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Abstract

Eco-labels are important features of many natural resource and food markets. They certify that a product has a desirable intrinsic quality, typically related to a public good such as being sustainably produced. In an increasing number of markets, consumers can choose between different labels that certify different attributes. Two issues that have received limited attention are whether pricing varies across different eco-labels and to what extent different retailers have adopted different pricing strategies for eco-labels. In this paper we investigate these issues by estimating a hedonic price model for salmon sold in Glasgow, UK for eight different retail chains, two eco-labels, and one label of origin. The results show substantial variation in the prices of the different eco-labels and that eco-label premiums vary across retail chains. Specifically, salmon certified with the Marine Stewardship Council label carries a high premium in low-end retail chains but no statistically significant premium in the high-end chains. Failure to account for retailer heterogeneity will over- or under-estimate the premium. In contrast, premiums for organic certification are similar in magnitude across retailer types.

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1. Introduction

Eco-labels have become increasingly important product attributes in many natural resource and food markets. Like other certification schemes, eco-labels attempt to solve asymmetric information problems by signaling that the product or its production process has some intrinsic quality that is otherwise difficult for the consumer to observe. However, eco-labels are not just about solving asymmetric information problems because they are typically affixed to impure public goods. When consumers can choose an impure public good that jointly produces a private good and an environmental public good, welfare can increase or decrease, depending on the responsiveness of consumers to the environmental attribute (Kotchen 2006). Understanding consumer demand for eco-labels thus is an important step in evaluating the overall potential for markets to provide public goods.

While the availability of particular choices varies across markets, consumers of eco-labeled goods often can buy products that are certified as sustainably or organically produced or not containing specific ingredients that are perceived to be harmful to the environment. A number of studies have used survey or experimental data to show that many consumers are willing to pay for traits certified by eco-labels. Examples include sustainably harvested fish and forestry products (Wessells et al. 1999; Johnston et al, 2001; Aguilar and Vlosky, 2007), organically grown food (Bond, Thilmany, and Keeling Bond 2008; Lusk and Briggeman 2009), fair trade (De Pelsmacker, Driesen, and Rayp 2005;), and contains no genetically modified (GM) materials (Loureiro and Hine 2002; Lusk et al. 2005). There is also substantial evidence that consumers prefer domestic to imported products (Alfnes and Rickertsen, 2003; Lusk and Anderson, 2004). [1]

In general, it is costly to provide the intrinsic value associated with an eco-label. Theoretically, an eco-label will only be supplied if the higher willingness-to-pay translates into a positive price premium (Gudmundsson and Wessells, 2001; Sedjo and Swallow, 2002). Somewhat surprisingly, there are few studies showing that eco-labels actually result in a price premium. Among the exceptions are Teisl, Roe and Hicks (2002), who show that a dolphin-safe tuna label increases demand for the eco-labeled product in a demand system and Roheim, Asche and Insignares (2012) and Sogn-Grundvåg, Larsen and Young (2013), who show that the Marine Stewardship Council (MSC) eco-label produces a price premium in the London area and in Glasgow, UK, respectively. While most of the literature has focused on demand for eco-labels used to signal quality, there is a growing interest in eco-labels used to screen products. Hallstein and Villas-Boas (2013) show that in California the use of wallet cards (a form of third-party screening that provide purchasing recommendations) significantly reduced seafood purchases of species with a yellow label, but purchases of species with red or green labels were unchanged.

Despite the growing literature on eco-labels, two issues that have received little attention are: 1) the price premiums when consumers can choose between products with different eco-labels that signal similar intrinsic qualities and 2) the potential for retailer markup strategies to obscure the true price premium. An exception to the first issue is Onazaka and Thilmany McFadden (2011), who investigated the willingness-to-

[1] We use the term eco-label to refer to all of these cases, recognizing that some of these labels attempt to signal public good attributes that are non-environmental social objectives and/or private attributes related to perceived health benefits.

pay for, respectively, organic, fair trade, carbon footprint and production location using stated preference survey data. They found different preferences for the different eco-labels. Moreover, while some combinations of eco-labels may enhance willingness-to-pay, others led to a discount.

