Certification Labels Vs Convenience Formats: What drives the market in aquaculture products?

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Certification Labels Vs Convenience Formats: What drives the market in aquaculture products? [1]

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Abstract

A priority for the new Common Fishery Policy will be to enhance the competitiveness of EU aquaculture in compliance with high standards of consumer protection, animal welfare, and environmental sustainability. Consumer expectations in relation to food quality present new business opportunities for EU aquaculture producers who are willing to differentiate their products. In particular, new convenience formats and certification labels are likely to influence consumer choices. This study uses the choice experiment method to investigate consumer preferences and willingness to pay for new convenient formats and certification labels for oysters. Cross-sectional data were collected through a web-based consumer survey carried out in Italy in 2015. The main result of the study is that certification labels are decisively more effective than new convenient preparation formats to differentiate high quality products. However, some heterogeneity was detected in consumer preferences.

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Certification Labels vs Convenience Formats:
What drives the market in aquaculture products?

Introduction

Aquaculture is one of the world's fastest growing food sectors providing approximately half of the global fish production (FAO, 2014).In the EU, aquaculture is important for many coastal regions and accounts for about 20% of the total fish production (European Commission, 2014). However, from 2000 to 2012, while the world aquaculture production more than doubled, from 32.4 to 66.6 million tonnes, the EU aquaculture production fell from 1.4 to 1.3 million tonnes (FAO, 2014).This is significant considering that the EU market of fish and seafood is mostly supplied (65%) by imports(European Commission, 2014). Therefore, a priority for the new Common Fishery Policy (Reg. EU No 1380/2013) isto enhance the competitiveness of EU aquaculture in compliance with high standards of consumer protection, animal welfare, and environmental sustainability.

Consumer expectations in relation to food quality present new business opportunities for the EU aquaculture producers who are willing to differentiate their products(European Commission, 2013).However, this implies that more attention should be focused on a consumer-oriented approach. Quality can only be an effective competitive tool when producers translate consumer wishes into physical product characteristics, and only when consumers have a concrete perception of their desired characteristics in relation to the products available (Grunert, 2005).

This study presents results from a consumer survey conducted in Italy, aimed at investigating how the demand for oysters is influenced by a set of attributes. The study focuses on consumer preferences and willingness to pay (WTP) for new convenient preparation formats and different certification labels.

Recent socio-cultural changes and busy lifestyles are increasing the need to save time

and effort in meal preparation (de Boer, Mc Carthy, Cowan, and Ryan, 2004; Buckley, Cowan, and McCarthy, 2007; Brunner, Van der Horst, and Siegrist, 2010). In addition, consumers tend to perceive fish and seafood as fairly inconvenient food products whose preparation involves a good deal of effort and time (Olsen et al., 2007; Rortveit and Olsen, 2009). High levels of knowledge, and expertise are also necessary in selecting and preparing fish and seafood (Pieniak et al., 2007, 2010a, 2010b; Rortveit and Olsen, 2007; Verbeke et al., 2007; Carlucci et al., 2015). Therefore, new product formats that are quicker and easier to prepare (e.g. fillets, steaks, burgers, pre-prepared fish-based meals, etc.) offer great potential in improving consumer acceptability of fish and seafood products. However, increasing processing levels seem to negatively influence the consumer perception of fish and seafood quality: loss of taste, naturalness, healthiness and nutritional value (Arvanitoyannis et al., 2004; Debucquet, Cornet, Adam, and Cardinal, 2012; Cardoso et al., 2013; Carlucci et al., 2015). Verifying this hypothesis is an important empirical question, and as far as we know no studies have analysed the trade-off between the need for convenience and quality perception in fish and seafood markets.

At the same time, third-party certifications and related labelling (e.g. organic labels, eco-labels, fair-trade labels) are emerging as effective instruments for ensuring food quality and safety (Albersmeier, Schulze, Jahnand Spiller, 2009; Hatanaka, Bain and Busch, 2005; Henson and Reardon, 2005; Hammoudi, Hoffmann and Surry, 2009).However, the global agrifood system is pervaded by a plethora of certification schemes with varying levels of importance.

The introduction of these schemes into the aquaculture sector raises at least two main questions. First, what type of certification label is likely to count the most in terms of consumer choices? Second, how much are consumers willing to pay for these certification labels?

