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Sustainability certification and product substitutability: Evidence from the seafood market

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ABSTRACT

Ecolabels address the asymmetry of information between producers and consumers regarding credence attributes. If consumers prefer a product with an ecolabel, the label will create product differentiation and a reduction in substitutability between ecolabeled and non-labeled products. Fisheries certification programs for sustainability have rapidly increased their significance within international seafood markets as a mechanism to create market-based incentives for improved global fisheries management and practices by differentiating seafood products with ecolabels. While there exists growing evidence of market benefits in the price dimension, this analysis investigates both price and quantity effects of fisheries certification by testing the hypothesis of structural changes in demand at the import (wholesale) level to determine if, in the period after sustainability certification, there were significant changes in market shares or substitutability between certified and uncertified frozen walleye (Alaska) pollock (*Theragra chalcogramma*) imported by Germany. A linear, first-differenced, inverse almost ideal demand system (IAIDS), incorporating a dynamic transition function, is used to estimate German imports of certified pollock from the U.S. and uncertified pollock from Russia and China. Results indicate no statistically significant change in market shares, although there were significant effects on the price flexibilities. The price of certified US pollock became less sensitive not only to changes in own quantity of imports but also to changes in import volumes of non-certified Russian pollock. These market changes may provide insight into economic incentives that may have led the Russian government to strengthen its national fisheries management policies to gain certification.

1. Introduction

Ecolabels address the asymmetry of information between producers and consumers regarding credence attributes (Darby and Karni, 1973). Producers investing in sustainability certification that allow for the use of credible labels may differentiate themselves in the marketplace, thus segmenting the market (Bonanno and Lopez, 2009). If consumers prefer a product with an ecolabel, the label will create a differentiating effect between two otherwise homogeneous products, creating product differentiation and imperfect substitutes (Shaked and Sutton, 1982; Bonroy and Constantatos, 2015). This leads to a less price elastic demand for the ecolabeled product, with a reduction in substitutability between ecolabeled and non-labeled products (Kinnucan et al., 1997; Wessells et al., 1999).

Sustainability certification and corresponding labeling programs span numerous global industries such as forestry, fisheries, aquaculture, organic agriculture, coffee production, and palm oil production (Blachman and Rivera, 2011; Gulbrandsen, 2014) and are often created by NGOs as a means to correct what in their view is ineffective formal governance (Vandergeest et al., 2015). Major OECD food retailers, with increased market concentration and buying power, are increasingly requiring sustainability certification of food products (Fulponi, 2006).

Sutton's (1997) theory of change proposed using demand-driven incentives through certification and ecolabeling of seafood as a means to improve ocean management policies globally and promote sustainable fisheries. Since not all fisheries meet the standards required for certification, in some cases there are needed changes in policies that must occur (Sampson et al., 2015). As fisheries are a common pool resource, this includes strengthening property rights (Smith et al., 2010) and changing both national and international fisheries governance, through regulations such as those, for example, that: (a) limit overfishing; (b) require specific gear types and fishing methods to protect ecosystem health; and (c) create safe labor practices (Roheim, 2008). Additional managerial changes may be required within in the seafood supply chain such as strengthening traceability systems and chain of custody assurances to verify truth in labeling.

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To incentivize certification, bioeconomic models show that price premiums and a shift in demand are necessary for sustainable fisheries management and fulfill the premise of Sutton's (1997) theory of change (Gudmundsson and Wessells, 2000). Once certified, ecolabels signify that seafood products have met standards that address consumers' 'non-use' preferences regarding sustainable production processes (see Tiesl and Roe, 1998).

Since the 1990s, fisheries sustainability certification programs have rapidly increased their number and significance within international seafood markets (Parkes et al., 2010; Gutierrez et al., 2016). Most of the current literature investigating market effects from fisheries certification has focused upon the effect in the price dimension, namely whether there exists a price premium at retail or ex-vessel market levels (e.g. Wessells et al., 1999; Johnston et al., 2001; Jaffry et al., 2004; Johnston and Roheim, 2006; Brécard et al., 2009; Roheim et al., 2011; Uchida et al., 2013; Sogn-Grundvag et al., 2013, 2014; Uchida et al., 2014; Asche et al., 2015; Blomquist et al., 2015; Stemle et al., 2016).

The objective of this paper is to pivot the examination from a focus on price premiums to investigate other market benefits that have been hypothesized as driving fisheries' decisions to pursue and obtain certification (Roheim, 2008), such as a structural shift in market shares and by affecting product substitutability through product differentiation.[1] Assuming consumers prefer ecolabeled seafood over the non-ecolabeled, effective product differentiation will result in a price premium for ecolabeled seafood (Wessells et al., 1999). In a theoretical model, Bonroy and Constantatos (2015) show that if the high-quality (i.e. ecolabeled) product market is competitive after labeling, then compared to a market with no labeling, at equilibrium prices the high quality market share expands, and the lower quality market share shrinks. In other words, certified products gain increased market shares at the expense of the non-certified products. Successful product differentiation will rotate the demand curve, create more inelastic demand and reduce substitutability between the differentiated products. Thus, a demand shift (or rotation) post-certification will be in the price dimension, the quantity dimension, or both, depending upon the shape of the demand curve. The contribution of this analysis is to investigate both the price and quantity effects by testing the hypothesis of structural change in demand through empirical estimation of a system of share equations.[2]

We choose to investigate market shares at an intermediate market level, focusing on imports. The analysis is applied to German imports of frozen walleye (Alaska) pollock (*Theragra chalcogramma*)[3] from the U.S., Russia and China, since Germany is one of the more important markets for pollock in Europe. The US fisheries for Alaska pollock became certified by the Marine Stewardship Council (MSC), in 2005. The MSC is the largest fisheries certification program, having certified approximately 10% of global capture fisheries supply (MSC, 2016b). With additional chain-of-custody certification, US pollock can bear the MSC ecolabel.

