Are Expectations Being Met? Consumer Preferences and Rewards for Sustainably Certified Fisheries

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Abstract

The paper evaluates the potential consumers' response from the United Kingdom and Denmark to the introduction of certification for the sustainability and quality of seafood products. Broadly speaking, it was found that consumers were willing to pay a price premium for and buy more of hypothetically labelled products. Fifteen years on, drawing on the experience of the fisheries that have already actually been certified, the paper evaluates the effectiveness of certification and conclude that consumers are still willing to pay premiums for certified seafood products but few fisheries have in fact achieved the size of predicted price premiums or increases in sale volumes predicted and that the product and geographic variation is particularly marked.

1.   Introduction

Traditionally, the focus of fisheries management has lain with supply-side measures and attempts to use these measures to promote responsible and sustainable fisheries management. Such measures have included the determination of total allowable catch, quotas and individual transferable quotas, licenses and technical conservation measures. They have also included international initiatives (UNCLOS, the Rio Declaration, UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks, FAO Code of Conduct for Responsible Fisheries, and the Common Fisheries Policy) as well as national policy measures. Over the past few decades, however, there has been a growing recognition that traditional supply-side measures have proven insufficient on their own to adequately address many of the management challenges facing fisheries management, particularly over-exploitation ([1-3]).

Reflecting this, both academics and fisheries management stakeholders started to look to the potential of complementary demand-side measures ([1-4]), building on a growing body of literature exploring the market for seafood products ([5-9]), the determinants of the consumption of fish and shellfish ([10-14]) and the relationship between price, consumption and product attributes ([15-16]).

One of the principal areas of research during the latter half of the 1990s targeted the eco-labelling of seafood products ([17-20]). Traditionally there had been little differentiation among seafood products, such that consumers were largely unable to exercise choice as to the location and state of the fishery their seafood came from and how it was caught. Researchers were, therefore, interested in establishing whether product labelling could influence consumer choice and could be used, inter alia, to enlist consumer support for, and reward, desirable fisheries management and product processing practices. Within the policy arena, this interest was paralleled by the creation of the Marine Stewardship Council (MSC) in 1996 through a joint initiative between the World Wide Fund for Nature (WWF) and Unilever ([21]) following the collapse of the Grand Banks cod fishery that was once the largest fishery in the world. The MSC quickly set about spreading sustainability certification (and associated ecolabelling) to eligible fisheries around the world. In April 2013 the European Parliament registered support for the introduction of an EU-wide ecolabelling scheme for fish

and aquaculture products[1], requesting the Commission to submit a feasibility report on options for a Union-wide ecolabel scheme (for which a public consultation took place between April 2015 and July 2015).

It is now over 15 years since the creation of the Marine Stewardship Council and over 10 years since the first MSC certified products started to enter the retail market. Other certification schemes have also been developed covering seafood and its sustainability, as with Friend of the Sea, the KRAV label in Sweden, Icelandic Responsible Fisheries, and Naturland (Association for Organic Agriculture) in Germany, among others ([22-26])). Despite these efforts and the success in the introduction of seafood labels, some authors have recently debated about the credibility of labels and authority who issues these labels. For example [23] have evaluated the challenges in maintaining credibility, accessibility and evolution process of certification by organisations such MSC. The authors argued that MSC certification should adopt tiered system alongside already established metric based principle indicator system. Similarly, [25] also evaluated the credibility issue in tuna sustainability labelling by two certifier (MSC and Dolphin Safe). The authors concluded that the credibility of label is greatly helped by the authority of the standard setter. Interestingly, authority of the standard setter appears to be more important than credibility of the label. Some authors argued that that certification system perhaps does not adequately address the sustainability issue and broadly speaking standards appears to be less stringent.

It is, therefore, timely to review the answer to a key question: whether product labelling is having the desired effect of enlisting consumer support for and rewarding desirable fisheries practices and, is this effect as expected? This paper addresses this question by starting with expectations formation by a study undertaken in the United Kingdom and Denmark in 2000 that, inter alia, estimated consumers' preferences and willingness to pay for and the quantity demand of labelled seafood products using expressed preference methods. The 1999-2000 study[i] was undertaken before the first MSC certified products gained any real presence in the market place and was designed to establish whether consumers in the two case study countries were likely to buy more or pay a premium for sustainably labelled seafood products. The survey employed choice experiments [27] to determine relative preferences for quality and sustainability labelling

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1 Regulation (EU) No 1379/2013 of the European Parliament and of the Council of 11 December 2013 on the common organisation of the markets in fishery and aquaculture products, amending Council Regulations (EC) No 1184/2006 and (EC) No 1224/2009 and repealing Council Regulation (EC) No 104/2000.

alongside other product specific attributes. Quality labelling was included as a comparator as consumers from many countries exhibit limited skills and confidence in identifying the quality of seafood from visual cues ([13, 28-32]). With few, if any, explicit cues available to help them at the time, and reports in the media addressing the potential health concerns of certain seafood (e.g. farmed salmon ([33]) and the risks of pathogenic *Vibrio spp.* and viruses in shellfish and *Listeria* monocytogenes in lightly preserved fish products ([34])), consumers were also likely to express preferences for quality and safety assurances ([30, 35-37]). Here, we compare these fifteen year old consumer responses with a number of more recent studies, surveys and practices. As the EU wide ecolabelling initiative gains momentum, it is timely to review these studies to elucidate the indicated potential of labelling fish and other seafood products.

Using the 2000 consumer choice survey data in the UK and Denmark, it was evident that there was a marked preference among consumers for 'reassurance labelling' both in respect of quality and sustainability labelling and the other label formats incorporated within the study. It was also evident that there was likely to be marked inconsistency in the market take-up of quality and sustainably labelled fish and seafood products as they were introduced. The significance, scale and willingness to pay varied between fish products, labels and consumer groupings. When the results for the two targeted label formats were interacted with the respondents' key socio-economic factors, it became evident that different food expenditure groupings exhibited preferences for certain product-label combinations as did different age groups and gender, with significant national differences also evident. In the UK, the labels actually exerted a smaller influence than generational distinctions in eating habits, an observation also true of the Danish results in terms of age. In terms of the influence of food expenditure on choice; this was more marked in the UK than in Denmark. However, when gender was analysed, there was less of a gender inspired difference in the UK than in Denmark.

The rest of the paper is comprised of five sections. Section two contains theoretical underpinning and specification of utility function and how discrete choice method is used to determine relative preferences for product attributes and to elicit willing to pay estimates. This section is further appended by brief summary of questionnaire design and delivery of survey. Section three contains empirical findings and the formation of expectations based on the analysis in term of what consumers revealed fifteen years ago, which is then followed by a section looking into what has actually transpired since 2000. The paper then concludes with a discussion and the presentation of conclusions and suggestions for future research on this issue.

2. Methodology

The application of self-explicated utility approaches (notably conjoint analysis) are not new to research characterising seafood markets, being used in 1980s and 1990s for salmon markets in the USA ([38-39]) and Japan [40] and striped bass [41]. Since 2000, a significant number of studies have used this method to determine relative preferences and willingness to pay without any geographic limitation (see Table 1 for a selection of studies that have used this method since 2000 for the food products in particular).

[Insert Table 1 about here]

2.1 Theory of discrete choice method to determine relative preferences

To study consumer behaviour, one can present to an individual a set of alternatives with differing attributes from which they are asked to choose the most preferred alternative (i.e. a discrete choice scenario). Similarly, one can elicit from such individuals their socio-economic and demographic attributes. Depending upon whether the attributes of the alternatives or the attributes of the individual, or both, are expected to be important factors in explaining choice it is possible to model consumer behaviour. In this discrete choice scenario, a number of econometric models can potentially be used to explain the probability of the individual choosing the alternative i over j in accordance with the assumption that the individual reaps the greatest utility for alternative i over j. Discussion has focused in on both the generalized and conditional logit models, with the choice of probability models depending on the objective of the analysis. Where the objective is to analyse choice behaviour and the attributes of the alternatives are expected to be determining factors then the conditional logit is used, with choice treated as a function of the characteristics (attributes) of the alternatives in the choice set. Where the characteristics of the individuals are the most important factor in explaining choice behaviour then a generalised logit model is used, with choice being a function of the attributes of the individuals making the choice. Where choice is regarded as a function of both the attributes of the alternatives and the attributes of individuals then a mixed logit model is appropriate, as in this case.

