Food package information and the success of processed potato products in The UK

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Abstract

During recent years an increase in the consumption of processed potatoes products has been observed in the UK market and a parallel decrease in the consumption of fresh potatoes. This paper analyses the introduction of processed potato products in the UK market to understand its trends and the underlying reasons for its success. Results show that retailers are importantly responsible for the introduction of new potato products in the UK. Attributes such as microwaveable, on-the-go, organic, with social media presence and low or reduced-sodium have a significant and positive impact on the market success. At the same time, attributes such as light or recyclability have significant and negative effect on market success. The combination of private label and the type of packaging was non-significant. Finally, flavours are significant for the success of the products with chilli, onion, cheese cream and mint flavours show a positive impact on the market success.

Keywords New product development, potatoes, UK, positional claims, flavour

JEL code Q130, L220

Introduction

Potatoes is a valuable staple crop, together with wheat, rice, and maize, contributing significantly to global food security in the world (Robertson et al., 2018; Zaheer and Akhtar, 2016). The total world production of potatoes is more than 350 million tonnes for 2018-2020 (FAOSTAT). In 2020, the world's largest producer of potatoes was China, producing more than 78 million tonnes (FAOSTAT). The UK ranks eleven among world potato producing countries with annual per capita production of about 102 kg. Potatoes are the third most important crop in the UK, contributing around £750 million to the total food and agricultural output for 2018-2020 (Defra, 2020). Interestingly the value of output from potatoes increased by almost 8% from 2019 to 2020 (Defra, 2020).

Potatoes have been recognised as providing a large portion of daily requirement values of essential nutrients such as different vitamins (C, B1 and B2), potassium, magnesium, calcium, iron, sodium or zinc, among others (Zaheer and Akhtar, 2016; CIP, 2017). However, potatoes need to be processed, at high temperatures, for human consumption to convert its indigestive resistant starch (Zaheer and Akhtar, 2016). During these processing processes, some harmful substances can be created and therefore health benefits of potatoes depend on many things such as variety, cooking methods or storage (Robertson et al., 2018; Furrer et al., 2018).

Potatoes are considered an affordable and nutritious food purchased by a big part of UK consumers. However, before COVID-19 the overall consumption of potatoes in the UK was following a negative trend which seems to have changed in 2020 (AHDB, 2021). The pre COVID -19 negative trend can be explained by several reason being the high glycaemic index, associated by consumers to weight gain and diabetes, and its preparation time the most important identified by consumers in other countries (Robertson et al., 2018; Fernqvist et al. 2013). Frozen and fresh potatoes represent 33 percent of all in-home meals containing carbohydrates (AHDB, 2017). Interestingly the UK in-home potato market is divided into three big categories 36% represents fresh potato consumption, 34% processed potatoes, such as frozen, chilled, canned or reconstructed products and finally 30% accounts for crisps (AHDB, 2017). 2017 sales data revealed a reduction in value for fresh potatoes and an increase in value and volume for the total processed potatoes category (AHDB, 2017). In fact, the average weekly consumption of fresh potatoes has declined by 68 per cent from 1974 to 2018 while the consumption of processed potatoes has increased by 109 per cent (Defra Family Food Survey, 2020), see Figure 1. This can be explained by the added value offered by the processed group which is highly appreciated by consumers living in urban areas and with busy lifestyles.

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Added value is mainly incorporated into the food products through research and the creation of new products, new packaging or adding varieties to existing ranges of products. For processed potatoes, New Product Development (NPD) focuses on health issues associated with potatoes' consumption, such as the frying step, the salt content, the type of oils used for its processing and the use of potato peels in processing (Keijbets, 2008). Another critical attribute included in the NPD strategy for potatoes is its sustainable production. Sustainability covers the variety of crops produced and their environmental impact, together with reducing waste and water consumption during both its production and processing stage (Keijbets, 2008). Packaging materials are also crucial for sustainability.

Furthermore, this added value is communicated to consumers through food labels with positional claims, among other information. Food label information assists consumers in their

food purchase decisions. Fernqvist et al. (2013), looking at consumers' intake of potatoes, highlighted package information as an important factor for consumer choice, particularly the type of packaging, product information and preparation tips

`The purpose of this research is to focus on the introduction of new processed potato products, except crisps, to better understand the characteristics of this products, the role of retailers and manufacturers on the launching of new processed potato products and the impact that new product characteristics have on the success of the new developed products.

