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Sustainable Seafood From Aquaculture and Wild Fisheries: Insights From a Discrete Choice Experiment in Germany☆

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ABSTRACT

There is an increasing focus on environmentally sustainable seafood, which creates a potential for segmentation in the seafood market. Several recent studies demonstrate that consumers prefer ecolabeled wild seafood over unlabeled seafood. In addition, there is increasing evidence of a preference for wild fish relative to farmed fish, despite the rapid increase of aquaculture production. Recently, ecolabels have also been introduced for farmed fish. An interesting question is whether the preference for wild fish is primarily related to the perceived lack of environmental sustainability in aquaculture, or whether it is a perceived quality difference. In this paper, a choice experiment is used to investigate these issues in Germany for salmon using the Aquaculture Stewardship Council (ASC) ecolabel for farmed salmon and the Marine Stewardship Council (MSC) ecolabel for wild salmon. Using a mixed logit model, the random parameter specification indicates substantial variation in consumer preferences beyond demographic variables. With respect to the main question, the ASC ecolabel not only makes up for the negative association of farmed salmon, but gives a similar price for the ASC labeled salmon as for MSC labeled wild salmon. This is an indication that environmental concerns and not quality differences are the major issue in segmenting the market between farmed and wild fish.

1. Introduction

Aquaculture is the world's fastest growing food production technology, and in 2014 it surpassed wild fish as a source of seafood for human consumption (FAO, 2015). However, aquaculture is also a controversial food production technology that constitutes a new way of using the environment, which creates new negative externalities (Naylor et al., 2000). This has led to a negative perception of aquaculture in many markets and several studies indicate a consumer preference for wild fish (Salladarré et al., 2010; Roheim et al., 2012; Uchida et al., 2014a). Recently, the Aquaculture Stewardship Council (ASC) introduced an ecolabel certifying that the production process for the labeled fish is environmentally sustainable. Using survey data, this study investigates the effect of the ASC label for salmon, a popular species that is available as both wild and farmed in Germany. If the ASC label has a positive effect, it is of particular interest whether this effect is large enough to negate the disadvantage of not being wild as well as how the ASC compares with ecolabels for wild fish such as the Marine Stewardship Council (MSC) label.

Environmentally sustainable production processes for seafood initially focused on wild fish, as many fisheries were perceived to be over-fished. This has led to a number of sustainability schemes and ecolabels being implemented since the turn of the century (Roheim, 2008), with the MSC ecolabel being the most commonly used.[1] A number of studies using revealed or stated preference data show a positive preference and willingness-to-pay (WTP) for seafood with an ecolabel that guarantees an environmentally sustainable production process (Wessells et al., 1999; Johnston et al., 2001; Jaffry et al., 2004; Johnston and Roheim, 2006; Brécard et al., 2009; Salladarré et al., 2010; Uchida et al., 2014a, 2014b; Fonner and Sylvia, 2015; Rickertsen et al., 2017). In addition, studies using hedonic price functions indicate a positive premium for the ecolabel using scanner or store observation data (Roheim et al., 2011; Sogn-Grundvåg and Young, 2013; Sogn-Grundvåg et al., 2013, 2014, Asche et al., 2015a; Bronnmann and Asche, 2016). Hence, the ecolabels seem to be successful in segmenting the seafood market into a higher paying sustainably fished market

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[1] At the beginning of 2016, 286 fisheries have been certified to use the MSC.

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segment and a lower priced segment with no guarantees with respect to environmental sustainability.

Initially, aquaculture was regarded as a production technology that could reduce over-fishing by reducing demand for and thereby fishing effort for wild species.[2] In the 1990s, Anderson and Bettancourt (1993), Gu and Anderson (1995) and Holland and Wessells (1998) reported evidence of consumer preferences for farmed fish. However, as aquaculture production increased, more attention was given to the negative environmental effects of the production process, and consumer attitudes have shifted to a preference for wild fish (Salladarré et al., 2010; Roheim et al., 2012; Uchida et al., 2014a). While this in itself constitutes a challenge for farmed seafood, the fact that aquaculture and wild seafood within a species group are highly substitutable contributes further to make the MSC label a challenge for farmed seafood.[3] There have been some attempts to mitigate this challenge by labeling farmed seafood as organic or using best practices labeling (Asche et al., 2015a; Ankamah-Yeboah et al., 2016).[4] However, these are at best half-way measures since they are only imperfectly addressing the sustainability concern.

The lack of a serious ecolabel for farmed seafood has become more apparent as aquaculture production has continued to grow.[5] Moreover, despite environmental challenges in parts of the industry, it is hard to argue that all aquaculture production is unsustainable (Bush et al., 2013a). In 2012, the ASC ecolabel was created in cooperation with the World Wildlife Fund (WWF), which was also the case for the MSC ecolabel.[6] The ASC ecolabel allows fish farmers to indicate that their product is sustainably produced with a credible label, and can remove the potential market advantage the MSC ecolabel gave wild fish if the main reason for the preference for wild fish is environmental concerns.