In a discrete choice experiment, where an individual chooses among n alternatives in a choice set, Π_{jk} is the probability of an individual j choosing alternative k, X_j represents the characteristics of individual j, and Z_{jk} represents the characteristics of the kth alternative. For example, X_j may be the age of the individual j and Z_{jk} is labelled cod fillets. For the mixed logit model, which includes both the characteristics of the individuals and the alternatives, the choice probabilities are therefore:

$$\Pi_{jk} = \frac{\exp(\beta'_k \mathbf{X}_{j+}\theta'\mathbf{Z}_{jk})}{\sum_{t=1}^{m}\exp(\beta'_l \mathbf{X}_{j+}\theta'\mathbf{Z}_{jl})}$$

(1)

where β1,…,βm-1, and βm, ≡ 0 are the alternative-specific coefficients (the coefficients attached to the socio-economic variables (i.e. fixed for individuals), with θ the set of global coefficients (all the coefficients in the model). Of course, Xj which represents the characteristics of the individual would be dropped in the above framework where characteristics of the individuals are not assumed to have any impact on choice of attributes. This is the approach taken here.

2.2   Empirical model specification

Having outlined the basis of the general econometric specification of the utility models used in the paper, the discussion now turns to the empirical model. In the survey each respondent was presented with 5 cards (1 practice card and 4 recorded), each card having 6 choice alternatives including none of these (i.e. none of the alternatives offered) and don't know. The choice alternatives were composed of 7 attributes, both those targeted by the study and others of equal legitimacy intended to minimise voting bias (see Table 2). Alongside the presence or absence of a quality or sustainability label were, therefore, price and five other attributes: a description of the seafood product form, its origin (whether produced domestically or abroad or caught by domestic fishermen or by foreign fishermen), whether it had been caught in the wild or farmed, who the certifier was if it was certified (governmental or non-governmental) and whether it was a manufacturer or store branded product. There were six seafood product forms chosen for the study, reflecting: their high market penetration within the United Kingdom and Denmark; their suitability for use by a revealed preference study also being undertaken; and to avoid zero answers due to product form rather than labelling (Table 2). The other attributes included reflected trends underway in fish product labelling and the type of information that could be present on the packaging or in the marketing of a seafood product, hence simulating a potential real world scenario and increasing the predictive validity of the results.

Each of the above mentioned attributes had at least two levels, with product form having six levels/forms and the price attribute four levels (low, medium, high and very high). The latter were translated into monetary values at set percentages above and below the current average retail price for each of the products forms used. To evaluate consumers' responses to the various combinations of these attributes, an orthogonal main-

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effects design using a fractional factorial routine in SPSS generated 32 choice sets from the attributes, from which a block design utilising SAS created 8 blocks (choice sets) of 4 choice alternatives per block. These choice sets were transferred on to 8 cue cards, with each respondent being presented with 5 cue cards (as aforementioned).

The number of alternatives or choices presented to each respondent theoretically depends on the number of the coefficients to be estimated. However, there is evidence that certain numbers of choices can make respondents confused and undermine their interest. According to [55], the use of 15 to 20 (or to 25) alternatives does not significantly affect the standard error of the parameters, however, other authors cite the optimal number to be presented at one time to be much lower. The block design and the number of cards to present were, therefore, selected to minimise this effect as well as to minimise non-responses (zeros), while providing, in combination with a random number chart, for each choice to be presented an equal number of times throughout the survey and the respondent to be presented with a choice set that mimics the purchase environment. For the analysis, two econometric specifications were estimated. Firstly, the seafood product forms were interacted with the two targeted labels and with price, the latter to obtain product form-specific prices. Note that the number of respondents who chose the uncertified product forms ultimately proved insufficient to analyse the uncertified product form in any depth. In the second model, the sustainability and quality labelled products and the individual demographic and socio-economic factors were interacted, reflecting that the choice of the product was likely to vary with the demographic and socio-economic factors. The first model took the following form:

$$
\begin{aligned}
V_{ij} = &\sum_{jk} \alpha_{0j} (type\ of\ product_j * price) + \sum_j \alpha_{1j} (sustainability * type\ of\ product) \\
&+ \sum_j \alpha_{2j} (quality * type\ of\ product) + \sum_j \beta_{0j} (govt.) + \sum_j \beta_{1j} (non-govt.) \\
&+ \sum_j \gamma_{0j} (UK/Denmark) + \sum_j \gamma_{1j} (abroad) + \sum_j \delta_{0j} (wild) + \sum_j \lambda_{0j} (manufacturing\ brand) + \varepsilon_{ij}
\end{aligned}
$$

(2)

where Vij denotes the individual's choice (0,1) of seafood product; type of product denotes the product form (i.e. fresh and chilled cod fillets, canned tuna etc.); sustainability and quality reflect the label; govt. and non-govt. refer to the certifier being governmental or not (if true equals 1); UK/Denmark denotes the origin of the seafood as being produced or caught domestically; abroad denotes the origin of the seafood as being produced or caught abroad; wild refers to the production method and equals 1 if the seafood had been caught in the wild instead of being farmed; and manufacturing brand draws the distinction between the

products on branding and equals 1 if the product has a manufacturer's brand rather than a store brand. This model was extended to introduce the interaction terms between labelled products and socio-economic variables to form the second model. Both models were estimated using the conditional and mixed logit modelling framework.

Consumer theory predicts that as the price of a normal good rises, the probability of choosing that product reduces. The signs in the model for the product price coefficients were, therefore, expected to be negative. It was also hypothesised that the respondents' would be concerned with the sustainability of seafood resource and the quality of the seafood products and as a consequence the probability of choice should, therefore, increase post-labelling. Heterogeneous consumer preferences for the labelled seafood products were also anticipated. For example, it was anticipated (on the basis of the literature) that not all age groups would prefer sustainability or quality labelled seafood products, or at least, not to the same extent.

As a final step, in accordance with the method proposed by [56], marginal willingness to pay estimates were generated from the mains-effects model choice experiment model results using the implicit price formula for different seafood products labelled in terms of quality and sustainability. This marginal willingness to pay estimates was then compared with the current prices of this product to calculate % price premiums (reported later in the paper). This provided a qualification to market impact of the choices made by respondents.

The focus of this study was not solely on the respondents' willingness to pay. The potential effects of labelling also extend to changing consumers' willingness to buy. Consequently, additional survey elements and analysis were included to also address consumers' willingness to buy.

2.3   European expressed preference survey (1999-2000)

The study involved a survey delivered face-to-face to 2400 households in the year 2000, split equally between the UK and Denmark, representing 0.002% and 0.02% of the households in each country. A regionally stratified sample frame was used, reflecting population distribution, age of respondents, existence of dependent children and social class (United Kingdom) or household income (Denmark).

Following initial questions exploring the respondent's current seafood and food purchases (product forms, quantity, and expenditure), the survey presented a near event scenario (Figure 1), designed to elicit the choice they as consumers would make between labelled and unlabelled versions of seafood products if/when they encountered them in the supermarket or other retail outlet, and what quantity they would buy and at what price. Given the unfamiliarity of the labels, cue card based definitions were provided. Note that in formulating the scenario, definitions and explanations of the labels attention was given to presenting the material in a realistic format in the absence of label familiarity, combining brevity with the clarity ([57-60].

[Insert Figure 1 about here]

Once the scenario was introduced, the respondents were presented with the choice experiment question. In the questionnaire six seafood products were targeted, reflecting market share, cross-country comparability, and diversity of processed form and meal context -

- fresh and chilled cod fillets

- fresh and chilled salmon steaks

- smoked haddock fillets (UK)/ smoked salmon (Denmark)

- frozen fish fingers (UK)/ frozen breaded plaice (Denmark)

- frozen prawns (UK)/ frozen shrimp (Denmark)

- canned tuna (UK)/ canned mackerel in tomato (Denmark)

Five cards each containing 3 variants of one of the seafood products were presented to respondents, representing the choice consumers could have in front of them when they go shopping in the future (see Figure 2 for an example of choice card). Variant/**Product A** was labelled 'certified as coming from a sustainably managed fishery', variant/**Product B** was labelled 'certified as of high quality', and **Product C** by default was 'not certified'. The respondent was asked to identify which one of these products, if any, they would most likely buy when shopping, how much they would be willing to pay given the current average price, how much they would be willing to buy in a shopping trip (using the respondent's preferred measure of choice), and how often they would buy it. The responses were subsequently normalised in terms of price (£) per 200 grams (taken as a meal portion), prior to analysis.

