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Developing an Internationalization Strategy Using Diffusion Modeling: The Case of Greater Amberjack

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Abstract: For farmers of new fish species, market adoption is needed in order to grow a viable business. Farmers may try to sell the new species in their firms' domestic markets, but they might also look at other markets. However, as markets are becoming more global and competitors more international, considering internationalization may be a necessity rather than a choice. Using diffusion modelling, and based on results of an online supermarket experiment, the innovation and imitation parameters are estimated and diffusion curves for five countries predicted in an attempt to determine the best lead market for introducing fillets of farmed greater amberjack (*Seriola dumerili*). The production capacity consequences of implementing different internationalization strategies (i.e. "sprinkler" and "waterfall") were also explored. A waterfall strategy refers to the sequential introduction of a product in different markets, whereas the sprinkler strategy concerns the simultaneous introduction of a product in multiple international markets. Since a sprinkler approach requires many resources and the ability to quickly ramp up production capacity, a waterfall approach appears more suitable for farmers of greater amberjack. Italy and Spain appear to be the best lead markets for greater amberjack farmers to enter first.

Keywords: greater amberjack; forecasting market demand; market diffusion modelling; internationalization strategy

1. Introduction

While new fish species require much time and money to develop, adoption by the market is needed to grow a business and earn money. However, predicting consumer demand for a new species is difficult at best. Every year, businesses spend millions of euros developing and introducing new products only to find consumers reluctant to adopt them or even plainly reject them.

Forecasting diffusion is important, since it influences production and marketing planning decisions. Diffusion refers to the process and pattern of market penetration of a new product or service over time, which is driven by social influences related to interdependencies among consumers [1]. Two elements or stages of diffusion are particularly important. First, the "take-off" stage, because this offers information about which countries are more or less inclined to lead in new product adoption. Second, the "pattern of adoption" stage, specifically the time between the new species' initial trial and full market adoption in a country. Together with information about market volume, this information

will help match supply and demand. Due to the fact that production of life stock has long lead times, decisions for expanding production capacity to meet demand growth require long time horizons. Although supermarkets can deal with seasonal products, they require predictable and constant supply. Supermarkets set high production standards, thus constant product supply is a basic requirement for any farmer who wants to sell through supermarket channels. Accordingly, carefully selecting a firm's initial launch and internationalization strategy becomes of utmost importance.

The aim of the present paper is to determine the diffusion rate of a new species, namely the greater amberjack (*Seriola dumerili*), in a number of selected EU markets. The greater amberjack is of great interest to the European aquaculture sector due to its excellent flesh quality, worldwide market potential, and high consumer acceptability [2]. Its rapid growth and large size (i.e., the market size for greater amberjack is usually 3–5 kg and is achieved 24–36 months after hatching) [3] make this species very suitable for product diversification and development of value-added products. The greater amberjack could be positioned as the sustainable aquaculture alternative for wild tuna.

The research presented in this paper makes three contributions. First, it extends prior work on diffusion that has been skewed towards technical innovations and offering post hoc predictions and explanations using secondary sales data. In agriculture and food industries, attention has mainly focused on adoption and diffusion regarding farming practices and developing countries [4–6]. In contrast, this paper uses data of an online market test to make ex ante predictions regarding diffusion and focus on unfamiliar new food products (i.e., greater amberjack fillets). Specifically, the paper shows how market research can be used to obtain proxies for the central parameters used in diffusion modeling using the Bass model [7] (which will be explained in more detail in subsequent sections). Second, the research reported here compares the diffusion curves for each of five target countries and draws conclusions on the attractiveness of each market. The focus is on the top five EU fish markets, namely the UK, Germany, France, Italy, and Spain. Based on this, the paper makes suggestions regarding the lead country and order of market entry for the new species. Third, the paper explores production capacity issues related to two alternative internationalization strategies: "waterfall" vs. "sprinkler". The former refers to the sequential introduction of a product in different markets, whereas the latter concerns simultaneous introduction of the product in multiple international markets. Due to the fact that entering a market (i.e., focusing on the supermarket channel as a way of reaching consumers) only makes sense if production levels can keep up with market development, and since current production volume of farmed greater amberjack is limited [3], this information is extremely important.

The paper begins with the theoretical background of the study and then continues by outlining the methodology of the research approach adopted. After presenting the results, the manuscript discusses theoretical and managerial implications, as well as limitations of the whole work.