Only a few European studies have explored consumer attitudes and willingness to pay for

certification labels on seafood products (Brécard, Lucas, Pichot, and Salladarré, 2012; Jaffry et al., 2004; Mauracher et al., 2013; Stefani et al., 2012). Moreover, it seems that no one has undertaken an analysis aimed at understanding the trade-off between certification labels and convenience formats in fish and seafood markets.

We focused on the oyster market for a number of reasons. First, oysters are one of the most important products of EU aquaculture[2]. .Second, since oysters are not quick or easy to prepare for consumption[3], the oyster market represents an ideal framework to test the trade-off between perception of quality and the need for convenience . Third, oysters are highly perishable products which are mostly consumed without any cooking, thus consumers are particularly concerned about their safety and quality.

The article is organized as follows. The next section provides a brief literature review in , followed by a methodological discussion and description of the empirical results. We conclude with various recommendations for practitioners and policy makers.

Background

The quality of fish and seafood products depends upon several intrinsic and extrinsic attributes which affect consumer choices and satisfaction. Although a number of studies have investigated consumer preferences in terms of fish and seafood products, most have focused on only a few quality attributes, such as country-of-origin, production method (wild vs farmed),and the level of processing (Carlucci et al., 2015).

As regards the country of origin, several studies carried out in various countries (Birch et al., 2012; Brécard et al., 2009; Brunsø et al., 2009; Claret et al., 2012; Jaffry et al., 2004; Loose, Peschel, and Grebitus, 2012; Mauracher, Tempesta, and Vecchiato, 2013;Stefani et al., 2012) have highlighted a clear preference for domestic fish and seafood, which are

[2] İn terms of production value, the most important EU aquaculture products are salmon (21%), trout (14%), and oysters (12%) (European Commission, 2014).

[3]Oysters are bivalve molluscs which must be opened before consumption. Opening the shells of oysters requires great effort and time as well as special dexterity, which is not easy to learn.

perceived as being superior to imported products in terms of freshness, safety and overall quality. Two Italian studies based on choice modelling (Mauracher, Tempesta, and Vecchiato, 2013;Stefani et al., 2012)found a significant willingness on the part of consumers to pay a premium for domestic fish.

Concerning the production method, an extensive literature has shown that wild fish and seafood are generally perceived as being superior to farmed products in terms of taste, safety, healthiness and nutritional value (Arvanitoyannis et al., 2004; Brunsø et al., 2009;Cardoso et al., 2013; Claret et al.,2012; Hall &Amberg, 2013; Jaffry et al., 2004; Kole, Altintzoglou,Schelvis-Smit, &Luten, 2009; Lawley et al., 2012; Roheim, Sudhakaran, and Durham, 2012; Sveinsdóttir et al.,2009; Verbeke, Sioen, Brunso, De Henauw, and Van Camp, 2007). However, these studies also revealed that consumers' perception of farmed fish and seafood does not appear to be negative and most consumers often eat popular cultivated species such as bream, bass, trout and salmon as a viable alternative to wild products.

On the other hand, a smaller number of studies have investigated consumer attitudes towards fish and seafood products with different processing levels of (Arvanitoyannis et al., 2004; Birch et al., 2012; Cardoso et al., 2013; Claret et al., 2012; Debucquet, Cornet, Adam,& Cardinal, 2012). These studies highlight that, in the last few years, a variety of fish and seafood products with different levels of processing has been developed, mostly to meet the increasing consumer demand for convenience. All these studies identify two distinct consumption patterns. The first pattern belongs to older and habitual consumers who continue to prefer fish and seafood with very close characteristics to the "natural" product and who find what they consider to be negative changes in taste, odour and texture as well asloss of safety, healthiness, and nutritional value caused by product handling and processing. The second pattern is characterized byyounger and non-frequent consumers who are more willing to consume processed fish and seafood products above

all for their convenience. Some hedonic price studies(Roheim, Gardiner, and Asche, 2007; Roheim, Asche, and Santos, 2011; Sogn-Grundvåg, Larsen, and Young, 2014)have also shown that more processed fish products, in particular with added ingredients such as bread, butter and sauces, had lower prices than “natural” product forms.