In particular, the research aims to answer the following questions:

- Which type of processed potato products have been introduced in the UK during the last twenty years?
- What companies are leading the launching of these products? Which is the role of private labels?
- What claims are particularly important for the market success of newly developed processed potato products?
- Are flavours important for the success of processed potato products?

Methods

In order to respond to the first and second research questions we explore the trend in the introduction of processed potato products and identify the leading suppliers. To do that we use descriptive statistics (i.e., frequency distributions and cross tabulations). Next, to assess the influence of product claims on consumer acceptance, this study uses hazard-based duration models, which provides an explanation on the length of time that launched potato products survived in the market. Duration models are based on the survivor function, which in our case is the probability of the product still being available in the market up to a specific time t, as follows:

$$\boldsymbol{S_{(t)} = pPr\{T \geq t\} = 1 - F(t) = \int_t^{\infty} f(x)dx,} \quad (1)$$

where T is a continuous random variable, $\boldsymbol{f(t)}$ is its probability density function and $\boldsymbol{F(t)}$ is the cumulative distribution function. The distribution of T can also be expressed as the hazard function, which is the rate of occurrence of the event. In our case the event means failing or disappearing from the market, and this is expressed as follows:

$$\boldsymbol{h(t) = \lim_{\Delta t \to \infty} \frac{\Pr(t \leq T < t + \Delta t | T \geq t)}{\Delta t}} \quad (2)$$

where the numerator is the conditional probability of occurrence during the period under consideration given that it has not occurred before, and the denominator is the length of the interval under consideration. The hazard function can also be expressed as follows:

$$\boldsymbol{h(t) = \frac{f(f)}{S(t)}.} \quad (3)$$

In order to estimate the hazard function, different models can be used depending on the shape of the hazard and the features of the explanatory variables included in the model. A Cox's proportional hazards model (Cox, 1972) was estimated for this research. Using the Cox model, specification of each individual follows its own survival function formulated as follows:

$$\boldsymbol{h_i(t) = h(t; x_i) = h_0(t) exp(x_i' \beta)} \qquad (4)$$

where $\boldsymbol{h_0(t)}$ is a nonparametric function (baseline hazard at time t), $\boldsymbol{exp(x_i' \beta)}$ is a parametric function, and $\boldsymbol{x_1, \ldots, x_k}$ are a pool of predictor variables. The dependent variable was the period (in years) that a product remained on the market.

Data

The first part of this study employs the Mintel's Global New Products Database (GNPD) to present and provide an overview of the introduction of processed potato products launched in the UK between 2000 and 2019. The dataset contains information on 1,611 new potato products launched in different types of retail stores between January 2000 and December 2019 by 141 manufacturing or retailing companies using 402 different brands. The database also contains information on the type of new product (new product, new packaging, new variety, relaunch), type of label (branded, private label), introduction price, type of packaging, positioning claims (55 different claims were found) and flavours (160 different flavours were found).

The second part of the study combines data from GNPD and the Kantar Worldpanel Dataset (KWDS) for the UK. GNPD data were used to gather information on which new processed potato products were launched in the UK market in the period 2011-2013. KWDS includes weekly records of all foods and beverages that were taken home from supermarkets and similar stores by UK households during the period 2013 to 2018. The potato products observed in the GNPD database were identified in KWDS to follow its sales in UK retail and trace their durability in the market. The explanatory variables considered for the cox model are: launch type, private label, introduction price, all positional claims and all flavours.

Results

Figure 2 shows the evolution of new potato products introduced into the UK market between 2000 and 2019. The results show a positive trend for the period 2000 to 2017 and a subsequent reduction 2018 and 2019.

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Table 1 shows the number of products introduced by type of potato product. We can see that almost 60 percent of the new introduced products are fries, mash potatoes, roast potatoes, and wedges. Being fries the most important potato group concentrating almost 22 percent of new products introduced.

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Table 2 indicates which companies have introduced potatoes in the UK market. Retailers (through their private labels) introduced almost 70 percent of the new processed potato products, the rest of the manufacturers launched on average 1 percent of the new products or less with the exception of McCain Foods and Aunt Bessie's that account for almost a 9 and 2

percent respectively. The retailer with more new products launched is Tesco followed by ASDA and Marks & Spencer.