[Insert Figure 2 about here]

In the choice experiment question, to mimic the purchasing environment closely, other attributes and their definitions were also provided (e.g. brand, origin) alongside the target attributes. The aim was to avoid unduly focusing attention on the target attributes. The attributes used in the product descriptions were identified and selected on the basis of existing knowledge, a review of consumers' attitudes towards food and fish products (including focus group sessions) and existing product differentiation.

[Insert Table 2 about here]

As shown in Table 2, the experimental design had seven attributes of at least two levels each, generating 1,728 potential combinations. As aforementioned, an orthogonal block design reduced the number requiring testing to 8 blocks of 4 choice alternatives each, hereafter referred to as choice sets and transferred on to 8 cue cards. Each respondent was provided definitions of the labels given on a cue card and presented with a trial card followed by four of the eight cards, each containing four products and a "none" option (Figure 1). They were asked which product on each card they would choose. Their choice was reflected through binary recording of positive or negative choice (1 and 0, respectively). The questionnaires concluded with questions used for validity testing and for detailed analysis of the results by key socio-economic characteristics.

3.   Empirical results

The empirical analysis of revealed consumers' preferences was comprised of two parts. Firstly simple descriptive analysis looked at the potential impact of labelling on frequency and quantity purchased each week of fish and other seafood products. The second part comprised of the estimation of choice/utility function and price premiums by a conditional logit maximum likelihood technique using choice experiment data. A further detailed analysis using three way interactions (consumer's age, gender and economic status measured by weekly food expenditures were interacted with fish type and label (quality/sustainability) interactions) was performed to analyse the heterogeneity in the choice of labelled seafood products.

3.1   Consumers response fifteen years ago?

From the descriptive analysis, one of the interesting observations was the percentage of respondents' who prior to the survey did not buy a particular seafood product stated that they would do so if the labelling schemes were introduced. For the UK, the largest percentage increase in the number of respondents who stated that they would be likely to start buying one of the product forms after labelling was observed for

sustainably labelled salmon steaks at 23% (see Table 3). Similarly, all the other sustainably labelled product forms attracted increased numbers of purchasers, with between 7% and 16% of previous non-consumers being willing to buy the sustainably labelled variants. Apart from smoked haddock, it was the sustainably labelled versions (rather than quality labelled versions) of each product form that attracted the greatest number of new consumers. For Denmark, the percentage of respondents who stated that they would buy a particular product form after labelling who had not bought the product form previously were much lower, accounting for between 0% and 2.6%. Sustainability labelling attracted no additional customers for frozen shrimp, but did convert 0.9%-1.2% of previous non-consumers to buy the other product forms. The largest increase due to labelling, however, was registered for one of the quality labelled products, frozen breaded plaice fillets (2.6%).

[Insert Table 3 about here]

Next, by multiplying consumers' stated intensions as to the frequency and quantities of the products they would purchase post labelling, mean average household weekly quantities were calculated for the two countries from the survey responses, revealing a positive change also in consumers' willingness to buy post-labelling when compared with the household weekly quantities registered by the same respondents early on in the questionnaire (pertaining to their current purchasing behaviour). The respondents were then grouped according to their choice of the sustainably or quality labelled product, and means and percentage changes calculated for each group. Differences in current and future buying quantities for each type of seafood product were tested using pairwise t-tests.

With the introduction of the sustainability label to the United Kingdom, willingness to buy increased for all product forms except smoked haddock and fish fingers (Table 4). The largest increases were for salmon steaks (42%) and frozen prawns (33%) followed by cod fillets (16%), and canned tuna (10%). For the quality label, the respondents' demonstrated an increase in their willingness to buy fish fingers, smoked haddock, and frozen prawns, but not cod fillets, salmon steaks and canned tuna, which Exhibited no statistically significant change (Table 4).

In the Danish survey, the introduction of sustainability labelling was accompanied with an increased willingness to buy quantities for all product forms, with the largest increases for frozen breaded plaice fillets

(46%), fresh and chilled salmon steaks (34%) and canned mackerel in tomato sauce (33%). The smallest increases were recorded as 15% for shrimp and 16% for smoked salmon. All of these increases proved to be statistically significant except for cod fillets. Similarly, quality labelling also gave rise to an increased willingness to buy across the board, with statistically significant quantity increases for fresh and chilled cod fillets (25%), canned mackerel in tomato (28%), fresh and chilled salmon steaks (19%) and shrimp (21%).

[Insert Table 4 about here]

To add further statistical rigour in part two of the analysis, we estimated conditional and mixed logit models using the choice experiment responses. Two such models were estimated: one with and one without individual demographic and socioeconomic characteristics. A conditional logit model ([61, 27]) models expected utilities in terms of attributes of the alternatives (rather than characteristics of the individuals as in the usual multinomial logit model). In the mixed logit model, on the other hand, characteristics of the alternatives and individuals are both modelled simultaneously. Both these logit models produce vectors of regression coefficients (marginal utilities). These marginal utilities are the impact of a variable on the choice probabilities derived from the difference of its values across the alternatives. These marginal utilities are subsequently used to derive marginal willingness to pay. Estimates are then compared against current prices to calculate price premiums in response to choosing a particular product/label combination.

Table 5 presents the marginal utilities for the conditional logit model. For the United Kingdom, when the six product forms were interacted with the two proposed labels (sustainability and quality), it was evident that certified seafood products, either in terms of "sustainability" or "quality", had a positive influence on the probability of choice. This result, however, was subject to one exception, that of fish fingers certified for quality. Fish fingers are a low value product and UK consumers may have perceived that the quality label would make this product too expensive. Note however that certification was not alone in generating a positive influence. Another form of product differentiation demonstrating potential in engendering an increase in the likelihood of product choice was the distinction of wild caught fish versus farmed fish. Interestingly, both a foreign origin and a non-government certifier attracted a negative response from the UK survey respondents.

The estimates at the bottom of Table 5 show the UK respondents' marginal willingness to pay for labelling alongside the current average price for each product form. The figures in brackets are the statistically significant price premiums. We do not report premiums for those product form-label combinations where the marginal utility of the price or of the label was not significant. The only significant premiums were registered for sustainably labelled smoked haddock and both quality and sustainably labelled fresh and chilled salmon steaks and frozen prawns, with only the premiums for quality labelled frozen prawns and sustainably labelled salmon steaks being positive. The largest premium recorded was that for sustainably labelled salmon steaks.

[Insert Table 5 about here]

Looking at the Danish consumers' responses, it is evident from Table 5 that the certification of the product forms, either in terms of "sustainability" or "quality", also had a positive influence on the probability of choice. Again there was one exception to this observation that of canned mackerel in tomato sauce, for which the certification for quality reduced the likelihood of the product form being chosen. Canned mackerel, like fish fingers in the UK, is a low value product and Danish consumers may have perceived that the quality label would make this product too expensive. As in the UK, sustainability and quality certification were not the only forms of product differentiation that demonstrated the potential to increase the likelihood of a product form being chosen, another being the distinction of wild caught fish over farmed fish. However contrary to the UK survey results, a domestic origin to the fish or seafood generated a negative but statistically insignificant influence on product choice. The other difference in Danish consumers' preferences over the UK results was for a non-governmental certifier, over a governmental certifier.

When the Danish marginal willingness to pay estimates from the choice experiment survey for the two label formats were determined relative to the current average price, six product form-label combinations proved statistically significant. Of the quality labelled product forms, the price premiums for the two fresh and chilled product forms (cod fillets and salmon steaks) proved significant and positive. The results for these same two product forms when sustainably labelled also proved statistically significant and positive. In contrast to the negative premiums registered for some of the product forms in the UK, the two other sustainably labelled versions registering statistically significant premiums in Denmark (smoked salmon and canned mackerel) also registered positive premiums: a clean sweep. The latter received the largest premium (141%), while the rest received premiums between 22% and 39%, with fresh and chilled salmon steaks getting the second largest premium at 62%.