2. Theoretical Background

2.1. Diffusion Research

Diffusion research generally analyzes the development over time of first purchases of a new product or service by a population. The models used in these studies refer to the diffusion rate at time t and take the form of:

$$dN(t)/dt = g(t) [N^* - N(t)] \tag{1}$$

where $dN(t)/dt$ is the rate of diffusion at time t, $N(t)$ is the cumulative number of adopters at time t, N^* is the total number of potential adopters in a population, and $g(t)$ is the rate at which adoption occurs [8,9].

Different types of *functions* for $g(t)$ have been applied to model different diffusion processes. For example, $g(t) = P$ implies an "external influence" model, with diffusion driven by factors such as advertising that are external to the adopting unit. The coefficient P is commonly called the "coefficient of innovation". The model leads to a modified exponential diffusion curve. When $g(t) = QF(t)$,

the model suggests an "internal influence", where later adopters learn from earlier adopters. Q is often called the "coefficient of imitation" and market growth follows a logistic curve related to the Gompertz function (The Gompertz curve or Gompertz function is a type of mathematical model for a time series and is named after Benjamin Gompertz (1779–1865). It is a function that describes growth as being slowest at the start and end of a given time period. The right-hand or future value asymptote of the function is approached much more gradually by the curve than the left-hand or lower valued asymptote.) and is based on contagion. Most popular is probably the so-called "mixed influence" model, g(t) = P + Q[F(t)] [7], in which diffusion is driven by both innovation (P) and imitation effects (Q). In this model, market growth follows a generalized logistic curve. At each point in time, new adopters join the market as a result of both external influences (P) and internal market influences (i.e., contagion (Q)).

Assuming that one starts with zero adoptions (F(0) = 0), the formula of Bass's mixed influence model can be also written as [10]:

$$F(t) = [1 − e − (P + Q)t]/[1 + (Q/P)e − (P + Q)t] \tag{2}$$

this implies that the curve is S-shaped when Q > P, and more pronouncedly when the Q/P ratio increases. This formula can be used to compute (i.e., predict) the diffusion curves per country.

The rates of diffusion differ among countries because the characteristics of consumers and preferences for particular species also differ [10,11]. For instance, freshwater fish (e.g., trout) are more appreciated and popular in some countries and generally more readily consumed in areas where the fish has its natural habitat. Differences between countries in P and Q for a species/product determine the shape of the diffusion curve and can help inform managers about which country (or countries) to enter first.

2.2. Sprinkler Versus Waterfall Strategies

Two different internationalization strategies are generally distinguished in the literature, namely "waterfall" and "sprinkler" [1]. The waterfall strategy is used by a company to introduce a product sequentially in different markets. The company enters one market first, then another, and then another. A sprinkler strategy is used when a company chooses to introduce a product simultaneously in multiple markets. The sprinkler strategy works particularly well for a company that wants to be a first mover or one that wants to preempt moves by competitors. However, it requires vast resources and production capacity. The waterfall strategy, in contrast, allows the company to take time to understand a market and make appropriate adjustment to its marketing mix in order to satisfy the specific needs of each market.

Some studies have explored the question of whether a firm should enter all of its markets simultaneously (a "sprinkler" strategy) or sequentially (a "waterfall" strategy). Empirical research by Mascarenhas found that sequential market entry is more common than simultaneous entry into multiple markets [12]. Simultaneous entry into multiple markets occurs in the mature product life stage, with smaller markets, and when uncertainties are reduced. In general, first entrants that manage to survive enjoyed the highest long-term market share. A first entry, early in a product's life, helped generate resources, experience, and/or reputation that facilitated subsequent market start-ups and increased survival chances in these markets too. Building on a game theory model for two brands, Kalish, Mahajan, and Muller found that the waterfall strategy is preferable when conditions in foreign markets are unfavorable (slow growth or low innovativeness), competitive pressure is low, the lead–lag effect (i.e., the ability of a later (lag) market to learn from a first (lead) market) is high, and fixed entry costs are high [13]. Other, more recent work has addressed, for example, the impact of marketing instruments and regulations in entry decisions [14].

Since consumers and their preferences vary by market, EU farmers may try to sell their new species and related products in their domestic markets, consider other EU markets, or even consider

worldwide markets. As markets are becoming more international and competition more global, considering internationalization may be a necessity rather than an option. The harmonization of regulations and markets in the EU fuels these developments. Picking the right lead country to break open the global market and generating cash flow to allow for reinvestment and expansion of the business is vital for long-term survival.

