.7	867.2
Frozen	1290.8	1325.8
Dried, smoked and salted fishes	656.1	654
Fresh fish (prepared)	494.4	496.3
Soups	2931.8	2886.4
Canned	704.3	727.6
Breaded	1399.2	1417.9
Surimi	1229.8	1293.4

Source: own elaboration based on GNPD and Kantar Word Panel

Table A.5: Product factor variables

Variables	Newness	Descriptive statics	Expected sign	Models 1	Models 2
Product family	Original	(1) Transformed fish **59.92%** (2) Main course **35.44%** (3) Soups **4.64%**	+/-	Dropped	Dropped
Species	Original	(1) White fish (cod, haddock, pollack, pollock) **15.61%** (2) Shellfish, cephalopod and crustacean **21.52%** (3) Blue fish (sardine, mackerel, and anchovy) **17.72%** (4) Others **19.41%** (5) Salmonid (salmon, trout, and other salmonids) **25.74%**	+/-	Dropped	Dropped
Storage	Original	(1) Fresh **40.51%** (2) Frozen **35.02%** (3) Ambient **24.47%**	+/-	Kept	Kept
Type of launch	Original	(1) New product/relaunch **20.68%** (2) New recipe/extension of the range **49.79%** (3) New packaging **29.54%**	+/-	Dropped	Kept
Brand type	Original	**55.70%** of products come from a national brand	+	Dropped	Kept
Price	No	More than twice the average price of the category: **6.33%** Less than half the average price of the category: **5.06%**	+/-	Dropped	Dropped
Claims*	Original	Natural **20.25%** Sustainable **33.33%** Convenient **48.52%** Healthy **9.28%** No Claims **25.74%**	+ claims - No claims	Dropped	Kept/ Dropped
Picture	Original	**69.62%** of products have a picture on the packaging	+	Dropped	Kept
Window display pack	Original	**31.22%** of products have a window display pack	+	Kept	Kept
Colour	Original	(1) Black and purple **13.92%** (2) Green and yellow **16.03%** (3) White and blue **36.71%** (4) Flashy and fluorescent **16.03%** (5) Red and orange **17.30%**	+/-	Kept/ Dropped	Kept/ Dropped

*Note: "**Newness**" indicates whether this variable has already been used in the literature. "**Descriptive statics**" describes the matched database, and "**Expected sign**" the expected impact on the probability to succeed. "**Models 1 and 2**" display whether the variable has been kept or dropped in the final models. *Products can display several claims. Source: Authors, 2019; number of observations 237*

Les **Working Papers SMART – LERECO** sont produits par l'UMR SMART-LERECO

- **UMR SMART-LERECO**

L'Unité Mixte de Recherche (UMR 1302) *Laboratoire d'Etudes et de Recherches en Economie sur les Structures et Marchés Agricoles, Ressources et Territoires* comprend les unités de recherche en Economie INRAE de Rennes, INRAE de Nantes et les membres des Unités Pédagogiques de Rennes et Angers du département Economie, Gestion et Société d'Agrocampus Ouest.

Adresse:
UMR SMART-LERECO, 4 allée Adolphe Bobierre, CS 61103, 35011 Rennes cedex

Site internet : https://www6.rennes.inrae.fr/smart

Liste complète des Working Papers SMART – LERECO :
https://www6.rennes.inrae.fr/smart/Working-Papers
https://ideas.repec.org/s/rae/wpaper.html
http://ageconsearch.umn.edu/handle/204962/

The **Working Papers SMART – LERECO** are produced by UMR SMART-LERECO

- **UMR SMART-LERECO**

The « Mixed Unit of Research » (UMR1302) *Laboratory for Empirical Research in Economics on Structures and Markets in Agriculture, Resources and Territories* is composed of the research units in Economics of INRAE Rennes and INRAE Nantes and of the members of the Agrocampus Ouest's Department of Economics, Management and Society who are located in Rennes and Angers.

Address:
UMR SMART-LERECO, 4 allée Adolphe Bobierre, CS 61103, 35011 Rennes cedex

Website: https://www6.rennes.inrae.fr/smart_eng/

Full list of the Working Papers SMART – LERECO:
https://www6.rennes.inrae.fr/smart/Working-Papers
https://ideas.repec.org/s/rae/wpaper.html
http://ageconsearch.umn.edu/handle/204962/

Contact

Working Papers SMART – LERECO
INRAE, UMR SMART-LERECO
4 allée Adolphe Bobierre, CS 61103
35011 Rennes cedex, France
Email : smart-lereco-wp@inrae.fr

2020

Working Papers SMART – LERECO

UMR INRAE-Agrocampus Ouest **SMART-LERECO** (Laboratoire d'Etudes et de Recherches en Economie sur les Structures et Marchés Agricoles, Ressources et Territoires)

Rennes, France