Table 6 contains estimates of the mixed logit model where the product forms and two targeted label formats (sustainability and quality) were further interacted with the respondents' key socio-economic factors in order to gain some understanding of heterogeneity in the choice of labelled products. Starting with the United Kingdom's estimates, it became evident that there was a marked heterogeneity among different socio-economic and demographic groups. These relationships, or their significance, were not universal across all groups. In the subsequent discussion, we mainly focus on those relationships that proved statistically significant. When the results for the quality and sustainability labels were interacted with the average weekly household food expenditures categories, the estimates in Table 6 show that the bottom food expenditure group (<£50) were less likely to choose smoked haddock and canned tuna with a quality label than the top food expenditure group (£100+). Canned tuna when sustainably labelled was also less likely to be chosen by the middle food expenditure group (£50-99) than by the highest weekly food expenditure group.

When the age of the respondent was interacted with the labels, there were also marked differences, although the results for most of the product forms met expectations for the consumption patterns of the different age groups for fish products, irrespective of the presence or absence of a label. Younger respondents were, on average, less likely to choose quality or sustainably labelled smoked haddock, fresh and chilled cod fillets and salmon steaks, and quality labelled frozen prawns than the oldest category of respondents (55+). However, they were more likely to choose quality and sustainably labelled fish fingers than the oldest respondents. Respondents aged 35 to 54 years were also less likely to choose quality labelled frozen prawns, fresh and chilled cod fillets, and fresh and chilled salmon steaks than the oldest respondents, along with sustainably labelled salmon steaks and smoked haddock. They were also more likely to choose quality and sustainably labelled fish fingers than the oldest group. In terms of gender, the analysis revealed that females were more likely to buy fresh and chilled salmon steaks labelled for both quality and sustainability than males, while, for smoked haddock, canned tuna and frozen prawn, they were more likely (in comparison to males) to choose only the sustainably labelled version. Interestingly, there were no other significant differences in the choice behaviour of the two sexes in this respect.

[Insert Table 6 about here]

Similarly, when the results for the two targeted label formats (sustainability and quality) were further interacted with the respondents' key socio-economic factors of Danish consumers, it became evident that,

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as with the United Kingdom, these relationships or their significance were not universal across all socio-economic and demographic groupings. The interaction of sustainability and quality labels with the age of respondents produced limited statistically significant coefficients. Notable among the findings were the younger group being more likely to choose quality labelled mackerel than the oldest age group, while the middle-aged respondents were more likely to choose shrimp with a quality label than the oldest age group. In terms of the influence of food expenditure on choice, the differences in label choices were less marked in Denmark than in the UK. The significant results in Denmark registered for a quality label on the 'budget' product incorporated in the study, canned mackerel in tomato sauce, and for a sustainability label on two products with prominent resource issues: cod and shrimps.

There was more of a gender inspired difference in Denmark than in the UK. With the exception of shrimp, Danish women were more likely to choose the labelled versions of all product forms than Danish men, while in the UK this was limited to only four of the label-product combinations. This was obviously a far more consistent trend than exhibited for the United Kingdom. There could be several factors acting to generate such variation, among them preferences for and end use of different products, perceptions of products as 'premium' or 'budget' and the purchasing and socio-economic characteristics of consumers, but there was also evidence of a lack of knowledge of, or concern for, the issues surrounding particular fisheries and aquaculture operations, particularly amongst UK consumers. The latter offered an informational and educational challenge for fisheries stakeholders.

It is evident that there was a marked preference among consumers for 'reassurance labelling'. In particular, both sets of consumers preferred the presence of quality and sustainability certification and labelling, with UK consumers prepared to pay a premium for certain specific label-product combinations, while Danish consumers matched their choices with a more general willingness to pay for them. However, the significance, scale and willingness to pay evidently varies between products, labels and consumer groupings, which obviously has implications for the adoption of certification as a means of rewarding fisheries for sustainable fishing practices. Notably, labelling may not necessarily engender the positive premiums likely to be required to offset the costs of certification and ensuring compliance therewith, as demonstrated by sustainably labelled frozen prawns in the UK. Even in 2000 it was evident that there was likely to be a marked heterogeneity to the market uptake of quality and sustainably labelled fish and seafood products as they were introduced. The organisations promoting such labelling in the interests of supporting and encouraging improvements in the

management of marine fisheries had a challenge on their hands. This challenge not only lay with the practical and legitimacy issues involved in certifying marine fisheries but also with targeting consumers effectively.

3.2   Findings to take forward and the expectations

From the overall results above, despite a significant heterogeneity among different consumer groups, one would predict that for a wide variety of seafood products sustainability and quality certification and labelling would result in an increase in consumer demand irrespective of country. However, these findings show that price premiums were likely to be uncertain. For the UK, quality labelled fresh and chilled salmon steaks and sustainably labelled smoked haddock and frozen prawns attracted negative premiums as recorded by the choice experiment analysis. Consumers were however, willing to pay positive price premiums on sustainably labelled salmon steaks and quality labelled frozen prawns. For Denmark positive premium applied to fresh and chilled cod fillets and salmon steaks (both labels) and sustainably labelled smoked salmon and canned mackerel.

The early and enthusiastic take-up of Marine Stewardship Council certified products by the retail sector would indicate an awareness of the potential consumer support for sustainability labelled fish and seafood products [62], and more recent consumer surveys have revealed positive responses to sustainability-type labelled seafood. In a consumer survey undertaken in the United Kingdom, Germany and Spain by the Seafood Choices Alliance [63], 95% of respondents wanted more information on how to purchase sustainable seafood and avoid seafood harmful to the environment, and 85% indicated that they would be more likely to buy seafood labelled as environmentally responsible versus non-ecolabeled seafood. Further afield, the Gulf of Maine Research Institute [64] in Portland, Maine, USA, also found that approximately 75% of respondents in their consumer seafood survey were very or somewhat likely to purchase more seafood if they knew that it was sustainably harvested. More recently, three surveys in two different regions in the UK (Glasgow and London) targeting three different species (salmon, Alaska pollock and haddock), revealed that consumers exhibit a marked preference for and are willing to pay a premium for products carrying the Marine Stewardship Council label (with an average premium of 13.1% for salmon, and the other species of a similar magnitude) ([65-67]).

However by referencing back to the results of the 2000 survey, it has to be noted that willingness to pay and buy is inconsistent across product forms. Variation is evident between different product forms, the meal context and market niche of the product, and also the socio-economic and attitudinal characteristics of the

consumer, including nationality. Therefore, are the expected benefits and the rewards for sustainable fishing practices guaranteed?

4. A (more than) decade or so on

Since the 2000 survey, the certification of fisheries on the basis of their sustainability has taken off. The Marine Stewardship Council scheme in particular has gone from strength to strength, extending sustainability certification (and associated eco-labelling) to eligible fisheries around the world. Fifteen years on, in April 2015, there are 255 certified fisheries within the MSC program and over 100 in assessment, representing 10% of the annual global harvest of wild capture fisheries and over 25,000 seafood products (www.msc.org, 10 June 2015). It therefore seems timely to ask whether product labelling is actually having the desired effect of rewarding desirable fisheries practices by drawing on the experience of the fisheries that have already been certified. The experience of fisheries currently certified under the Marine Stewardship Council scheme is hereinafter reviewed by reference to research commissioned by the MSC in 2009 and more recent research by the University of Portsmouth, UK. The objective is to establish whether consumers' actual decision-making is actually rewarding participating fisheries for their engagement in the scheme, and in what form.

In 2009 the Marine Stewardship Council commissioned a research report entitled "Net Benefits: The First Ten Years of MSC Certified Sustainable Fisheries" [68] to review the experiences of fishers and client organisations with MSC certification. All 42 fisheries certified by April 2009 were included, with each asked to tell in their own words whether certification delivered what it promised, whether there were clear economic benefits and whether the ecolabel resulted in a market premium, helped fisheries penetrate new markets or allowed them to retain old ones. Interestingly in respect of the central theme of this paper, the report highlighted that only a limited number of participating fisheries reported an MSC related price premium being obtained, mainly "smaller scale, artisanal fisheries" (Table 7). A greater number of certified fisheries, however, reported increased sales opportunities. For fisheries not already operating at full capacity, opportunities to increase sale volumes were described as:

- New and enhanced demand from multiples (supermarkets and other retail chains), who as a sector have particularly engaged with the Marine Stewardship Council certification scheme (Marine Stewardship Council [69])
- Opening of new markets globally

- Enhanced product form differentiation, facilitating access to new markets

- Product form diversification, adding value through processing

- A raised media profile and associated consumer awareness of the products from the fishery.