Finally, only a few studies have explored consumer attitudes and willingness to pay for certification labels on fish and seafood products. In the U.K., Jaffry et al. (2004) found that the presence of a certified ecolabel had a significant and positive influence on consumer choice. In France, Brécard, Lucas, Pichot, and Salladarré (2012) surveyed consumer preferences for three types of certification labels (health, eco, fair-trade), and found that, everything else considered equal, the health-label was the most popular. Two Italian studies (Stefani et al., 2012; Mauracher et al., 2013) and a Norwegian study (Olesen, Alfnes, Røra, andKolstad, 2010) showed that a significant segment of consumers were willing to pay a significant premium price for farmed fish products with an organic label (bream, bass, and salmon, respectively).In the USA, Zhou, Hu, and Huang (2016) found that surveyed consumers on average preferred tuna steak with the “Certified Turtle Safe” (CTS) eco-label and were likely to pay more for it. On the other hand, a number of hedonic analyses provide evidence of a price premium for different certification labels on fish and seafood markets. In particular, for organic salmon, Ankamah-Yeboah, Nielsen, and Nielsen (2016) reported a premium price of 20% on the Danish market, while Asche et al. (2015) found a premium of 25% in the UK. Other studies(Asche et al., 2015; Blomquist, Bartolino, and Waldo, 2015; Roheim, Asche, and Santos, 2011; Sogn-Grundvåg, Larsen, and Young, 2013; Sogn-Grundvåg, Larsen, and Young, 2014) estimated a premium price of 10-14% for the Marine Stewardship Council (MSC) ecolabel on different fishery products (salmon, cod, haddock, and Alaska Pollock).On the other hand, in Germany, Bronnmann and Asche (2016)estimated a price premium of only 4% associated with the same eco-label on frozen seafood.

Theoretical framework and econometric modelling

This study is rooted in the theoretical framework proposed by Lancaster (1966) which has been widely adopted in applied analyses of producers and consumer choices (Ortega et al., 2011; Asche et al., 2015; Waldman and Kerr, 2015; Santeramo et al., 2016). According to Lancaster's theory, consumer utility is directly linked to the characteristics or quality attributes embedded in the products. Differentiated products are perceived by consumers as a bundle of different quality attributes which are independently valued at the time of purchase.

In a similar fashion, we assume that seafood products, and in particular oysters, convey several intrinsic and extrinsic attributes which are important to consumers, including the certification labelling and preparation format. Consumers express individual preferences for product characteristics and maximize their utility according to their budget constraints (Lancaster, 1966).

If utility is additively separable, the consumer has to solve a set of maximization problems for each of the attributes embedded in the product. The empirical counterpart of this theoretical problem is the estimation of a discrete choice model, based on a choice experiment. The experimental design is able to simulate real-world purchasing decisions in that consumers are asked to select a specific product from a set of available options (Chang et al., 2012; Marette et al., 2012). Lusk and Schroeder (2004) and Carlsson et al. (2007), among others, recognized the advantages of choice experiments compared to other experimental methods, mainly because they are in line with both the random utility theory and Lancaster's theory. We designed an ad-hoc choice experiment.

We assume that at given time *t*, each individual *n* obtains utility [U_{nit}] from a product alternative *i.* In other words, each consumer maximizes his / her utility by selecting the preferred alternative from a finite set of *J* alternatives. Consumer utility for the alternative *i*

can be separated into a deterministic component [V_{nit}], depending on the specific mixture of product attributes, and a stochastic component [ε_{nit}]:

$U_{nit} = V_{nit} + \varepsilon_{nit}$

The individual *n* will choose the alternative that provides the highest utility through a pairwise comparison over the full set of alternatives: the alternative *i* is preferred to *j* if it provides a higher utility ($U_{nit} > U_{njt}; \forall j \neq i$). Given the stochastic nature of the hypothesized utility function, the maximization problem is solved probabilistically: each consumer *n* will choose the alternative *i*if it provides the highest utility from among the set of *J* alternatives. The probability of choosing the alternative *i* (P_{nit}) equalsthe probability that the associated utility will provide the highest utility for consumer *n*:

$P_{nit} = \text{Prob}[(V_{nit} + \varepsilon_{nit}) > (V_{njt} + \varepsilon_{nit})] > 0 \; ; \forall j \neq i \; , \forall J$