Forecasting market diffusion is an important tool when planning to address market internationalization [15]. It can help a firm understand and plan for the right production capacity at the right time. Based on diffusion curves and information about the expected overall market volume of the product required, the production volumes needed to satisfy demand can be computed for each point in time and the choices of entry speed and strategy can be better informed.

3. Methodology

To estimate a mixed influence diffusion model, information about P (the coefficient of innovation) and Q (internal influence or contagion factor) is required. In contrast to some research that has used survey data involving expert interviews [15], the present work makes use of data from an online consumer experiment involving greater amberjack fillets that was part of the EU-funded "DIVERSIFY" project. The experiment investigated the probability for the adoption of high added-value farmed greater amberjack products (i.e., fillets) and mimicked as closely as possible a real-life, competitive choice setting of a national retailer's online store. Consumers were instructed to think of a scenario where they had to prepare a meal for their family and had decided to use fish fillets as the main ingredient of their dish. The shopping context was the fish counter of an online supermarket. After the landing page (at the general fish category level), a number of alternative fish species' fillets were shown next to the new species' fillets on the second page as a complete choice assortment (see Figure 1).
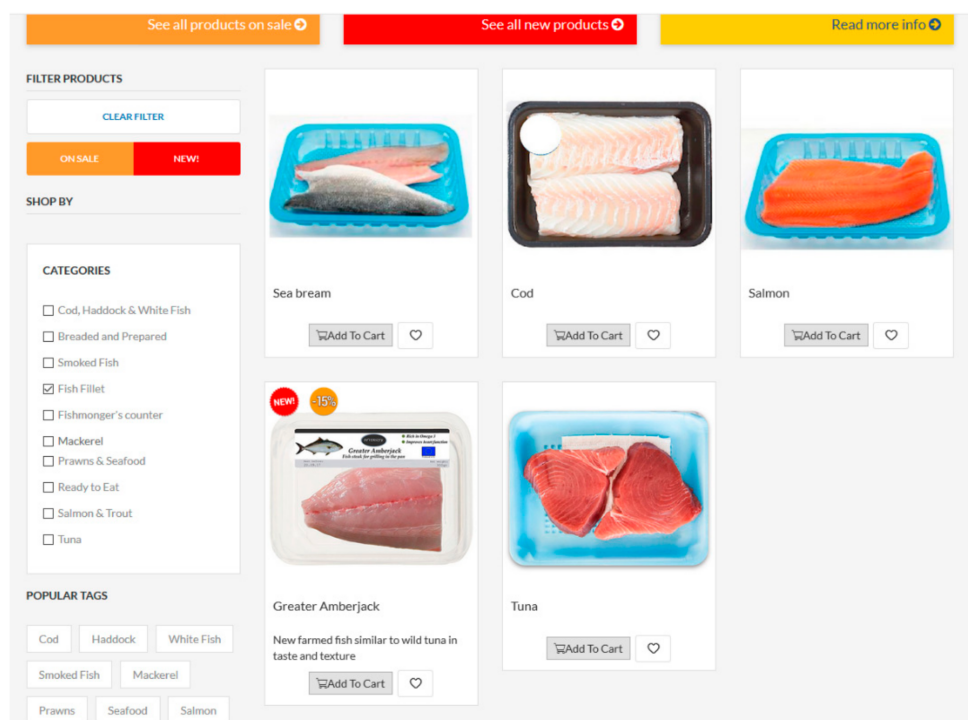
Figure 1. Screenshot of page 2 of the online store. Copyright: Hellenic Research House, 2017.

The alternative species (i.e., cod, tuna, salmon, and sea bream) had been selected to fit consumer taste in all study countries and were the same for each country. In total, 1500 respondents were included in the experiment in the UK, Germany, France, Italy, and Spain, with approximately 300 respondents per country and matched samples based on demographics in order to allow for meaningful comparisons

between the countries. Since prior research has shown a positive impact of basic product information, tuna was communicated as a reference product for greater amberjack in the accompanying product information. The label 'new' was also presented in the accompanying product information of the 'new' greater amberjack fillet. Because the test would involve only a single encounter (whereas a real test market could run for multiple weeks and allow for an introduction discount in, for example, week 1, with such a test accounting for actual customer experience and repurchase behaviors, in the absence of farmed greater amberjack products to sell, the current virtual and online approach was chosen) and to account for a potential price discount during the first week(s) of introduction, a 15% discount was offered to half of the sample in each country. Price discounts at introduction are common and aim to stimulate trial. The aim of offering the discount to only half of the sample was to prevent overestimation of the adoption potential at the sample level. Any provider launching a new product should take all necessary measures to fuel trial because failure to create consumer interest will increase the chance of a supermarket deciding to discontinue the new product early or denying it shelf space altogether. Interestingly, results showed only a limited and generally non-significant impact of price discount on adoption, while in some cases a negative impact was even noted. This is consistent with observations that discounts may negatively affect quality perceptions of newly introduced products [16].