In this study, we investigate whether actual retail prices vary across different eco-labels for salmon, and whether the eco-label premium varies by retailer. To quantify price premiums, we use a unique data set of 6,618 weekly price observations of a wide range of salmon products sold in eight UK retail chains. In contrast to scanner data, which typically do not include information on eco-labels, our data allow us to access all attributes of each product, including two eco-labels (organic, MSC) and one country of origin label (Scottish).[2] We also are able to study products that are not bar-coded and sold as fresh.

Our methodological approach is to estimate hedonic price models, which have been used to quantify the value of various seafood product attributes at the landing point (McConnell and Strand, 2000; Kristofersson and Rickertsen, 2004), the wholesale level (Asche and Guillen, 2012) and the retail level (Roheim, Asche and Insignaris, 2011; Sogn-Grundvåg, Larsen and Young, 2013). These studies typically estimate a single parameter for each product attribute. To capture potential differences in pricing strategies across retailers for the different eco-labels, we introduce a set of interaction variables in our model.

[2] Roheim, Asche and Insignaris (2011) had to augment their scanner data with store observations to determine which products carried the MSC label.

The paper is organized as follows. In the next section, we provide background on eco-labels for seafood and describe the data set in section 3. Section 4 shows the model specification, section 5 reports the empirical results, and we offer concluding remarks in the final section.

2. Background

According to the Food and Agriculture Organization of the United Nations (FAO), more than 50% of the world's fisheries can be characterized as fully utilized and another 32% can be characterized as overfished or recovering (FAO 2011). The prevalence of overfishing and the globalization of the seafood trade raise concerns not only about whether fish stocks are currently poorly managed but also whether some seafood exporting countries have the institutional capacity to govern their resources effectively in the future (Smith et al. 2010). Moreover, in some cases, sub-optimal management may result from institutional arrangements that empower the industry that is being managed in the regulatory process (Boyce 2010).[3] As a result, decisions about what is best for the resource are replaced by decisions about what is best for those utilizing the resource. To allow consumers a voice, certification programs for sustainably managed resources and eco-labeled products derived from those resources have been introduced in various forms (Wessells et al, 1999).

The most successful eco-label in fisheries so far, certainly in terms of the number of fisheries certified, is the MSC. Since the first capture fishery was certified as sustainable against the MSC´s standards in 2000, the number of certified fisheries has grown to 189

[3] For instance, Homans and Wilen (1997) provide a model, in a different context, where managers´ decisions are treated as endogenous.

as of January 2012 (MSC, 2013). While recent studies confirm that there is an economic premium associated with the MSC-label (Roheim, Asche and Insignaris, 2012; Sogn-Grundvåg, Larsen and Young, 2013), the label is not without its controversies. One view is that MSC is not worth the cost of being certified because there is no premium (Andeson et al, 2005; Washington, 2008). The most serious concern is that fisheries management is not necessarily improved in fisheries certified by the MSC-label (Jaquet et al, 2010; Gutièrrez et al, 2012). One unique feature of the MSC label is that it applies to products from an entire fishery for a common-pool resource, not simply to products from a subset of the firms in an industry. This all-or-nothing approach to solving a commons problem and providing public goods at the same time (e.g. restricting the use of destructive fishing gear) raises questions about whose behavior the label purports to change and how the premium is transmitted to these agents.[4] Another controversy in the literature is whether eco-labels, including MSC, act as trade barriers and deny market access (Salzman 2007). In developing countries, seafood eco-labeling raises questions about distributional consequences because labeling requirements may disadvantage small operations relative to large ones that have more capacity to manage their supply chains (Tran et al. 2013). MSC's perceived lack of value was underscored in January 2012 as the leading Alaskan salmon processors and thereby the Alaska Seafood Marketing Institute withdrew from certification after the 2012 season (Intrafish, 2012; Alaska Seafood Marketing Institute, 2012).

[4] What constitutes a "fishery" can be a matter of discussion and further complicate the MSC label.