. Thus by recognizing that individual preferences are likely to be heterogeneous as individual characteristics are (Resano et al., 2012; Janssen& Hamm, 2014), we[[[[[move a step forward and]]]]adopt Random Parameter Logit (RPLM) and Latent Class (LCM) models which are capable of taking such heterogeneity into account. Their use has been increasing in applied economic research to investigate heterogeneity in consumer preferences (Tonsor, Wolf and Olynk, 2009; Tonsor and Wolf, 2011). The RPLM is a highly flexible model capable of approximating any Random Utility Model (RUM) by relaxing the assumption of the traditional logit models of homogenous tastes. The RPLM allows for random taste variation within the sample (McFadden & Train, 2000), while the deterministic component of the utility function [V_{nit}] is linear in the product attributes:

$V_{nit} = \beta' \mathrm{X}_{nit}$

where β' is a vector of random parameters, with known mean and variance (McFadden & Train, 2000),which represent individual preferences; X_{nit} stands for the vector of attributes embedded in the i^{th} alternative. Following Train (2009), the probability of the individual *n*

choosing the alternative *i* at given time *t* is computed as follows:

$$P_{nit} = \int \frac{\exp\,(V_{nit})}{\sum_j \exp\,(V_{njt})}\, f(\beta) d\beta$$

where the distribution *f*(.) of the random parametersβ is specified by the analyst. Alternatively, the heterogeneity of individual preferences may be assumed to follow a discrete distribution, as in the latent class approach, which enables individuals to be grouped by homogeneous preferences (Bechtold and Abdulai, 2014). Therefore, in the LCM, each of the latent classes have a parameter space consisting of up to *S* values (Train, 2009).The unconditional probability of each individual *n* choosing the alternative *i* is a weighted sum of probabilities:

$$P_{nit} = \sum_{s=1}^{S} \frac{\exp\,(\beta'_s X_{nit})}{\sum_j \exp\,(\beta'_s X_{njt})} R_{ns}$$

where β'_s is the specific parameter vector for the class *s*, and R_{ns} is the probability of the individual *n* falling into the latent class *s*. Such probability depends on the observed characteristics (Ouma, Abdulai, & Drucker, 2007):

$$R_{ns} = \frac{\exp(\theta'_s Z_n)}{\sum_r \exp\,(\theta'_r Z_n)}$$

where Z_n is a set of observable characteristics affecting the class membership for individual *n*, and θ'_s is a parameter vector for consumers in class *s*.

The choice experiment

In order to select the relevant quality attributes associated with consumer purchasing decisions, and thus to avoid under- or over-identifying the model specification, we conducted a pilot study based on focus group discussions. We conducted four focus groups in major Italian cities (Milano, Bologna, Roma and Bari) to investigate consumer purchasing behaviours and consumption habits in relation to oysters. In addition we

carried out two in-depth interviews with economic operators who have great expertise in the production, processing and selling of oysters. As a result, we identified four main attributes affecting consumer choice of oysters: species, country of origin, size[4] and price. The choice experiment included these four attributes plus two additional variables of great interest for our analysis: certification labelling and preparation format.

TABLE 1

Each attribute was included in the choice experiment with two or more levels as detailed in Table 1. We considered the two most important species of oysters cultivated and sold in Europe: the native "flat oyster" (*Ostrea edulis*) and the most common "cupped oyster" (*Crassostreagigas*), which is native to Japan and was brought to Europe in the 1970s. We included three different country of origin labels: "Italy" (the country in the survey), "France" (the most important and renowned oyster-producing country in Europe), and "other EU countries". We considered three size categories(small, medium and large), and four price levels (€4.00, €6.00, €8.00, €10.00 per half dozen) representing the range of market prices available at the time of the study. Finally, we included three types of preparation formats with increasing levels of convenience (closed, pre-shucked, and half-shell[5]), and four types of certification labels: safety, traceability, organic, and "no certification[6].

Note thata full factorial experimental design - with all possible combinations of the six attributes with related levels and the three alternatives - would require 864(i.e. $2 \cdot 3^3 \cdot 4^2$) choice sets. Such a large number of choice would make the experiment extremely costly, if

[4] The size of oysters as an significant attribute affecting consumer choice is also supported by various hedonic studies that highlight the strong effect of size on the price of seafood products (Hammarlund, 2015; Sjöberg, 2015).