The outcome of the experiment included information on the following: (i) percentage of consumers who chose greater amberjack out of the choice set, (ii) percentage of consumers willing to consider and to switch to the new species after receiving extra information about the product and the way it was produced, and (iii) percentage of consumers indifferent towards the new product again after receiving extra information. All the above were generated at the country level (see Table 1, upper part). Information about the degree to which consumers were innovators (i.e., tended to be among the first to try new products in the fish category without the need to first taste the product) was also collected (measure borrowed from Goldsmith and Hofacker [17]). An exploratory factor analysis pointed to the existence of two factors with the original scale's item referring to 'not buying a new fish if not having tasted it' as a separate factor. The value of ≥5 (on a 7–point scale) was used to identify those with very high innovative—and no need to taste first—attitudes. These consumers constitute the true innovators in the five countries.

Drawing on these results, proxies of the P and Q values were created for each country. The proxy for P was based on the percentage of consumers who immediately bought greater amberjack. To correct for the fact that not everybody trying the species would immediately adopt it, this percentage was multiplied by the percentage of innovative consumers in the country. The proxy for the contagion factor Q was built on the percentage of switchers and consumers willing to reconsider/try the new product after receiving extra information about it. These consumers do not buy immediately but are affected by internal dynamics of the market, such as observing others (i.e., the innovators) and exposure to word-of-mouth and other product-related information. Again, the value was corrected by multiplying these percentages by the market potential for greater amberjack, that is, the percentage of consumers that had expressed interest in the new product in each country (i.e., 100% minus those not interested in the new species in the country) (see Table 1, row G). The results for P and Q are shown in Table 2.

A comparison of the P and Q values with values used in previous diffusion studies took place after. Although prior research has focused on durables and not on food products, a comparison was considered useful in helping establish face validity. Van den Bulte and Stremersch report a 10%–90% range of 0.001–0.083 and mean of 0.027 for P values of durable products, and a 10%–90% range of 0.128–0.690 with a mean value of 0.419 for Q [10]. In their meta-analysis, Sultan et al. reported similar values/ranges [8]. Comparing the here estimated Q values (see Table 2) to these data, the former appear in the mean/mid-range of values reported in prior research, while for P, current values are at the middle to upper part of the range. These observations can be explained by the fact that this study focusses on food products that are rather affordable and similar to existing products on the market, such as tuna, thus they may be adopted more easily than new electrical devices, among others.

Data regarding market size, market share of tuna (greater amberjack's closest neighbor) in each country, anticipated maximum market penetration of greater amberjack, etc., were collected and estimated too (bottom half of Table 1). These data are necessary in order to be able to forecast the ultimate market share and volume of greater amberjack in each of the five target countries. By combining this data with that of the diffusion model, market volumes for greater amberjack at each period (i.e. at any point in time) might be calculated. To meet demand and prevent product shortage, a provider should ensure production levels that match demand and its growth over time. These final results will thus offer a proxy of the required production capacity at any point in time.

Table 1. Acceptance of greater amberjack by consumers in the five target countries.

Acceptance of Greater Amberjack	Country				
	UK	Germany	France	Italy	Spain
A. Chose greater amberjack (GA)	12.0%	12.0%	10.0%	16.3%	12.5%
B. Did not choose GA, but willing to switch	8.5%	9.2%	14.7%	8.7%	13.8%
C. Did not choose GA, but willing to consider	41.0%	43.7%	30.6%	49.8%	49.3%
D. Did not choose GA, and indifferent to extra info	38.5%	35.1%	44.7%	25.2%	24.4%
Total	100.0%	100.0%	100.0%	100.0%	100.0%
Extra Market Information	**UK**	**Germany**	**France**	**Italy**	**Spain**
E. % consumers that bought tuna in experiment	13.9%	18.9%	17.2%	26.0%	27.0%
F. % of innovators in market	39.1%	34.8%	37.8%	49.8%	40.3%
G. 100% minus% that was not interested in GA	61.5%	64.9%	55.3%	74.8%	75.6%
H. Household consumption of fresh fish 2016 in country (tonnes) †	304.738	68.083	225.659	330.088	666.055
I. Estimated market potential GA (vol.) (A + E)/2×H (tonnes)	52.385	13.666	47.261	84.038	177.368
J. Market size (volume share of country in five country total)	14.0%	3.6%	12.6%	22.4%	47.3%