[Insert Table 7 about here]

Several of the fisheries also believed that MSC certification had also been instrumental in maintaining existing markets, albeit with different levels of confidence in the link with MSC certification. It is, however, marked that only a proportion of the fisheries experienced such opportunities or particular variants thereof. Many of the benefits recorded were noted as indirect or of an environmental or social nature (Table 8). Certification has been found to bring fishers together and develop improved management or endorse existing good management. Benefits have also arisen out of conditions attached to certification or recertification (e.g. stock regeneration and reduced bird deaths; implementation of marine protected areas and bycatch mitigation measures; additional stock management or rebuilding measures; and increased research). There have also been distinctly social benefits attributed to MSC certification, as with the supply of a $20million government grant for electricity plus additional infrastructure investment to the villages participating in the Mexico Baja California Red rock lobster (*Panulirus interruptus*) fishery.

[Insert Table 8 about here]

It is interesting to note that some of these benefits are confirmed in a more recent publication by the Marine Stewardship Council, "Fishers' Stories" [70], which examines a small sample of MSC certified fisheries. For example, the links between certification and securing a strong customer base are noted for the Ocean Conservation International Grand Banks yellowtail flounder (*Limanda ferruginea*) fishery, Dutch rod and line sea bass (*Dicentrarchus labrax*) and South Brittany sardine (*Sardina pilchardus*) purse seine fishery, with a promotional and public relations value widely recognised. However, as with the 2009 report a price premium is less widely experienced, with only one of the fisheries included (the Dutch rod and line sea bass fishery) identifying a price premium (5-10%, depending on available supply).

To bring the "Net Benefits: The First Ten Years of MSC Certified Sustainable Fisheries" [68] report up to date, and to specifically target the extent to which MSC certified fisheries are being financially rewarded for

their sustainable management, in the early summer of 2013 an exploratory questionnaire survey was undertaken under the auspices of the University of Portsmouth. Following standards for questionnaire design, piloting, distribution and follow-up, the survey was delivered globally via email to fisheries identified through the MSC's website, with returns received from 22 fisheries. In addition to socio-economic questions included for analytical and validity testing purposes, the questionnaire addressed the financial impacts of certification (notably the effect on prices, sales volumes, market opportunities, profit margins and the time taken for certification to generate any observed changes) and the experiences and attitudes of the respondents following participation in the MSC programme (including intentions to remain within or promote the programme and the perceived effects of certification on the sustainability of the fishery). The respondents were also given the opportunity to expand and elaborate on their answers, providing further insight and a rich body of information.

From the results of the survey (Table 9, Question I), it is evident that the majority of the respondents (67%) regarded the Marine Stewardship Council programme as having been beneficial to their fisheries. However, it should be noted that a surprising number (24%) claimed the opposite. Some of the benefits cited in response to the invitation to elaborate included: increased global awareness of their product and fishery arising through the MSC; expansion of the market base to customers who only sourced MSC certified products; provision of a mechanism to address management issues and improve the running of the fishery; and provision of a mechanism to prove the sustainability of the fishery. Several fisheries also presented figures demonstrating benefits in terms of sales and turnover (see below). However, not all respondents elaborated and not all comments were positive. One of the less positive responses suggested that certification had not been very beneficial for them because they already fished sustainably, as required by law.

[Insert Table 9 about here]

In terms of the quantification of the benefits (Table 9, Questions II-IV), the vast majority of respondents attributed no change in price, sales or profit to Marine Stewardship Council certification (68%, 82% and 77%, respectively). When the effect on the price the fishery receives for its catches and sales are looked at individually, as with the previous MSC commissioned survey in 2009, the number of fisheries that have experienced such benefits is again limited. 23% of respondents attributed an increase in product prices to the MSC, with premiums varying between 0% and 20%, and 9% of respondents attributed an increase in

sales and profits to the initiative. As noted, several fisheries provided evidence of gains in sales and turnover, while another fishery cited that while there had been "no change yet ... [they did] expect to have some increases in sales in the future" and a further one commented that "without the certification, the price and landings would be likely to be 25% less". In terms of profits, possibly explaining the reduced level of increase over those given for price and sales, one respondent highlighted that while "there was an increase in price and sales... MSC costs are expensive and therefore no increase in overall financial gains". It is worth noting that similar comments were made in response to other questions in the survey.

Looking at the responses to Question V it is evident that while small numbers of fisheries experienced an effect on prices, sales or profits when looked at individually, the number of fisheries that experienced one form or other of these benefits was larger (8 out of 17 respondents, 47%), albeit still less than half.

In terms of the other focus of Question V - how long it took for certification to start having an effect on price, sales or profit - of those that noted an effect, 56% saw an effect within 6 months of certification and another 33% between 10 and 18 months of certification. The effects, however, were noted as staggered with customer awareness growing over time. One respondent made the observation that supermarkets were more aware of certification and certified products than certain other customer groups. Another comment raised the point that in certain fisheries sales were at full capacity prior to certification, so there was little room for gains in this respect.

Despite the number that felt that the programme had not been beneficial in terms of financial returns to the fishery, when explicitly asked whether they were in favour of MSC certification, 86% of the respondents indicated that they were in favour, and none registered a negative response. The explanations behind this endorsement lie with the observations made by respondents that: "the MSC are good as a marketing tool and good for bringing fishermen, processors and regulators together to understand more about the fishery"; "it is a credible programme, addresses many of the issues and concerns about the oceans productivity"; and "one cannot be not in favour of" the greater good of the MSC, i.e. the preservation of fish stocks and fisheries on a global scale. The benefits are, therefore, viewed as broader than purely generating a financial reward for the adoption of desirable fishing practices. The comments were not wholly uncritical though. Matching some of the criticisms in the literature (23, 71-72, 73[ii], 74-75[iii]), one respondent highlighted the inconsistencies in the rigour of the certification process among fisheries and stressed that the MSC needs to

ensure that its credibility is "maintained and not hijacked". Another respondent stated that while their organisation was in favour of the MSC certification it did not believe that the MSC is entirely independent, being influenced unduly by green NGO's.

The responses to Question VII, asking whether the fishery was likely to continue to hold MSC certification for the foreseeable future, also consolidated the dominant positive stance towards the scheme above mentioned, with 82% indicating that they were likely to. Only 14% of the fisheries held the opposing view, although the reasoning behind these responses is unclear. The associated comments highlighted that for some of the fisheries the decision would be determined by future costs, funds, the actions of larger fisheries and changes in fisheries policy. 64% of the respondents stated that they would also promote MSC certification to other eligible fisheries (Question VIII), although it was acknowledged that the MSC scheme was not suited to all fisheries, with some too small to absorb the cost of certification.

It is evident from this recent exploratory survey and the previous Marine Stewardship Council survey in 2009 that while there is widespread support for MSC certification among participating fisheries, the supply side benefits being experienced by MSC certified fisheries are far from universal or homogeneous, with only a proportion experiencing price premiums and enhanced sales.

5.   Discussion and conclusions

With the European Parliament in April 2013 registering support for the introduction of an EU wide ecolabelling scheme for fish products and a feasibility study underway currently, it is timely to evaluate the effects of such schemes. Here, the findings of research separated by more than a decade were compared to evaluate whether fish product certification and labelling is actually doing what was expected, namely rewarding fisheries for sustainable environmental practices and thereby encouraging those practices.

Drawing from the study undertaken in the UK in the year 2000 and the more recent studies reported, one would have predicted that, for a wide variety of seafood products sustainability certification and labelling would attract price premiums and higher sales, resulting in enhanced returns and financial rewards for the certified fisheries behind those products. The findings of the choice experiment survey also revealed that in a global market place variation is likely in the consumers' response to different product forms, the meal context and market niche of the product, and in response to the socio-economic and attitudinal

characteristics of the consumer, including nationality. This variation, one would expect to be reflected back through the supply chain to reveal differing returns and rewards for the fisheries concerned. This has certainly been found in the review we performed in this paper.

With reference to the findings over a decade later, by examining the benefits experienced by fisheries certified under the Marine Stewardship Council scheme, variation among fisheries is marked, with only a limited number of fisheries recording price premiums and enhanced market opportunities, while other fisheries cite the avoidance of a decline in their market and more indirect and environmental or social benefits. The numbers of fisheries identifying a price premium are relatively small in number, and are of a similar order of magnitude to the premiums estimated in the surveys in 2000. The reasons for this are potentially broad and cannot be conclusively determined within the scope of this analysis, but are potentially influenced by consumer purchasing behaviour, retail pricing strategies and supply chain factors ([67, 76]). One factor several of the fisheries drew attention to, however, was the relative lack of power they exercise over the market price their product attracts on first sale given their relatively small size.