[5] Closed oysters are traditionally sold on the European market and must be opened before consumption. Pre-shucked and half-shell oysters are new preparation formatsalready available on international seafood markets such as Australia (Loose et al., 2012) and the USA (Bruner et al., 2014), but still practically unavailable on the European market. Both pre-shucked and half-shell oysters are ready-to-eat products as they are pre-opened. Pre-shucked oysters keep the two original shells together, thus appearing very similar to closed oysters, while half-shell oysters are sold with one shell only and with the edible part made clearly visible.

[6] The chose types of certification labels were the most preferred, according to the participants in the pilot study. The three types of certification labels were: *i)* a safety label assuring that the product and the production process fulfil high safety standards; *ii)* a traceability label assuring that an advanced traceability system has been adopted so that the name and location of the producer is readable on the label; *iii)* an organic label assuring that the production process is free of chemical inputs (e.g. hormones, antibiotics, OGM feed, etc.).

not unfeasible. We thus reduced the number of choice sets through a fractional factorial design capable of producing forty choice sets, subsequently put into ten versions of the questionnaire[7],each containing four choice sets. Respondents were randomly allocated to one of the ten versions of the questionnaire and each respondent was presented with photo-realistic images showing three product alternatives and the no-choice option (negative purchase intent) in each choice set (Figure 1).

FIGURE 1

The survey was carried out in Italy in March and April 2015.A total of 800 participants were recruited by a market research agency specialised in conducting on-line consumer surveys. The agency actively manages anon-line panel of 45,000 members, who are representative of the Italian population in terms of geographical area, age, gender, education and income. Participants were randomly selected from the panel and according to two inclusion criteria: *i)*the participant had to be the member of the household responsible for food purchasing, and *ii)*the participant had to have consumed oysters at home at least once in the last year. Participants who met these criteria were asked to take part in the survey through a web-based interview. The socio-demographic characteristics of the final sample are presented in Table 2.

TABLE 2

Estimation and willingness-to-pay

We estimated an RPLM and an LCM. The "opt-out" variable eliminated potential confounding effects between the constant and the attributes (Bech and Gyrd-Hansen,

[7]Blocking overcame the unfeasibility of our choice experiment which contains several attributes and levels and refers to a market with a relatively limited number of consumers. We used a D-optimal criterion to selectan optimal set of combination of choices, thus exploiting the information obtained through the specific survey design.

2005; Resano, Sanjuán, and Albisu, 2012). In the RPLM, it was assumed that product-specific parameters were distributed normally . A preliminary analysis showed that price effect was homogeneous across consumers, and thus the constant ("opt-out"), the price, and the interaction terms were treated as fixed (Ubilava and Foster, 2009). We estimated the RPLM using 1000 Halton draws for the simulations. For the LCM, through the Akaike and Bayesian Information Criterion, we identified four classes as the optimal number of classes.

The parameter estimates for both models were interpreted in relative terms in that they represented changes in utility with respect to the omitted alternative. The WTP was computed through the ratio of the estimates for each attribute and the estimate for the price:$WTP_k = -\frac{\beta_k}{\beta_p}$

where WTP_k is the willingness-to-pay for the k^{th} attribute, β_k represents the estimated parameter of the k^{th} attribute, and β_p is the estimated coefficient for price. Confidence intervals at 95% for the WTP estimates were calculated using the parametric bootstrapping technique proposed by Krinsky and Robb (1986): 1000 replications for each estimated WTP were obtained by drawing from a multivariate normal distribution. This procedure produces comparable results to those provided by the delta method with the advantage of relaxing the assumption that WTP is symmetrically distributed (Hole, 2007).

Empirical results

First we estimated a conditional logit model and a mixed logit model (Table 3). The results of the two models were similar in terms of signs and the statistical significance of parameters.