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The types of new products introduced can be New Variety/Range Extension; New Product; New Packaging; Relaunch and New Formulation. 45 percent of all new potato products launched for the studied period are classified as New Variety/Range Extension. New products represent more than 25% of the new launches while new packaging covers almost 18 percent.

Looking at the positional claims it can be observed that the top ten claims account for the 78 percent of the total claims. These claims are: Vegetarian, Environmentally Friendly Package, Microwaveable, No Additives/Preservatives, Recycling, Low/No/Reduced Trans-fat, Premium, Ease of Use, Low/No/Reduced Allergen, and Gluten Free. Furthermore, 112 potato products do not have any positional claim in the label, this represents almost a 7 percent of all new products for the period 2000 to 2019. The different positional claims have been organised in five claim category groups: Health and nutrition, safety, demographics, sustainable and convenience. We can see in Figure 3 than more than 35 percent of the claims refer to demographic attributes such as children, vegetarian, vegan, female, etc. Sustainable and convenience claims follow are the second and third group of claims in importance. Interestingly, health and nutrition is the less frequent type of claim for new introduced potato products. The attribute flavour has been also considered for this study with 122 different flavours identified. The most common flavours are spicy, cheese, butter and herbs.

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The second part of this paper looks at the factors influencing the success of the newly developed potato products in the UK market using a duration model. Table 4 presents the estimated results for the Cox model. Goodness of fit results show that the model appropriately fits the data. We also implemented the proportionality hazards assumption test, which indicates an absence of evidence contradicting the proportionality assumption.

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The hazard model reveals, in line with previous research, that “new” potato products have a negative impact on the success of potato products. The remaining launch strategies considered were not significant and were removed from the model. The positional claims microwaveable, on-the-go, organic, with social media presence and low or reduced sodium were significant with a positive impact on the market success of potato products. Other claims such as diet/light and recycling do have a significant but negative impact on the success of the processed potato products. Other explanatory variables considered in the model were private label and packaging resulting non-successful. Finally, flavours were also considered and revealed significant in many cases. Chilli, onion, cheese cream and mint resulted significant and positive for the success of the products. On the contrary, no flavour, pecorino, vegetable, mozzarella, Caribbean, curry, chorizo, chicken, milk, salted and pea were significant but with a negative impact on the success of potato products.

Discussion and Conclusion

The results and discussion is preliminary, and the final version will be presented during the conference. This study aims at identifying the effort of food suppliers in developing new processed potato products for the UK market and which of these suppliers are leading new product development. It also intends to recognise which attributes associated to these new products are communicated to consumers through the product packaging. As previously mentioned, packaging information impacts on consumers decision regarding food choices. Furthermore, we also want to identify if companies deciding on development of new potato products are focusing more on development towards, health, sustainability, convenience or safety concerns. The paper shows that the number of processed potato products introduced in the UK flowed a growing trend from 2000 to 2018 with a reduction om the number of new products introduced during 2018 and 2019. This reduction can be related to several issues being the Brexit process one of them. The most common new potato product launched in the market are fries/chips, followed by mash potatoes, roast potatoes, potato wedges and potato salad. All these products are precooked, fast and easy to prepare. In line with the reasons explaining the increase of consumption of processed potato products. These results are in line with the reported sales of frozen potato products in the UK. More than 50 percent of retailers sales of frozen potato products are chips.

The companies leading new product development for the processed potato market in the UK are mainly retailers which introduce almost 70 percent of the new processed potato products. Tesco and ASDA are the top retailers introducing new developed potato products and McCain Foods and Aunt Bessie's are the top private companies. Even though we can see a big effort done by retailers to introduce new potato products sales recorded by Kantar show that consumers purchase almost the same amount of branded potato products than private label products.

Our results also show that for potato products retailers and companies focus more on developing new varieties (such as new flavours) covering 45 percent of the launched products and on developing totally new products which represents 25 percent of the new products introduced by companies during the studied period. The development of new varieties is a less risky and cheaper strategy for companies.