Fishery size is cited as a constraint in terms of taking advantage of market opportunities, with several fisheries in the 2013 survey identifying the lack of capacity within the fishery to increase sales as a key constraint. Given the character of the fisheries being certified and the underlying requirement for sustainability, the capacity to increase landings to satisfy an increase in demand is necessarily limited, as manifest in the smaller percentage of fisheries citing increased sales in the 2013 survey than price premiums. Increased sales do not, however, equate with market opportunities or the securing of markets otherwise lost, as reflected in the MSC survey in 2009 where a greater number of fisheries cite enhanced or secured market opportunities through the interest of multiples and via such as the opening up of new, alternative markets and product form opportunities. The long-term benefits of the conservation and stock regeneration measures implemented as a condition of certification may go some way to increasing the sustainable output of a fishery in the long-term, but the capacity of the certified fisheries to take advantage of the scale of increased demand indicated by the 2000 consumer survey is obviously constrained by the nature of the resource.

When the effect on the financial bottom line (profits), is considered it is evident that even where price premiums and increased sales opportunities are experienced, a net financial benefit to the fishery is far from

guaranteed. As several respondents highlighted during the survey, "... MSC costs are expensive and therefore [there is] no increase in overall financial gains". Potential revenue gains are offset by the costs of certification, supplemented by the cost of pre-assessments and annual audits, the cost of implementing the improvements to fisheries management and monitoring required as a condition of certification, and annual licence fees and levies[iv], as also reported by [76-78]. Given this, and other potential factors on performance [79], it would appear that sustainability certification is not financially rewarding fisheries for sustainable fisheries practices to the extent anticipated in 2000 or hoped for either by the fisheries themselves or the advocates of the certification schemes. However, it is evident from the 2009 and 2013 surveys and complementary studies (e.g. [80]) that benefits are being experienced by the certified fisheries, albeit more broadly defined and environmental, social and psychological in nature rather than financial.

In terms of whether the above outcomes match expectations - it is evident that some fisheries have experienced premiums and sales increases consistent with the findings of the survey in 2000. It is also evident that subsequent surveys have similarly demonstrated a strong sustainability vector in consumer preferences for MSC certified seafood products. However, there are a wide range of factors acting throughout the supply chain to determine whether consumer preferences and demand are translated into financial rewards for the fishery. The rewards are not guaranteed, given: the potential differences in consumer preferences and revealed demand between products and markets and over time in the light of other influences (e.g. the recession and the price of substitute products ([76, 81-82])), and consumer motivation and understanding [83]; the influence of retail pricing strategies [67] and supply chain factors; the time and financial cost of the certification process and delivering certified products to market; the certification program not being designed to effectively manage all types of fisheries [84]; the growing number of participating fisheries and the resultant growth in MSC differentiated products on the market; the time-scales over which benefits from changes to fisheries management practices, monitoring and research are likely to be expected; and the lack of capacity for expansion within a fishery to take up opportunities. It is certainly evident from this paper and other studies on the topic that the benefits to European fisheries from the introduction of an EU wide ecolabelling scheme for fish products cannot be assumed in either form or extent, despite consumer preferences [76].

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Figure 1: Scenario and associated definitions presented

Scenario:

Very soon two new labels will be introduced to the United Kingdom [Danish] market for

fish and seafood products:

- "The product is of high quality"

- "The seafood comes from a sustainably managed fishery"

The fish and seafood products that people buy could have one or other of these labels or

be unlabelled.

Definitions presented:

'Certified as of high quality: This label means that the quality of the fish has been assessed and the safety,

freshness, taste and appearance of the fish has been shown to be of a high standard'.

'Certified as coming from a sustainably managed fishery: This label means that the fish comes from a source

that has been assessed and shown to be "sustainably managed", such that-

- fish supplies are maintained

- high fish populations are guaranteed

- long term environmental damage is avoided'.

Figure 2: Example choice card

During a shopping trip, which <u>one</u> of these products, if any, would you be most likely to buy? | NONE |

A

<u>Frozen prawns</u>

manufacturer's brand

farmed

certified as coming from a sustainably managed fishery

certifier is governmental

£11.16 per kg
£5.07 per lb
£4.46 for 400g bag

B

<u>Smoked haddock fillets</u>

shop's brand

caught in the wild by foreign fishermen

£5.60 per kg
£2.54 per lb
£x.xx for 2 average fillets

C

<u>Frozen fish fingers</u>

manufacturer's brand

farmed in the UK

certified as being of high quality

certifier is non-governmental

£3.33 per kg
£1.51 per lb
£x.xx for a packet of 10

D

<u>Fresh or chilled cod fillets</u>

shop's brand

caught in the wild by UK fishermen

certified as coming from a sustainably managed fishery

certifier is non-governmental

£6.58 per kg
£2.99 per lb
£x.xx for 2 average fillets

Table 1: Post 2000 selection of studies using choice experiment survey to determine relative preference and willingness to pay for labelled food products

Authors	Product	Country
Alfnes (2004) [42]	Beef	Norway
Hu et al (2005) [43]	GM foods	Canada
Rigby and Burton (2005) [44]	GM foods	UK
Alfnes et al (2006) [45]	Fish	Norway
Carlsson et al (2007) [46]	GM foods	Sweden
Loureiro and Umberger (2007) [47]	Beef	USA
Balcombe et al (2010) [48]	Nutritional food	UK
Olesen et al (2010) [49]	Fish	Norway
Van Loo (2011) [50]	Chicken	USA
Ortega et al (2011) [51]	Food	China
Bitzios et al (2011) [52]	Bread	UK
Chowdhury et al (2011) [53]	Micronutrient-dense biofortified foods	Uganda
Aprile et al (2012) [54]	Olive oil	Italy

Table 2: Attributes and their levels

Attributes	Levels
Product form:	Fresh and chilled cod fillets
	Fresh and chilled salmon steaks
	Tinned tuna
	Frozen fish fingers
	Smoked haddock fillets
	Frozen prawns
Certification:	Certified for sustainability
	Certified for quality
	Uncertified
Certifier:	Non-governmental
	Governmental
Origin:	UK
	Foreign
	Un-stated
Production method:	Wild
	Farmed
Product specific price:	Low
	Medium
	High
	Very high
Brand:	Shop's brand
	Manufacturer's brand

Table 3: Percentage increase in respondents who stated that they would most likely buy a particular product form after labelling

	Sustainability	Quality
UNITED KINGDOM		
cod fillets	14.7%	12.1%
smoked haddock	14.5%	20.9%
salmon steaks	23%	17.7%
fish fingers	15.8%	11.6%
canned tuna	7.5%	6.6%
prawns	13.8%	11%
DENMARK		
cod fillets	0.9%	0.5%
smoked salmon	1.1%	0.6%
salmon steaks	1.0%	0.6%
breaded plaice	0.9%	2.6%
canned mackerel	1.2%	0%
shrimp	0%	1%

Table 4: Percentage change in would be quantity purchased post labelling

UNITED KINGDOM

	cod fillets	smoked haddock	salmon steaks	fish fingers	canned tuna	frozen prawn
sustainability	16.3*	4.3	42.2*	-1.9	9.5*	32.6*
quality	-6.6	34*	1.0	9.6*	-4.0	27.5*

DENMARK

	cod fillets	breaded plaice	canned mackerel	shrimp	salmon steaks	smoked salmon
sustainability	21.8	45.6*	33.3*	14.7*	34.4*	16.2*
quality	25.2*	2.1	27.9*	21.2*	19.3*	8.1*

Notes: * indicates statistically significant change.