TABLE 3

Price was negatively correlated with consumer choices; we found that the country of origin has a large impact on consumers' choices which tend to show a home bias effect. The three certification labels were found to be the most important attributes in consumer purchasing decisions. Conversely, the product size was less important, although the coefficient was statistically significant. Finally, consumer choices were not influenced by the species(flat or cupped)nor by the preparation format(closed, pre-shucked or half-shell). The high similarity of the results from the conditional and mixed logit models suggests that the findings were robust with respect to the heterogeneity of consumerpreferences, and independent of the irrelevant alternatives assumption (Hole, 2007). However, the mixed logit model provided some insights into the heterogeneity of the consumer preferences. In particular, the consumer preferences for certification labels ("organic label", "traceability label" and "safety label") and for a few other attributes ("cupped", "France", "large" and "half-shell") were found to be heterogeneous.These attributes showed statistically different standard deviations for the coefficients estimated.

A better understanding of the role of each attribute in the consumer choice was provided by the results of the WTP, whose estimated mean and 95% confidence intervals are presented in Table 4.

TABLE 4

We will comment only on the variables with coefficients that are statistically different from zero[8]. Consumers were willing to pay the highest premium (about 13 euros per half-dozen)for certified oysters, regardless of the type of certification label. Italian and French origin also gained a premium, although it was very different in magnitude (12.1 and 5.6

[8] As highlighted by a reviewer, the estimated WTP may be upward biased due to a sample selection bias: consumers of such a high value product as oyster may differ from other seafood consumers and in particular are likely to be willing to pay a higher premium for safety.

euros, respectively) with respect to the premium consumers would pay for oysters from other EU countries. Medium and large sized oysters are generally sold for 2 to 3 euros more than small sized oysters. The premium for cupped oysters, rather than flat oysters, was only 1 euro. Lastly, consumers were not willing to pay a premium for new convenient preparation formats, such as the half-shell and pre-shucked oysters.

More insights regarding the heterogeneity of consumer preferences were provided by the results of the LCM which identified four classes of homogeneous consumers (Table 5).Class 1 represented the smallest group of consumers, accounting for 10.7% of the sample size. Consumers in this group showed the highest sensitivity to price and tended to choose the oysters with the lowest price, irrespectively of other quality attributes. Class 4 was the largest group of consumers, accounting for 36.8% of the total sample. It groups consumers who were not concerned with price and were positively influenced by all the other oyster attributes, including the new convenient preparation formats. Classes 2 and 3 showed intermediate characteristics: class 2 (21.1% of total sample) included consumers who were extremely attracted by the certification label, tended to prefer Italian or French oysters, and disliked large sized products. Class 3 (31.4% of total sample) grouped consumers who were very appreciative of certification labels, such as an Italian and French country of origin label, safety, organic and traceability labels, preferred more sized oysters, and disliked convenient formats (particularly half-shell oysters).

TABLE 5

Conclusions and implications

The recent developments in the aquaculture markets have pushed the EU Commission to adopt Strategic Guidelines aimed at enhancing a sustainable and competitive sector (European Commission, 2013) and to ensure high standards of consumer protection,

animal welfare, and environmental sustainability.

At the same time the stiff competition among producers and high consumer expectations regarding food quality are pushing the market toward segmentation via product differentiation. As a result, convenience formats and certification labels are expected to be increasingly adopted for oysters. The relevance of these attributes in terms of consumer purchasing decisions, however, is still under-investigated.

We conducted a choice experiment to investigate consumer preferences for the quality attributes of oysters and, in particular, certification labelling and preparation format. The main result of the study is that the vast majority of consumers consider certification labels to be very important and are willing to pay a significant premium for them. However, while consumers prefer certified products, their preferences are not biased towards any particular certification label that guarantees safety, provides traceability, or that certifies the naturalness of the product (i.e. that certifies that the product is organic).In other words, consumers seem to value certification in itself as a guarantee that the product and the whole production process have been properly and systematically controlled by a third party. Therefore, despite EU mandatory standards for food safety and quality being among the most stringent in the world, consumers(and in particular consumers with higher levels of consumption) are likely to need additional guarantees when they purchase and consume aquaculture products, and in particular oysters[9]. Similar conclusions are supported by Wang et al. (2013) and Ortega et al. (2014).