When considering the information provided to consumers on the labels we can see that the major number of claim on potato products refer to Vegetarian (demographic claim), Environmentally Friendly Package (sustainable claim), Microwaveable (convenience claim), No Additives/Preservatives (safety claim), Recycling (sustainable claim), Low/No/Reduced Trans-fat (health claim), Premium (demographic), Ease of Use (convenience), Low/No/Reduced Allergen (Health claim), and Gluten Free (safety claim). Furthermore, when aggregating claim if the five claim groups: Health and nutrition, safety, demographics, sustainable and convenience. We can see that demographic attributes are the most frequently used by companies to differentiate the product for different kind of consumers. Demographic attributes are children, vegetarian, vegan, female, etc. Sustainable and convenience claims are also used although with less frequency. These two groups are withing the main focus of companies regarding the strategy for NPD for the proceeded potato sector which is focused on developing a more sustainable sector and achieving consumers changing needs. Health claims do not seem to as frequent as expected except for reduced trans-fat. The us of trans-fat for the

processing of potato product is an important issue due to the potential generation of toxic products during the cooking process.

The last part of the paper presents a duration analysis on the success of new potato products introduced in the market. We can see that regarding the type of innovation only those categorised as new products impact significantly on the market success. As expected, these impact is negative since a new product is more risky and have higher chances of failing than new varieties or reformulated products. Regarding to the different package claims, the ones that have a positive and significant impact on the success microwaveable, on-the-go, organic, with social media presence and low or reduced sodium were significant with a positive impact on the market success of potato products. On the other hand, diet/light and recycling do have a significant but negative impact on the success of the processed potato products. Finally, flavours do have an impact of the success of potato products, but results are mix with chilli, onion, cheese cream and mint impacting positively and significant the uptake of new potato products. These results can help the potato sector to better understand the attributes that can help potato products to succeed in the UK market. Furthermore, this paper also provides companies the ability to identify how they can help to shape the potato sector in line with sustainability, health and convenience to improve consumers food security and health.

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Tables and Figures

Table 1. Frequency of new products by type of potato product 2000-2019.

Type of product	Frequency	Percent
Fries	352	21.85
Mash	269	16.70
Other	215	13.35
Roast	177	10.99
Wedges	133	8.26
Salad	79	4.90
Jack potatoes	73	4.53
Baby potatoes	46	2.86
Croquettes	46	2.86
Skins	36	2.23
Dauphinoise	34	2.11
Bombay potatoes	30	1.86
Slices	28	1.74
Waffles	25	1.55
Gratin	22	1.37
In water	15	0.93
Bravas	13	0.81
Cakes	7	0.43
Sauté	5	0.31
Pockets	3	0.19
Dippers	3	0.19
Total	1611	100.00

Source: Own elaboration based on Mintel's GNPD database.

Table 2. Frequency of new products by company 2000-2019.

Company	Frequency	Percent
Tesco	244	15.1
Asda	215	13.3
McCain Foods	143	8.9
Marks & Spencer	141	8.8
Sainsbury's	127	7.9
Morrisons	107	6.6
Waitrose	92	5.7
Iceland Foods	83	5.2
The Co-operative Group	32	2.0
Aunt Bessie's	31	1.9
Aldi	26	1.6
Lidl	24	1.5
Rest of companies	346	32.3

Source: Own elaboration based on Mintel's GNPD database.

Table 3. Frequency of product claim 2000-2019.

Claims	Frequency	Percent
Vegetarian	1117	23.0
Ethical - Environmentally Friendly Package	522	10.8
Microwaveable	433	8.9
No Additives/Preservatives	433	8.9
Ethical - Recycling	395	8.1
Low/No/Reduced Transfat	213	4.4
Premium	206	4.2
Ease of Use	196	4.0
Low/No/Reduced Allergen	146	3.0
Gluten Free	143	2.9
Rest of the claims	1050	21.63

Source: Own elaboration based on Mintel's GNPD database.