Until recently, there has been no direct sustainability certification for seafood from aquaculture.[5] To provide a signal of environmental quality similar to MSC, some farmed seafood is marketed and labeled as organic. Despite similarities, organic farmed seafood differs from wild-caught MSC-labeled seafood in that the environmental problems are different (the commons problem, destructive gear, and bycatch for MSC compared to nutrient pollution, antibiotic use, and pesticides in feed for aquaculture), and consumers may perceive private health benefits of consuming organic compared to conventional. Although there have been a few studies concerned with the marketing and demand for organic salmon (Aarset and Young, 2004; Aarset et al, 2004;), we are not aware of any that mirror the detailed price and other product observations incorporated here and thus none with comparable identification of price premiums on organically labeled seafood. Nevertheless, one would expect a premium, as other attributes are more costly to provide for an organic product, e.g. salmon coloring (Alfnes et al, 2006; Forsberg and Guttormsen, 2006).

County of origin labeling tends to focus on consumer demand for private attributes such as food safety rather than public environmental goods (Loureiro and Umberger 2007). For seafood, generic marketing organizations like the Alaska Seafood Marketing Institute and the Norwegian Seafood Council have invested substantially in country of origin labeling and marketing of salmon. Kinnucan and Myrland (2002) provide evidence that these efforts are successful in producing premiums. Thus, isolating a

[5] In 2010 the Aquaculture Stewardship Council was established as MSC´s cousin eco-label, and certification commenced (is it perhaps more precise to say something like: According to ASC (http://www.asc-aqua.org), tilapia was the first ASC-certified species launched on the market in 2012.) in 2012. The Global Aquaculture Alliances backs a Best Aquaculture Practice that has been awarded for two years, but no studies exist with respect to its effect.

premium for eco-labeled seafood must at least control for the potentially confounding effect of country of origin labeling.

Seven different types of salmonids are marketed; pink, chum, sockeye and chinook are primarily wild and Atlantic, coho and trout are primarily farmed.[6] There have always been different premiums associated with the different species. The wild species pink and chum are often known as low-value salmon, while chinook, sockeye and wild coho are high value salmon. Traditionally, Atlantic salmon has also been regarded as high-value salmon. Asche, Bremnes and Wessells (1999) and Asche et al (2005) quantify the price hierarchy and show that it is stable. It is also of interest to note that farmed was a positive attribute when the salmon farming industry was emerging (Holland and Wessells, 1998), but it later became a negative attribute (Roheim, Sudhukaran and Durham, 2012). Overall, this literature highlights the critical importance of controlling for salmon species and whether it is farmed or wild-caught in isolating eco-label premiums.

3. Data

The data for this study were collected by personal observation of a wide range of fresh, chilled and frozen farmed and wild salmon products in eight outlets representing eight different retail chains located in Glasgow, Scotland, UK.[7] The eight retail chains are Asda, Coop, Lidl, Marks & Spencer, Morrisons, Sainsbury's, Tesco and Waitrose. Whilst there is some variation in the size of the stores sampled, the sample represents primarily

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[6] The trout is primarily large rainbow trout and also known as salmon trout (Asche et al, 2005) or steelhead (Olsson and Criddle, 2008). Wild coho is also available but in substantially less quantities than farmed. Wild Atlantic may also be found but in even smaller volumes and seldom, if ever, in large retail stores.

[7] Every product was purchased initially, and the packaging was retained. On subsequent visits, prices were recorded and packaging was spot checked for consistency with packaging from earlier time periods.

medium and large stores but not the smallest. Although the smallest convenience outlets show the greatest price variability, no systematic deviations from each chain's standard prices were found. Collectively these retail chains accounted for 85.3% of the UK retail fish market in 2012 (Nielsen Scantrack, 2013). Whilst data collection through personal observation necessarily restricts the number of outlets that can be visited, we argue that this limitation is not a major concern because chains appear to coordinate their pricing strategies for all outlets in a region (Pesendorfer 2002). In our case, the assumption of a chain-level standard pricing policy is consistent with anecdotal observations of prices at other stores. Hence, we assume that the data set provides an unbiased picture of the pricing of the products in these UK chains. The data collection method has the advantage that all visible product attributes can be observed and analysed, including attributes that are not reported in other types of data or that are generally too expensive to acquire for all but commercial purposes. As noted above, Roheim, Asche and Insignaris (2012) could not obtain information on eco-labels from their scanner data and did not have access to the different individually named store brands.