These findings highlight three main points. First, at least in the Italian market of seafood products, the role of the brand is limited in guaranteeing quality since the supply chain is highly fragmented[10]. Second, the public supervision of control measures over such a

[9]As pointed out by a reviewer, it is likely that there is an underlying perception that convenient products are not safe, and therefore consumers are likely to require an additional guarantee for food safety. To the extent that the seafood industry aims to promote new convenience formats, additional interventions are needed to build trust and orient risk perception in the seafood markets.

[10] This is also peculiar of the EU fruits and vegetable sector (Santeramo, 2015; Santeramo and Cramon-Taubadel,

fragmented supply chain (with thousands of small producers, traders and retailers) is quite difficult. Lastly, seafood products (and oysters in particular) are highly perishable products, often consumed in their live form without any cooking. Needless to say, these circumstances increase the concerns regarding the safety and quality of products, and consumers are in search of additional guarantees.

Our results also show that consumers of oysters are not very interested in new convenient preparation formats (although preferences are rather heterogeneous)[11].Some consumers are price sensitive and do not value convenience formats; others dislike the formats with the highest level of convenience. The remaining share of consumers appreciate and value new convenient formats of oysters. However, the last group we mentioned is particular in that it consists of consumers who are very interested not only in convenience but also in quality attributes (certification labels, Italian or French origin, and a medium-large size).

To sum up, certification labels seem to be decisively more effective than new convenient preparation formats in differentiating high quality products in the EU aquaculture market. The results are in line with Dedah et al. (2011) and Fonner and Sylvia (2014, who found that warning labels influence the demand for oysters in the US, and are capable of stimulating niche market strategies. Certification labels meet the needs of the majority of consumers who want to receive additional safety and quality guarantees for seafood products. The next step is the implementation of certification schemes, which requires the participation and coordination of the majority of operators at different stages of the supply chain, so that horizontal and vertical coordination strategies are implemented effectively (Hammoudi, Hoffmann & Surry, 2009). Given the preference of consumers for certifications and their benefit in terms of welfare, EU policy makers need to develop specific measures to incentivize the implementation of certification schemes.

2016), as well as of the seafood sector in other countries (Tran et al., 2013).

[11]As pointed out by a reviewer, while this is evident for oysters, the same conclusion cannot be drawn for other seafood products. Exploring this issue would be an important research area.

Thus new preparation formats of oysters are likely to be successful for one segment of the market, i.e. for those consumers in search of high quality products. Whilst it is not proved in our analysis, it is likely that certification labels and convenience formats have a synergic effect on high-quality demanding consumers.

A few limitations of the study are worth highlighting. First, the external validity of our analysis has not been proved, although, given the analogies that the Italian market shares with the markets in specific regions of the EU (e.g. Greece, Spain), we believe that our results reflect the European market. Second, the use of only oyster consumers in our analysis does not enable conclusions to be drawn on the potential that convenience formats and certification labels may have in attracting new customers. Indeed, our estimated WTPs, which represent an upper bound for the entire population, are quite high which suggests that convenience formats and certification labels may help producers in acquiring new clients.

A further aspect that deserves investigation is the possible interaction among certifications, which has already been reported for other markets (*cfr*. Onozaka and McFadden, 2011; Uchida et al, 2014). Understanding consumer preferences' for certification and convenience formats is likely to remain an important step in ensuring sustainability in agrifood markets. Exploring these aspects further would be an interesting area of research.

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Table 1 - Attributes and levels of the choice experiment design.

Attributes	**Levels**
Species	flat oysters (*Ostrea edulis*); cupped oysters (*Crassostreagigas*)
Country of origin	Italy; France; other EU countries
Size	small (16-30 pieces/kg), medium (10-15 pieces/kg), large (4-9 pieces/kg)
Certification label	safety; traceability; organic; none
Preparation format	closed; pre-shucked; half-shell

Price (per half dz)	€4.00; €6.00; €8.00; €10.00

Table 2 – Socio-demographic statistics.

Sample size (persons)	800
Gender (%)	
Female	55.4
Male	44.6
Age (mean ± St. Dev)	*41.3 ±*
Education (%)	
Primary	11.8
Secondary	57.8
Higher	30.4
Household size (mean ± St. Dev)	3.1 ± 1.1
Household monthly income (%)	
< 1.000 €	4.9
1.000 - 2.000 €	27.6
2.001 - 3.000 €	31.4
3.001 - 4.000 €	19.3
4.001 - 5.000 €	8.0
> 5.000 €	8.8
Oyster consumption frequency (%)	
One or more times per month	30.8
Less than once per month but more than four times per year	39.4
1 – 4 times per year	29.8

Table 3 – Conditional and Mixed Logit Models.