Table 4. Cox regression time-constant variables

	Rate of failure					
	Coeff.	St. Err.	Haz. Rat.	St. Err.	Z ratio	Sig.
New Product	0.376	0.212	1.456	0.309	1.770	**
Dummy Microwaveable	-0.303	0.159	0.738	0.118	-1.900	**
Dummy Organic	-38.755	1.021	0.000	0.000	-37.980	***
Claim Diet/Light	1.643	0.361	5.173	1.866	4.560	***
Claim Social Media	-38.043	0.749	3.01E-17	2.25E-17	-50.820	***
Claim On-the-Go	-0.844	0.202	0.430	0.087	-4.170	***
Claim Recycling	0.549	0.263	1.732	0.455	2.090	**
Claim Low/No/Reduced Sodium	-36.419	1.021	1.52E-16	1.56E-16	-35.680	***
Dummy Smoke	1.040	0.249	2.829	0.706	4.170	***
Dummy No flavour	1.564	0.192	4.780	0.916	8.160	***
Dummy Pecorino	0.485	0.236	1.624	0.383	2.060	**
Dummy Vegetable	1.589	0.195	4.900	0.958	8.130	***
Dummy Mozzarella	1.040	0.249	2.829	0.706	4.170	***
Dummy Caribbean	1.589	0.195	4.900	0.958	8.130	***
Dummy Chili	-0.771	0.073	0.462	0.034	-10.500	***
Dummy Curry	2.931	0.289	18.743	5.419	10.140	***
Dummy Chorizo	0.658	0.250	1.931	0.483	2.630	***
Dummy Chicken	1.034	0.156	2.812	0.438	6.650	***
Dummy Milk	1.287	0.396	3.623	1.434	3.250	***
Dummy Salt/Salted	2.931	0.289	18.743	5.419	10.140	***
Dummy Onion	-0.446	0.226	0.640	0.145	-1.970	**
Dummy Cream cheese	-37.870	1.033	0.000	0.000	-36.670	***
Dummy Pea	0.701	0.047	2.016	0.094	14.970	***
Dummy Mint	-0.468	0.130	0.626	0.081	-3.600	***
Dummy Monterey Jack	0.777	0.143	2.175	0.311	5.430	***
Log likelohood ratio test	-594.60					
Wald chi2(15)	8190.88	***				
Number of observations	173					