Source: DIVERSIFY Deliverable 30.6; †: EUMOFA 2017 [18,19].

Table 2. Proxies for P and Q based on the experimental data.

Estimation	Description	Countries				
		UK	Germany	France	Italy	Spain
P	% of all consumers bought first time around × percentage of innovators in the market	0.047	0.042	0.038	0.081	0.050
Q	% switchers and considerers × (100 − % uninterested consumers)	0.305	0.343	0.251	0.438	0.477

4. Results

4.1. Diffusion of Greater Amberjack

Using the above parameters for P and Q and equation (2), the diffusion curves per country were estimated in MS Excel. Figure 2 shows the curves for all five target countries together in a single figure. All curves follow the standard S-like pattern and evolve from zero to 100% adoption/diffusion (vertical axis: 0 and 1.0, respectively).

Comparing the curves, it can be noted that Italy is the market with the fastest adoption and fastest diffusion of the new species, closely followed by Spain. Compared to Italy, the take-off in Spain is somewhat slower. Germany and the UK, as northern EU countries, have a very similar diffusion pattern. However, their take-off is slower than that of both Italy and Spain, while their time to full market penetration is much longer. This is reflected in a flatter S-curve. Interestingly, the French market lags behind in the adoption of greater amberjack. This is due to its low P and Q values and ratio, respectively. The low set of initial adopters in France (see Table 1) causes a slow start, while the ratio explains the less pronounced curvature. Since Italy and Spain are the markets with the quickest take-off and steepest curves, these two countries could be best used as first target markets and thus lead countries.

4.2. Internationalization Strategies and Production Capacity Requirements

The development of market demand (volume) following a waterfall strategy consisting of entry to the Italian market in t1 and to the Spanish market in t3 is reported in Table 3. Results show that for year 1, a production capacity of approximately 9000 tonnes is required, while in year 2 a production capacity of approximately of 20,951 tonnes is needed. In year 3, when entry to the Spanish market is initiated, demand rises to 47,098 tonnes, further increasing to 114,865 tonnes in year 5.

If a competitor would enter the market it would account for some of the product supply and thus production numbers. This would reduce the sales but also the required production capacity of the first mover company. Without such competition, however, the above-mentioned numbers are the production output the first mover should anticipate and aim for.
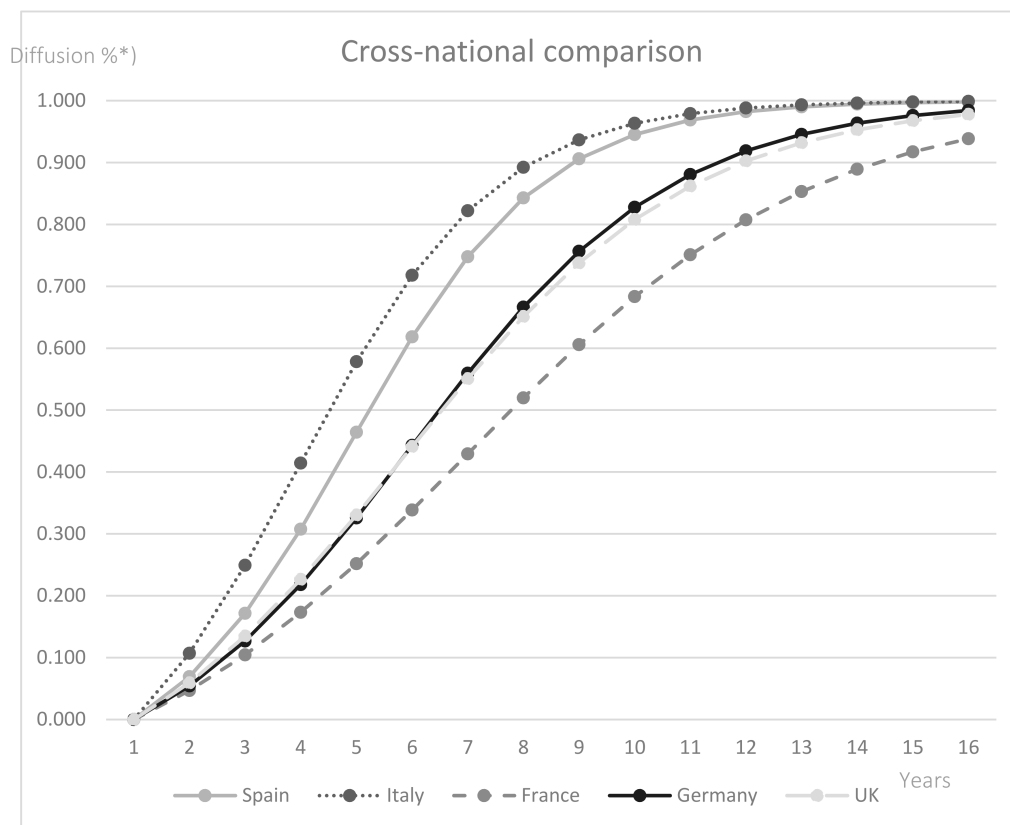