	Conditional Logit	**Mixed Logit**	
	Average effect	Average effect	Standard deviation
Price	-0.053 ** (5.66)	-0.121 ** (4.37)	0.148 (1.15)
Cupped oyster (species)	0.077 (1.50)	0.144+ (1.68)	0.774* (2.05)
Italy (country of origin)	0.917 ** (15.37)	1.467 ** (6.30)	-0.167 (0.30)
France (country of origin)	0.377 ** (5.63)	0.683 ** (4.58)	-1.188* (2.38)
Medium (size)	0.242 ** (3.95)	0.290** (2.66)	-0.322 (0.68)
Large (size)	0.317 ** (5.04)	0.405** (3.36)	-1.257* (2.55)
Safety (certification label)	1.083 ** (13.32)	1.602 ** (5.79)	-1.131 * (1.93)
Traceability (certification label)	1.032** (13.38)	1.617 ** (5.87)	1.780 ** (2.78)
Organic (certification label)	1.015 ** (14.12)	1.559 ** (5.97)	2.372 ** (3.90)
Half-shell (preparation format)	-0.066 (1.11)	-0.169 (1.48)	1.565 ** (3.55)
Pre-shucked (preparation format)	0.087 (1.38)	0.031 (0.30)	-0.240 (0.62)

Note: ***, **, and * denote statistical significance at 1%, 5%, and 10%, respectively.
Standard errors are presented in parentheses.

Table 4 – Willingness To Pay.

Attributes and levels	**WTP**	**Lower bound**	**Upper bound**
Cupped oyster (species)	1.18	-0.18	2.55
Italy (country of origin)	12.08	7.43	16.73
France (country of origin)	5.62	2.82	8.42
Medium (size)	2.39	0.41	4.37
Large (size)	3.33	1.08	5.59
Safety (certification label)	13.19	8.18	18.21
Traceability (certification label)	13.31	7.93	18.70
Organic (certification label)	12.84	7.80	17.87
Half-shell (preparation format)	-1.39	-3.27	0.49
Pre-shucked (preparation format)	0.26	-1.46	1.97

Note: confidence intervals are computed through the delta method (cfr. Hole, 2007).

Table 5 – Latent Class Model.

	Class 1	Class 2	Class 3	Class 4
Price	-0.259*** (0.042)	-0.193*** (0.047)	-0.055 ** (0.026)	-0.017 (0.022)
Cupped oyster (species)	0.212 (0.288)	0.031 (0.213)	-0.246 (0.167)	0.300 *** (0.113)
Italy (country of origin)	0.069 (0.359)	1.129*** (0.273)	1.586 *** (0.202)	1.085 *** (0.149)
France (country of origin)	0.091 (0.368)	0.600 * (0.334)	0.528** (0.214)	0.536 *** (0.137)
Medium (size)	-0.415 (0.321)	-0.322 (0.217)	0.569 *** (0.207)	0.487 *** (0.147)
Large (size)	0.104 (0.298)	-0.785 ** (0.318)	0.821*** (0.204)	0.783 *** (0.145)
Safety (certification label)	0.566 (0.356)	4.140 *** (0.828)	1.423 *** (0.207)	0.587 *** (0.169)
Traceability (certification label)	0.414 (0.362)	3.498 *** (0.637)	1.450 *** (0.214)	0.756*** (0.169)
Organic (certification label)	0.287 (0.345)	5.485 *** (0.884)	0.774 *** (0.187)	0.424** (0.166)
Half-shell (preparation format)	-0.595 (0.364)	-0.080 (0.281)	-2.201*** (0.393)	1.101*** (0.169)
Pre-shucked (preparation format)	-0.569 (0.376)	-0.195 (0.298)	-0.281 (0.193)	0.369 (0.152)**
Share	10.7%	21.1%	31.4%	36.8%

Note: ***, **, and * denote statistical significance at 1%, 5%, and 10%, respectively.
Standard errors are presented in parentheses.

Fig. 1. Example of a choice-set with visual simulation