P<0.10* P<0.05**
P<0.01***

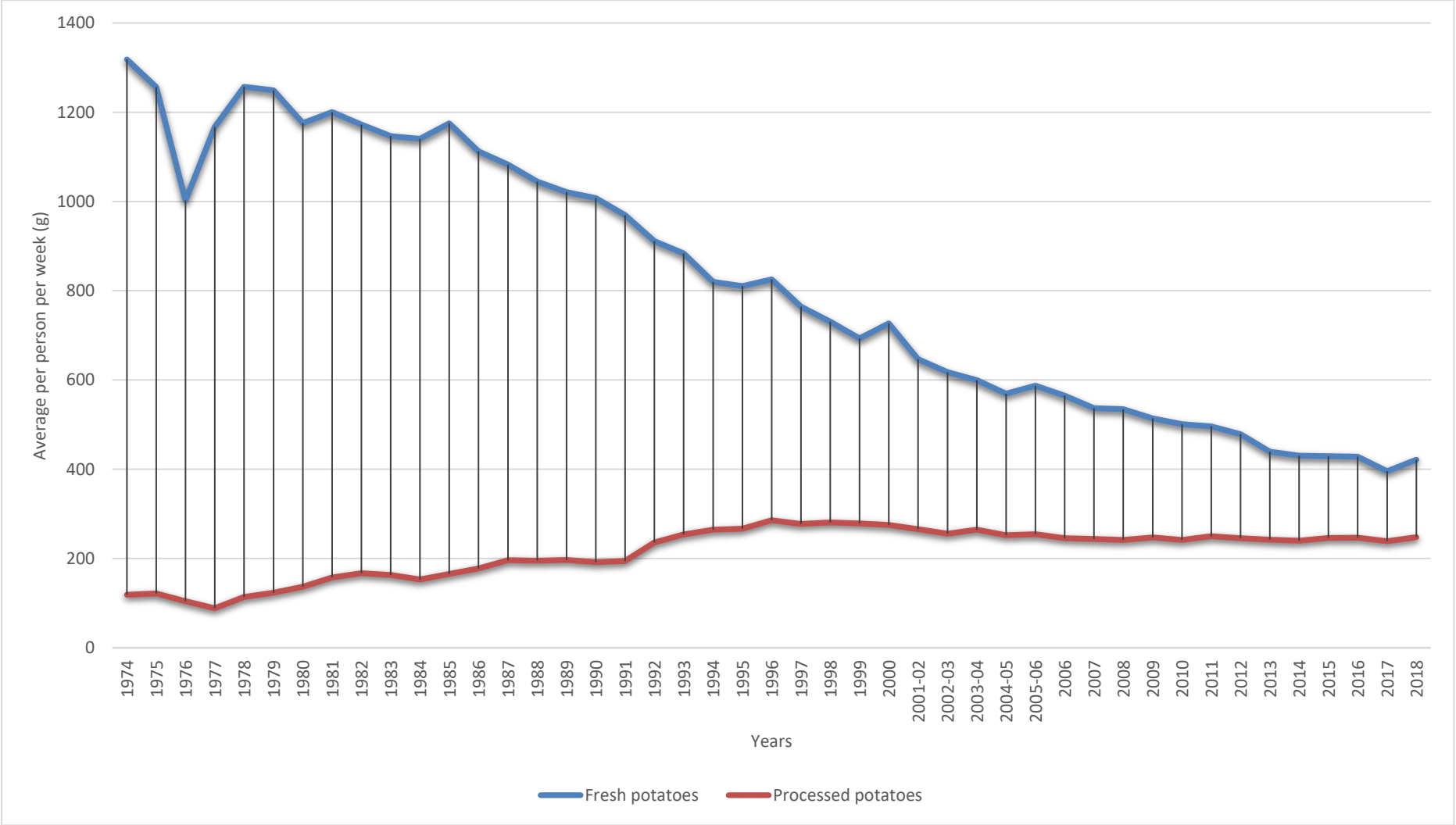

Figure 1 Average weekly consumption of fresh and processed potatoes in the UK
Source: Own elaboration based on DEFRA's data (2020)

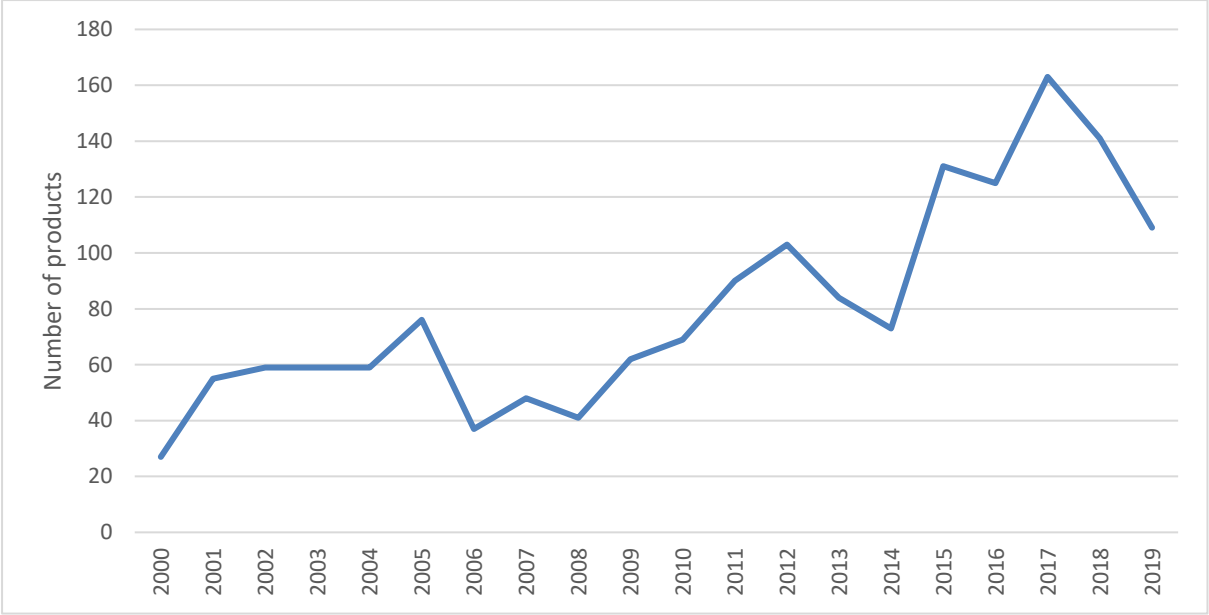

Figure 2 Number of new potatoes products launched in the UK market 2000-2019
Source: Own elaboration based on Mintel's GNPD database.