Figure 2. Diffusion curves for the five target countries. *: 1 refers to 100% diffusion whereas 0 means no diffusion at all.

Table 3. Waterfall internationalization strategy and required production volume.

Estimation of Required Production Volume (in Tonnes)			
Period (years)	Italy	Spain	Total Volume
t1	9001	0	9001
t2	20,951	0	20,951
t3	34,815	12,283	47,098
t4	48,592	30,437	79,029
t5	60,329	54,537	114,865

Table 4 shows the development of market volume following a sprinkler internationalization strategy. The example assumes that the new product of greater amberjack is simultaneously launched in all five target markets. The sprinkler strategy would require a capacity of 27,346 tonnes in year

1, increasing to 215,177 tonnes in year 5. A fish farm implementing this strategy should thus be able to scale up production rapidly in order to match the development in market demand in the five geographically different markets. The company should master its production planning well and be able and willing to scale up production capacity efficiently and effectively. Without this ability, dissatisfaction among consumers and retailers will certainly occur.

Table 4. Sprinkler internationalization strategy and required production volume.

Estimation of Required Production Volume (in Tonnes)						
Period (years)	UK	Germany	France	Italy	Spain	Total Volume
t1	3107	742	2213	9001	12,283	27,346
t2	7063	1732	4936	20,951	30,437	65,119
t3	11,854	2,980	8181	34,815	54,537	112,368
t4	17,312	4,452	11,905	48,592	82,345	164,606
t5	23,114	6,053	15,997	60,329	10,9685	215,177

5. Discussion and Conclusions

The current results show the diffusion curves for greater amberjack in each of the top five EU fish markets targeted. Data from an experimental online store test was used as input for the model estimation. Consistent with the 'raw' results of this experiment (see Table 1; i.e., row 1 for the percentage of people who bought greater amberjack for the first time), current findings indicated Italy to be the most innovative and attractive market, with the fastest adoption and diffusion of the new product. Spain was identified as being the second most innovative market, thus representing an interesting market to consider. Italy and Spain are also the most interesting country markets based on volume (i.e., the expected annual market potential is 84,000 and 177,000 tonnes of greater amberjack, respectively). In contrast to the static numbers of Table 1, the results shown in Figure 2 provide a dynamic view. Using a mixed influence Bass model and identifying proxies for P and Q, the present research estimated diffusion patterns.

Interestingly, the current results indicated the French market to be less attractive than one may have expected based on the static results of Table 1. The dichotomy in the market, as well as the lower percentage of initial adopters and of people willing to consider the new species, played a much more significant role in this dynamic perspective, suggesting that adoption in France may be more difficult and slower than in the other four countries examined. The German and UK markets are, in fact, more interesting—except for the fact that the size (volume) of the German market is small.