This paper investigates the preferences of German consumers for salmon, with a particular focus on the attributes farmed, wild, and eco-labeled.[7] However, factors such as demographics and product form are controlled for. As recent hedonic price function studies have shown the type of retail outlet to be important (Asche et al., 2015a; Bronnmann and Asche, 2016), we will also control for retailer, even in an experimental setting. The empirical analysis of this study is based on survey data from 485 respondents carried out in November 2015. These data are used to estimate a mixed logit model that avoids the three main limitations of the standard multinomial logit model by allowing for random taste variation, unrestricted substitution pattern, and correlation in unobserved factors over time (Hensher et al., 2015). The estimated parameters are used to compute WTP for the attributes of the model. While a number of studies focus on the ecolabeling of wild fish, to our knowledge the only two studies that consider ecolabels on farmed fish are Roheim et al. (2012) and Uchida et al. (2014a), who investigate, respectively, U.S. and Japanese consumers' WTP for salmon.[8] However, in both cases the ecolabels are hypothetical and apply to both wild and farmed fish, rather than the separate labels for wild and farmed fish that appear in the market.

The remainder of the paper is organized as follows. The next section describes the survey design. The data are then presented in Section 3, followed by a description of the methods used. Section 4 presents the results of the mixed logit model, as well as the estimated WTP for the various product attributes. A summary is provided in Section 5.

2. Background and Survey Design

Globally, salmon is one of the most successful farmed fish species in terms of production growth, and is the farmed species with the second highest value after shrimp (Smith et al., 2010; Asche et al., 2015b; Kumar and Engle, 2016).[9] In Germany, salmon is one of the most popular species as measured by market share (FIZ, 2015), and is available both fresh and frozen. Moreover, the market share of farmed and wild salmon is approximately 50% (Bronnmann and Asche, 2016). MSC-labeled salmon has been available for some years, while ASC salmon has been available since 2014. By the end of 2015, 1675 salmon products were available with the ASC label globally; in Germany 130 certified salmon products were available. At the same time there were 508 MSC certified salmon products available at the German market (MSC, 2016).

The empirical analysis of this study is based on a survey conducted at three different retail stores in northern Germany (located in Kiel and Kaltenkirchen) during two weeks in November 2015 using a paper-based questionnaire. The region of the survey is suited for analyzing consumers' preferences for fish because the majority of fish consumers in Germany are located in the northern states (FIZ, 2015). Prior to the actual survey, the questionnaire and the choice experiment were developed and pre-tested using a ten-person focus-group discussion to ensure the comprehensibility of the questions and the choice sets. Respondents were selected randomly from consumers shopping in the markets, and were asked for their willingness to participate in a study by the University of Kiel to investigate consumers' preferences regarding farmed and sustainable fish. A total of 776 survey responses were collected; 485 questionnaires were filled out completely with no information missing, resulting in 63% useable observations.

The survey consists of a four parts. In the first section, the respondents choose their preferred salmon product without any prior information. This avoids any priming effect, and is likely to provide the best representation of actual consumer perceptions (Burnham et al., 2000). The second section of the survey contains questions about some sociodemographic characteristics of the respondents. The third section identifies general seafood consumption habits, species purchased, beliefs and perceptions towards aquaculture and sustainable fish production, environmental concerns, and attention to seafood labeling. In the last section, the respondents receive background information regarding the production methods of salmon and challenges with respect to sustainability in fisheries and aquaculture in general, as well as the certification criteria of the MSC and ASC ecolabels. After providing this information, the respondents are provided with a second set of purchasing choices. If the information influences the responses, it is an indication of the potential changes in consumer behavior that can be obtained if consumers can be better informed. This can be important, as consumers in general are found to have a limited awareness of ecolabels and the issues they are to rectify (Grunert et al., 2014).

The experimental design included four attributes: Price, production process, sustainability certification, and processing. Table 1 shows the variation in the different attribute levels. The attributes are chosen based on the previous literature (Jaffry et al., 2004; Johnston and Roheim, 2006; Roheim et al., 2012; Davidson et al., 2012; Fernández-Polanco et al., 2013; Fonner and Sylvia, 2015) with the

[2] For instance, Anderson (1985) shows how increased aquaculture production of a species leads to lower prices and reduced fishing effort. Valderrama and Anderson (2010) show how this has been the case for salmon.

[3] This is the case, for example, for salmon (Asche et al., 1999a, 1999b) and whitefish (Asche et al., 2004; Nielsen, 2005; Bronnmann et al., 2016).

[4] The Friends of the Sea label has been available for both wild and farmed seafood, but had little impact, as illustrated by the lack of scientific interest. Fisheries Improvement Programs are also increasing in importance, but these provide no labels (Sampson et al., 2015).

[5] Not only has aquaculture production and trade been rapidly increasing (Asche et al., 2015b), it is expected to continue to increase strongly for years to come (Kobayashi et al., 2015), leading to an even larger market presence.

[6] The first ASC accreditation was given in 2012. By the end of 2012, there were 158 products available with ASC certification. That number increased to 4260 by the end of 2015 (ASC, 2016).

[7] By the end of 2015, a total of 563 ASC-certified fish products were available on the German market, of which 130 were salmon (ASC, 2016).

[8] There are several studies that discuss the principles of such labels, such as Bush et al. (2013b).

[9] However, there are also several environmental externalities associated with salmon such as disease (Asche et al., 2009; Fischer et al., 2016), parasites (Torrissen et al., 2013; Abolofia et al., 2017) and pollution (Asche et al., 1999a, 1999b; Tveterås, 2002; Nielsen, 2012; Nielsen et al., 2014).