We estimate import demand using an inverse demand system, consistent with previous studies of price formation for fish (Barten and Bettendorf, 1989; Eales et al., 1997; Chiang et al, 2001; Park et al., 2004; Asche and Zhang, 2013). Use of an inverse demand system facilitates analysis of sensitivity of prices of certified pollock to changes in volumes from competing sources. Much like new technology where adoption is unlikely to be fully implemented immediately after introduction, information regarding certification is more likely to follow a diffusion pattern over time with the full effects on demand occurring at some point later. Demand system literature analyzing the effect of new information on consumer demand for foods uses a variety of econometric specifications approaches to capture these effects (Moschini and Meilke, 1989; Eales and Unnevehr, 1993; Kinnucan et al., 1997; Holt and Balagtas, 2009; Lusk, 2010; Dedah et al., 2011). We follow the approach of Tiesl et al. (2002) and Holt and Balagtas (2009) to capture a smooth transition over time from a market with only uncertified Alaska pollock available to one where certified product from the U.S. is available.

The rest of the paper continues with a review of literature on markets benefits of fisheries certification, followed by background on the Alaska pollock market. Next we describe the data used in the analysis, and the methodology followed by results and implications for the German import markets for pollock. The paper concludes with a discussion of the broader policy and managerial implications for the whitefish market of sustainability certification.

2. Market benefits to fisheries certification

The current literature is limited and mixed in its evidence of the existence of market benefits to fisheries certification. While Grunert et al. (2014) shows that certain sustainability labels currently do not play a major role in consumers' food choices across many countries in Europe, empirical studies for seafood ecolabeling have shown the opposite in Europe and other countries. These studies have primarily focused on investigating if consumers are willing to pay, or do pay, a price premium. For example, several studies have found consumers in the U.S., Europe and Japan are willing to pay a premium for ecolabeled seafood (Wessells et al., 1999; Johnston et al., 2001; Jaffry et al., 2004; Johnston and Roheim, 2006; Brécard et al., 2009; Roheim et al., 2012; Uchida et al., 2014; Fonner and Syvia, 2015; Salladare et al., 2016). These results are based on contingent valuation methods, and provide little information as to potential changes in demand. In addition, hypothetical willingness to pay a premium does not necessarily translate into actual payments of a premium. Uchida et al. (2013) address this weakness using experimental auctions in Japan, simulating more closely actual market decisions. Again the result is that consumers are willing to pay a premium under certain information sets.

A growing body of empirical research indicates that, in some developed countries, price premiums are actually being paid in the market using Rosen's (1974) hedonic analysis approach. Using scanner technology products' prices are estimated as a function of product attributes, including the presence of an ecolabel. Premiums are found to range from 10 to 15% for pollock, cod, and haddock in UK markets (Roheim et al., 2011; Sogn-Grundvag et al., 2013, 2014). Bronnmann and Asche (2016) report smaller premiums in the German market, finding on average around 4% for a wide variety of species. Asche et al. (2015) uses similar methodology to find premiums for salmon in the UK retail market, but finds that the size of the premiums varies substantially by different retail chains. The retail chains range from discount to high-end retailers, and the heterogeneity of the premiums across retailers may imply differing retailer price-setting objectives.

In contrast to the growing evidence of price premiums from fisheries certification at the retail level, evidence at the ex-vessel level both is limited and mixed (Blomquist et al., 2015; Stemle et al., 2016). Blomquist et al. (2015) uses a difference-in-difference approach to compare prices paid to Baltic cod fishermen in Sweden, and finds no price premium to fishers for certified Baltic cod relative to uncertified Baltic cod. Baltic cod is primarily sold into the European market, so there appears that some mechanism exists that prevents the premium at

[1] As pointed out by a reviewer, sustainability certification can also be used strategically to raise rivals' costs and disadvantage them, at least temporarily (Korber, 1998; Grolleau et al., 2007).

[2] Similar to Stemle et al. (2016), this approach does not directly allow for examination of causality between certification and changes in the market but follows Brown and Schrader (1990) and a subsequent string of literature investigating whether new information affects demand. Detailed review of news related to the Alaska pollock market indicates a lack of other major exogenous factors shifting/rotating demand in the period contemporaneous to the post-certification period studied.

[3] Nomenclature of seafood can be challenging. Walleye (*Theragra chalcogramma*) pollock is commonly referred to as 'Alaska' pollock regardless of where it is caught in the northern Pacific Ocean. Alaska pollock hereafter in this paper. Should be taken to mean *Theragra chalcogramma*. To minimize confusion, the nation of origin will designate the product's source.