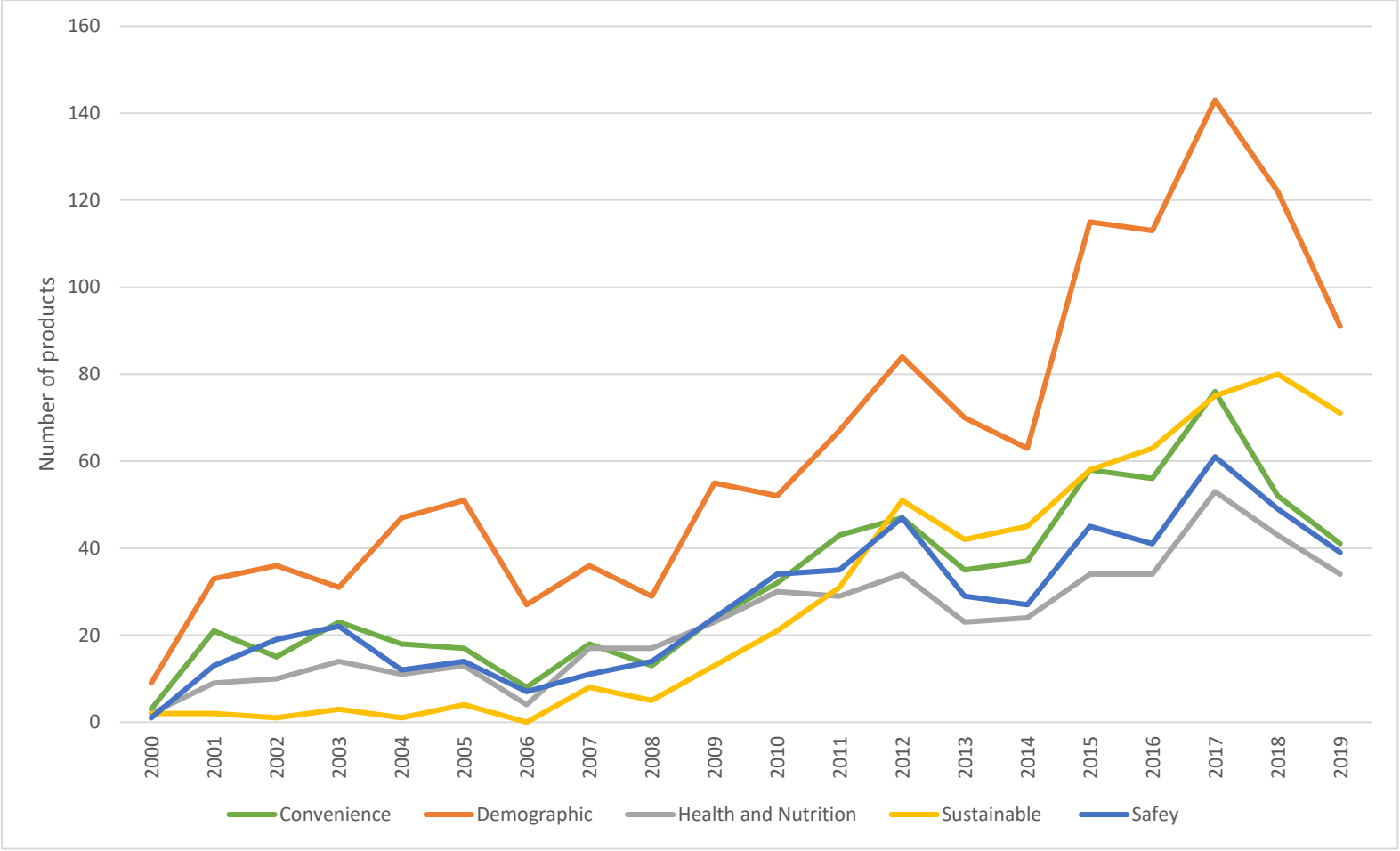

Figure 3 Number of claims by claim categories in new potato products launched in the UK market 2000-2019
Source: Own elaboration based on Mintel's GNPD database.