Table 5: Conditional logit maximum likelihood estimates

	Parameter estimate	Standard error	Chi-square	Pr > chi square
UNITED KINGDOM				
cod fillets price	-0.023	0.021	1.270	0.260
salmon steaks price	-0.078	0.020	15.751	<.0001***
fish fingers price	-0.030	0.025	1.409	0.235
smoked haddock price	-0.087	0.022	15.690	<.0001***
canned tuna price	-0.007	0.039	0.032	0.858
frozen prawn price	-0.086	0.023	14.062	0.000***
cod fillets * quality label	0.632	0.155	16.612	<.0001***
salmon steaks * quality label	0.366	0.186	3.866	0.049**
fish fingers * quality label	-0.069	0.204	0.116	0.734
smoked haddock * quality label	0.453	0.319	2.020	0.155
canned tuna * quality label	0.990	0.196	25.424	<.0001***
frozen prawn * quality label	0.830	0.313	7.024	0.008***
cod fillets * sustainability label	0.454	0.179	6.468	0.011***
salmon steaks * sustainability label	0.878	0.193	20.609	<.0001***
fish fingers * sustainability label	1.017	0.218	21.731	<.0001***
smoked haddock * sustainability label	0.522	0.206	6.405	0.011***
canned tuna * sustainability label	0.498	0.142	12.199	0.001***
frozen prawn * sustainability label	0.620	0.227	7.475	0.006***
certifier -non-government	-0.596	0.140	18.035	<.0001***
origin UK	0.125	0.107	1.373	0.241
origin foreign	-0.277	0.099	7.798	0.005***
wild	0.202	0.113	3.173	0.075**
manufacturing brand	-0.126	0.085	2.206	0.138
DENMARK				
cod fillets price	-0.012	0.002	49.823	<.0001***
salmon steaks price	-0.011	0.002	41.042	<.0001***
breaded plaice price	-0.003	0.002	1.687	0.194
smoked salmon price	-0.004	0.001	16.047	<.0001***
canned mackerel price	-0.008	0.004	4.556	0.033**
shrimps price	-0.002	0.002	2.427	0.119
cod fillets * quality	1.471	0.200	54.078	<.0001***
salmon steaks * quality	1.537	0.225	46.833	<.0001***
breaded plaice * quality	0.215	0.232	0.860	0.354
smoked salmon * quality	0.472	0.318	2.204	0.138
canned mackerel * quality	-0.245	0.246	0.994	0.319
shrimps * quality	0.778	0.339	5.266	0.022**
cod fillets * sustainability	1.351	0.207	42.742	<.0001***
salmon steaks * sustainability	1.156	0.231	25.064	<.0001***
breaded plaice * sustainability	0.067	0.244	0.077	0.782
smoked salmon * sustainability	0.965	0.226	18.200	<.0001***
canned mackerel * sustainability	0.726	0.173	17.648	<.0001***
shrimps * sustainability	0.764	0.243	9.863	0.002***
certifier non-government	0.187	0.138	1.837	0.175
origin Denmark	-0.095	0.109	0.757	0.384
origin foreign	-0.283	0.117	5.901	0.015***
wild	0.024	0.135	0.033	0.856
manufacturing brand	-0.157	0.090	3.028	0.082*

MEMORANDUM

	Marginal prices (premiums)		Current price
	Quality labelled	Sustainably labelled	
UNITED KINGDOM			
cod fillets	27.0	19.4	4.7
salmon steaks	4.7 (-22%)	11.2 (+87%)	6.0
fish fingers	-2.3	34.2	4.2
smoked haddock	5.2	6.0 (-14%)	7.0
canned tuna	142.4	71.6	3.0
frozen prawns	9.6 (3%)	7.2 (-23%)	9.3
DENMARK			
cod fillets	125.6 (+39%)	115.4 (+28%)	90.0
salmon steaks	136.2 (+62%)	102.5 (+22%)	84.0
breaded plaice	73.1	22.9	50.0
smoked salmon	106.4	217.3 (+31%)	166.5
canned mackerel	-30.2	89.5 (+141%)	37.2
shrimps	331.0	325.3	159.7

Notes: *** = significant at 1% level of significance, ** = significant at 5 % level of significance, * = significant at 10% level of significance.

Table 6: Consumers heterogeneity in choices (mixed logit maximum likelihood estimates)

		Weekly household food expenditures		Age groups		Gender
		<£50	£51-99	18-34 years	35-54 Years	Female
UNITED KINGDOM						
cod fillets	quality	-0.145 (0.641)	-0.074 (0.814)	-0.754*** (0.000)	-0.543** (0.006)	0.055 (0.748)
	sustainability	0.256 (0.454)	0.230 (0.508)	-0.869*** (0.000)	-0.256 (0.241)	-0.154 (0.415)
salmon steaks	quality	0.393 (0.426)	0.664 (0.175)	-0.678** (0.007)	-0.921** (0.001)	0.450** (0.056)
	sustainability	-0.341 (0.294)	-0.154 (0.630)	-0.833** (0.001)	-0.476** (0.039)	0.464** (0.031)
fish fingers	quality	-0.093 (0.767)	0.052 (0.868)	0.744** (0.005)	0.445* (0.107)	-0.066 (0.731)
	sustainability	0.245 (0.553)	0.220 (0.598)	0.690** (0.046)	0.946** (0.005)	0.117 (0.630)
smoked haddock	quality	-0.976* (0.082)	-0.655 (0.237)	-1.305** (0.010)	-0.446 (0.293)	0.088 (0.820)
	sustainability	0.117 (0.790)	0.515 (0.229)	-0.935** (0.001)	-0.605** (0.024)	0.619** (0.016)
canned tuna	quality	-0.608** (0.041)	-0.684* (0.026)	0.266 (0.299)	0.062 (0.824)	0.356 (0.110)
	sustainability	-0.279 (0.255)	-0.426* (0.088)	0.072 (0.712)	0.086 (0.665)	0.295** (0.073)
frozen prawn	quality	-0.148 (0.738)	-0.016 (0.971)	-0.696** (0.024)	-0.588* (0.055)	0.336 (0.217)
	Sustainability	-0.342 (0.325)	-0.436 (0.222)	0.033 (0.884)		0.422** (0.079)
DENMARK						
		<500 dkr	500-999 dkr	18-34 years	35-54 years	Female
cod fillets	quality	0.620 (0.240)	0.631 (0.166)	0.506 (0.555)	0.438 (0.316)	1.132** (0.001)
	sustainability	0.648 (0.364)	0.893* (0.092)	0.431 (0.607)	0.164 (0.771)	1.085** (0.011)
salmon steaks	quality	0.282 (0.711)	0.641 (0.160)	-0.260 (0.745)	-0.188 (0.724)	1.456*** (0.000)
	sustainability	0.625 (0.219)	0.552 (0.180)	0.294 (0.673)	0.129 (0.759)	1.289*** (0.000)
breaded plaice	quality	0.441 (0.444)	0.373 (0.394)	0.961 (0.142)	0.390 (0.382)	1.601*** (0.000)
	sustainability	0.556 (0.746)	0.384 (0.648)		0.689 (0.477)	1.586** (0.026)
smoked salmon	quality	0.735 (0.572)	0.417 (0.743)		0.506 (0.658)	1.453* (0.102)
	sustainability	0.320 (0.595)	0.493 (0.256)	0.558 (0.456)	0.381 (0.370)	1.141** (0.002)
canned mackerel	quality	2.169* (0.063)	1.288** (0.045)	2.153* (0.065)	1.643 (0.032)	1.746** (0.008)
	sustainability	0.393 (0.530)	0.366 (0.509)	0.425 (0.525)	0.774 (0.107)	1.142** (0.008)
shrimp	quality	1.035* (0.089)	0.668 (0.165)	0.011 (0.987)	0.784* (0.091)	1.058** (0.010)
	sustainability	0.785 (0.194)	0.891* (0.028)	0.438 (0.450)	0.773* (0.072)	0.624 (0.132)

*Notes: *** Significant at 1% level, ** Significant at 5% level, * Significant at 10% level. Some interactions dropped due to highly collinear variables. Interaction model results presented in this table also includes all the other variables of the model without interactions of previous table for both countries. Full model results are available upon request. Figures in parenthesis are standard errors.*

Table 7: Price and tariff benefits experienced by MSC certified fisheries

Fishery	Species	Benefits
Lakes and Coorong, South Australia	Golden perch (*Macquaria ambigua*), yellow-eyed mullet (*Aldrichetta forsteri*), mulloway (*Argyrosomus hololepidotus*), cockle (*Donax deltoids*)	• 30-50% price premiums relative to uncertified products
North Eastern Sea Fisheries Committee Sea Bass, UK	sea bass (*Dicentrarchus labrax*)	• <25% price premiums relative to prices prior to certification when selling to top London restaurants
Hastings Dover Sole, Herring & Mackerel, UK	Dover sole (*Solea solea*), herring (*Clupea harengus*) and mackerel (*Scomber scombrus*)	• <15% price premium in certain stores in France • Dover sole <10% price premium in Holland.
Thames Blackwater Herring Drift-net, UK	Herring (*Clupea harengus*)	• Immediate price increase from £2 to £3 per stone, with main outlets local farmers' markets and shops
Bering Sea and Aleutian Islands Alaska (Pacific) Cod – Freezer Longline, USA	Alaska (Pacific) Cod (*Gadus macrocephalus*)	• 2-3% premium, when demand is strong.
American Albacore Fishing Association Pacific Tuna, USA	Albacore tuna (*Thunnus alalunga*)	• Achieved an agreed price of $2,260 per short tonne compared to the typical $1,700 market price
Western Australia rock lobster	Rock lobster (*Panulirus cygnus*)	• MSC certification reduced the tariff on imports into Europe from 12% to 6%.