The results of the exploration of the two internationalization strategies (i.e., "waterfall" and "sprinkler") generated useful new insights regarding production volumes required for each alternative internationalization approach. Since current production levels of farmed greater amberjack are extremely limited, volume restrictions are an important factor to consider. As the results show, a sprinkler approach requires a producer's ability to quickly streamline production protocols and scale up production levels. Both of the strategies—and especially the sprinkler strategy—are only feasible with an adequately large production capacity. While capacity is still limited, the possible inability to deliver on promise will be high. This is particularly problematic in the supermarket channel, where constant quality and delivery are mandatory [20]. Consequently, a waterfall approach focusing on one country first and expanding to a second country in year 2 or 3 makes more sense. A benefit of the waterfall approach is also that the launch can be tailored to local conditions and that it offers the provider and its downstream supply chain partners (i.e., retailers) the opportunity to learn from the experiences of the launch in the (previous) lead country. In this specific context, results confirm that first entering Italy and then Spain would be likely to lead to more incremental growth.

Although the waterfall approach would allow the creation of first mover advantages in the selected markets, one should bear in mind that early success in the most interesting markets will help generate cash flow and increase the scale of operations quickly. This is to be preferred over

exhausting resources. In addition, supermarkets may favor at least two suppliers over time to avoid being dependent on a single source [21].

As mentioned above, previous literature has focused mainly on the post hoc estimation of diffusion patterns. The current effort used ex ante estimation instead. This approach extends the work of Kim, Hong, and Koo, who used expert data to estimate P and Q values [15]. Although experts may be able to predict the customer reception of a new product, it is clear that involving consumers and confronting them with the new product in a "real-life", competitive store setting (with familiar alternatives present, marketing mechanisms deployed (i.e., price discounts), and information available) increase the external validity of results. Although the cost of involving experts may be lower than the cost of creating an experimental set-up involving consumer testing, the relevant investment is more than justifiable. A better estimation of consumer adoption and diffusion will help a firm to plan its strategic marketing approach better and, more importantly, prevent crucial market flaws from taking place.

5.1. Theoretical and Managerial Implications

From a theoretical perspective, the current study shows that data from market/consumer research may be used to estimate diffusion models. The input for the models were data from an online store test. This type of test can also be applied to estimate diffusion curves of other new fish species or novel food products. Furthermore, this study shows that insights from other disciplines, like marketing and management science, may be used to further our understanding in the market development of the European aquaculture market. Future studies comparing alternative ex ante estimations of diffusion patterns of new products in markets (e.g., from expert judgement versus the current online approach) to that of a real market test, and actual market launch outcomes would be very insightful.

From a managerial perspective, the current results show that, for greater amberjack, Italy may be the most innovative and attractive market with the fastest adoption and diffusion of the new product. Spain was identified as being the second most innovative market and thus may also represent another interesting market to consider. Italy and Spain are also the most interesting markets to consider based on market volume. However, one may note that this conclusion is limited to greater amberjack fillets and not processed products. Other consumer studies conducted in the DIVERSIFY project showed that Italian consumers had lower acceptability values for different processed fish products than consumers of the other four countries.

Still, in the short run, the production capacity of farmed greater amberjack may be too low even for a waterfall option involving entry of both Italy and Spain soon after each other. If production remains (very) limited, producers may choose to either launch on a limited scale (e.g., in Italy only) and/or even limit distribution to a particular region or supermarket chain before scaling up. Alternatively, producers may decide to first experiment in a small-volume country, like Germany.

Production location and market access may, of course, play a role in these decisions too. For Spanish producers, first launching in the domestic market may be a more logical option, while Italian producers may select their home country as the lead country too. Leveraging one's home market and local relationships can seriously increase the chance of success. It also eliminates the impact of cultural differences and misunderstandings that may arise from introducing a new product in a foreign market. The current results offer solid information to assist in making these important internationalization decisions and can help ensure future growth for firms making use of these opportunities.

5.2. Limitations and Future Research

Due to the type of data available, the results are specific to greater amberjack and are not necessarily generalizable to other species. However, the current approach does show how a firm may go about making market forecasts and predicting production volumes.

A second limitation is the way the P and Q values were estimated. In particular, the proxy for Q was restricted by the fact that all data were collected at one point in time. As a result, no actual data on internal market effects were available. Future research using a full test market could help provide a better estimate for Q and be used to replicate and extend the current findings.

Third, no sensitivity analyses were included in this study. Future research could explore variations in waterfall options and further account for a provider's presence (i.e., relationships with partners/retailers in particular markets).

Finally, an opportunity for future research is to study diffusion after providers have mastered farming greater amberjack and have entered these markets to compare post hoc with these ex ante predictions. Such a study would help develop further insights into the robustness of performing diffusion forecasts using consumer research data.

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References

1. Peres, R.; Muller, E.; Mahajan, V. Innovation diffusion and new product growth models: A critical review and research directions. *Int. J. Res. Mark.* **2010**, *27*, 91–106. [CrossRef]
2. Nakada, M. Yellowtail and related species culture. In *Encyclopedia of Aquaculture*; Stickney, R.R., Ed.; Wiley: London, UK, 2000; pp. 1007–1036.
3. FAO Cultured Aquatic Species Information Programme, Report Seriola dumerili (Risso, 1810). 2018. Available online: http://www.fao.org/fishery/culturedspecies/Seriola_dumerili/en (accessed on 31 January 2019).
4. Kassie, M.; Jaleta, M.; Shiferaw, B.; Mmbando, F.; Mekuria, M. Adoption of interrelated sustainable agricultural practices in smallholder systems: Evidence from rural Tanzania. *Technol. Forecast. Soc. Chang.* **2013**, *80*, 525–540. [CrossRef]
5. Ndah, H.T.; Knierim, A.; Ndambi, O.A. Fish pond aquaculture in Cameroon: A field survey of determinants for farmers' adoption behaviour. *J. Agric. Educ. Ext.* **2011**, *17*, 309–323. [CrossRef]
6. Kaufmann, P.; Stagl, S.; Franks, D.W. Simulating the diffusion of organic farming practices in two New EU Member States. *Ecol. Econ.* **2009**, *68*, 2580–2593. [CrossRef]
7. Bass, F.M. A new product growth model for consumer durables. *Manag. Sci.* **1969**, *15*, 215–227. [CrossRef]
8. Sultan, F.; Farley, J.H.; Lehmann, D.R. A meta-analysis of applications of diffusion models. *J. Mark. Res.* **1990**, *27*, 70–77. [CrossRef]
9. Mahajan, V.; Peterson, R.A. *Models for Innovation Diffusion*; Sage Publications: Beverly Hills, CA, USA, 1985.
10. Van den Bulte, C.; Stremersch, S. Social contagion and income heterogeneity in new product diffusion: A meta-analytic test. *Mark. Sci.* **2004**, *23*, 530–544. [CrossRef]
11. Talukdar, D.; Sudhir, K.; Ainslie, A. Investigating New product diffusion across products and countries. *Mark. Sci.* **2002**, *21*, 97–114. [CrossRef]
12. Mascarenhas, B. Order of Entry and Performance in International Markets. *Strateg. Manag. J.* **1992**, *13*, 499–510. [CrossRef]
13. Kalish, S.; Mahajan, V.; Muller, E. Waterfall and sprinkler new-product strategies in competitive global markets. *Int. J. Res. Mark.* **1995**, *12*, 105–119. [CrossRef]
14. Stremersch, S.; Lemmens, A. Sales growth of new pharmaceuticals across the globe: The role of regulatory regimes. *Mark. Sci.* **2009**, *28*, 617–808. [CrossRef]
15. Kim, T.; Hong, J.; Koo, H. Forecasting diffusion of innovative technology at pre-launch, a survey-based method. *Ind. Manag. Data Syst.* **2013**, *113*, 800–816. [CrossRef]

16. Schuhmacher, M.C.; Kuester, S.; Hultink, E.J. Appetizer or Main Course: Early Market vs. Majority Market, Go-to-Market Strategies for Radical Innovations. *J. Prod. Innov. Manag.* **2018**, *35*, 106–124. [CrossRef]

17. Goldsmith, R.E.; Hofacker, C.F. Measuring consumer innovativeness. *J. Acad. Mark. Sci.* **1991**, *19*, 209–221. [CrossRef]

18. Deliverable 30.6. Report on Results of Test Markets per Species, FP7-KBBE-2013-07, DIVERSIFY 603121. 2018. Available online: https://www.diversifyfish.eu/uploads/ (accessed on 20 December 2018).

19. EUMOFA. EU Consumer Habits Regarding Fishery and Aquaculture Products, Final Report. 2017. Available online: www.eumofa.eu (accessed on 20 December 2018).

20. Helgesen, Ø. Drivers of customer satisfaction in business-to-business relationships: A case study of Norwegian fish exporting companies operating globally. *Br. Food J.* **2007**, *109*, 819–837. [CrossRef]

21. Alpert, F.H.; Kamins, M.A.; Graham, J.L. An Examination of Reseller Buyer Attitudes toward Order of Brand Entry. *J. Mark.* **1992**, *56*, 25–37. [CrossRef]