Table 8: Market opportunities and indirect and environmental benefits experienced by MSC certified fisheries

Benefit categories	Example MSC certified fisheries
MARKET/SALES OPPORTUNITIES	
Maintaining existing markets	• Canada northern prawn and Gulf of St. Lawrence northern shrimp trawl and Esquiman Channel (*Pandalus borealis*) • US Bering Sea/Aleutian Islands pollock and Gulf of Alaska pollock (*Theragra chalcogramma*) • UK Scottish Pelagic Sustainability Group western mackerel (*Scomber scombrus*)
Opening of new markets	• Argentina Patagonian scallop (*Zygochlamys patagonica*)
New and enhanced demand from multiples (supermarkets and other retail chains)	• UK Thames Blackwater herring (*Clupea harengus*) drift-net • South Georgia Patagonian toothfish (*Dissostichus eleginoides*) longline • US Bering Sea and Aleutian Islands Alaska (Pacific) cod (*Gadus macrocephalus*) – freezer longline • US American Albacore Fishing Association Pacific tuna (*Thunnus alalunga*) • Sweden Astrid Fiske North Sea herring (*Clupea harengus*) • Canada northern prawn and Gulf of St. Lawrence northern shrimp trawl Esquiman Channel (*Pandalus borealis*) • Germany North Sea saithe (*Pollachius virens*) trawl • Norway Domstein Longliner Partners North East Arctic cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*)
Enhanced product form differentiation facilitating access to new markets	• Western Australia rock lobster (*Panulirus cygnus*) • American Albacore Fishing Association Pacific albacore tuna (*Thunnus alalunga*)
Product form diversification	• Alaskan salmon – sockeye (*Oncorhynchus nerka*), chum (*Oncorhynchus keta*), Chinook (*Oncorhynchus tshawytscha*), coho (*Oncorhynchus kisutch*) and pink (*Oncorhynchus gorbuscha*) • US Bering Sea and Aleutian Islands Alaska (Pacific) cod (*Gadus macrocephalus*) – freezer longline • Germany North Sea saithe (*Pollachius virens*) trawl
Raised media profile and associated consumer awareness of the products from the fishery	• UK South-west handline mackerel (*Scomber scombrus*)
INDIRECT and ENVIRONMENTAL BENEFITS	
Brought fishers together and develop improved management	• UK Thames Blackwater herring (*Clupea harengus*) drift-net • South Georgia Patagonian toothfish (*Dissostichus eleginoides*) longline • UK North Eastern Sea Fisheries Committee sea bass (*Dicentrarchus labrax*) • Norway Domstein Longliner Partners North East Arctic cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*)
Endorse existing good management	• UK Burry Inlet Cockles (*Cerastoderma edule*) • UK Hastings fleet Dover sole (*Sole solea*), herring (*Clupea harengus*) and mackerel (*Scomber scombrus*) • US Bering Sea/Aleutian Islands pollock and Gulf of Alaska pollock (*Theragra chalcogramma*) • Pelagic Freezer-Trawler Association North Sea herring (*Clupea harengus*) – Germany, UK, France, Ireland & Lithuania • US North Pacific Sablefish (*Anoplopoma fimbria*) • US Oregon pink shrimp (*Pandalus jordani*) • UK Scottish Pelagic Sustainability Group western mackerel (*Scomber scombrus*)
Via conditions attached to certification — Stock regeneration and reduced bird deaths	• New Zealand hoki (*novaezelandiae*)
Implementation of marine protected areas and by catch mitigation measures	• South Africa hake (*Merluccius capensis* and *Merluccius paradoxus*) trawl
Additional stock management or rebuilding measures	• Pelagic Freezer-Trawler Association North Sea herring (*Clupea harengus*) – Germany, UK, France, Ireland & Lithuania • UK Scottish Pelagic Sustainability Group North Sea herring (*Clupea harengus*) • Japan Kyoto Danish Seine Fishery Federation snow crab (*Chionoecetes opilio*) and flathead flounder (*Hippoglossoides dubius*)
Increased research	• Australia mackerel icefish (*Champsocephalus gunnan*) • US Oregon pink shrimp (*Pandalus jordani*) • Norway North Sea saithe and north-east Arctic saithe (both *Pollachius virens*) • Canada Gulf of St. Lawrence northern shrimp and Gulf of St. Lawrence northern shrimp trawl and Esquiman Channel (*Pandalus borealis*)
Environmental impact mitigation	• Germany North Sea saithe (*Pollachius virens*) trawl

Table 9: Results of the 2013 survey of Marine Stewardship Council participating fisheries

Question	Responses (% or number of responses) by Category					
I) How beneficial has certification been to your fishery?	Extremely beneficial 29%	Beneficial 38%	Neither 9%	Not beneficial 24%	Extremely unbeneficial 0%	Not sure 0%
II) Percentage change in product prices attributed to MSC certification?	No change 68%	5% increase 4.5%	10% increase 9%	15% increase 4.5%	20% increase 4.5%	N/A 9%
III) Percentage change in annual sales attributed to MSC certification?	No change 82%	5% increase 0%	10% increase 4.5%	15% increase 0%	20% increase 4.5%	N/A 9%
IV) Percentage change in annual profit attributed to MSC certification?	No change 77%	5% increase 0%	10% increase 9%	15% increase 0%	20% increase 0%	N/A 14%
V) How long did it take for certification to start having an effect on price, sales or profit?	6 months or less 5 responses	7-9 months 0	10-18 months 3 responses	19-24 months 0	25+ months 1 response	No effect 8 responses
VI) How long did it take for certification to affect your market opportunities?	3 months or less 5 responses	4-9 months 4 responses	10-12 months 0	13-24 months 2 responses	25+ months 1 response	No effect 9 responses
VII) How in favour are you of MSC certification?	Extremely in favour 48%	In favour 38%	Neither 9%	Against 0%	Extremely against 0%	Not sure 5%
VII) Likelihood of your fishery continuing to hold MSC certification for the foreseeable future?	Highly likely 41%	Likely 41%	Neither 4%	Not likely 14%	Highly unlikely 0%	Not sure 0%
IX) How likely would you be to promote MSC certification to other eligible fisheries?	Highly likely 32%	Likely 32%	Neither 14%	Not likely 18%	Highly unlikely 0%	Not sure 4%

Notes

[i] Market-driven incentive structures for sustainable fisheries management (MISSFISH). EC FAIR-CT98-4255. December 1998-November 2000.

[ii] See also the rebuttal to elements of this article in [85].

[iii] The Marine Stewardship Council formally responded to defend itself against the claims in this paper: Marine Stewardship Council Responds to Critical Study, Wholefoods Magazine, June 2013. http://www.wholefoodsmagazine.com/news/green-news/marine-stewardship-council-responds-critical-study/WF7765129. Retrieved: 12 May 2014.

[iv] The Marine Stewardship Council charges an annual fee based on sales of non-consumer facing and consumer facing certified seafood. They also charge royalties on all products carrying the MSC logo. It should be noted that in return the Marine Stewardship Council provide marketing and promotional activities, to the benefit of the participating fisheries and their products. It should also be noted that the financial costs of assessments and certifications are passed to the independent auditors rather than the Marine Stewardship Council, and cost from $15,000 to $25,000 per fishery for pre-assessments and from $75,000 to $150,000 or more for full-assessments depending upon fishery complexity (number of stocks, gear types, jurisdictions, etc.). Annual surveillance audits are typically of the order of 15-20% of the price of the initial full assessment. (MSC 2013b).