The observations conducted in Glasgow, the fourth largest city in UK, were done during the second half of the week when the product range and sales volumes normally are at their highest. The continuous weekly observations started November 14th, 2012 and the latest observation included was August 20th, 2013, a period of 41 weeks. A total of 223 salmon products were included in the study. Information regarding the physical product included method of production as in wild catch or farmed, product form (frozen, chilled etc), the mode of processing, brand, eco-label, weight, and price per kilo. Due to product line deletions and additions during the observation period, the data set is not a balanced panel, resulting in a total of 6,618 observations. Descriptive statistics on variables included in the study are listed in table 1. Details on products across supermarkets are provided in appendix A. None of the eco-labels are carried by all retail chains. The MSC-label is not carried by Coop and Sainsbury,[8] only three chains carry salmon labelled as organic (Asda, Marks & Spencer and Waitrose), and all chains but Lidl carry salmon labelled as Scottish.

4. Model specification

Our model specification follows Rosen (1974) and uses a hedonic price model. The regression model specifies the price of a product as a function of the product attributes:

$$P_{it} = f(s_1, \dots, s_n), \tag{1}$$

where P_{it} is the price of product *i* at time *t*, and $s_1, \dots, s_n$ is a vector of attributes that determine the price of the product. This study uses a log-linear functional form, meaning that parameter estimates are interpreted as percentage deviations from a base product. The basic specification (Model 1) is:

$$\ln P_{it} = a + \sum_{j=2}^{J} b_j\, s_j + \sum_{k=2}^{K} c_k\, s_k + \sum_{l=2}^{L} d_l\, s_l + e_{it}. \tag{2}$$

Dummy variable coding was used on the parameters b_j, c_k, d_l for respectively the product attributes, the retailer attributes and the eco-label attributes listed in table 1, which follows previous hedonic literature for seafood products (McConnell and Strand 2000; Roheim *et al*. 2011; Asche and Guillen 2012; Sogn-Grundvåg, Larsen and Young 2013). The base product has attributes that are the excluded categories in the regression to avoid the dummy variable trap. While we do observe the own- or private labels for each of the retailers, we cannot separate them from the retailer dummy. Hence, with

[8] That there are no MSC-labeled salmon products at Sainsbury is a surprising, as they carry MSC-labeled products for other species (Sogn-Grundvåg, Larsen and Young, 2013). However, lack of MSC-labeled salmon may be an indication that the retail chains also have different strategies for different products.

respect to brands we explicitly specify the two leading brands, Birdseye and Young´s Bluecrest, and have two additional groups, other brands and store brands.

In addition to this basic model, we introduce a set of interaction dummies between the eco-labels and the retailer dummies. In the most general form, this augments the model to:

$$\ln P_{it} = a + \sum_{j=2}^{J} b_j\, s_j + \sum_{k=2}^{K} c_k\, s_k + \sum_{k=1}^{K} \sum_{l=1}^{L} f_{kl}\, s_{kl} + e_{it}. \qquad (3)$$

Here, the parameter f_{kl} provides the interaction effect, showing how an eco-label is enhanced (positive value) or discounted (negative value) relative to the base case for any retailer. We estimate four versions of equation (3) (Models 2-5). Model 2 has all of the interaction variables, while models 3-5 have interaction variables for respectively one of the eco-labels or Scottish origin and the results will be reported in the appendix.. The econometric analysis was conducted using STATA with robust standard errors.[9]

A feature that has not received attention in the earlier literature on the value of ecolabels in hedonic price models is that the standard errors are not likely to be independent across units, but rather independent across some clusters of units and correlated within those clusters. It is well known that the pricing strategies of supermarkets in general limit price variation due to menu costs, and increasingly such features are present also for seafood (Kvaløy and Tveteras, 2008; Larsen and Asche, 2011). This leads to a potential for correlation among product types, conservation forms, or retailers. This correlation can potentially lead to substantial biases in the estimated standard errors (Moutlon, 1990; Wooldridge, 2003). Because there is no

[9] White's test on homoscedasticity was rejected (MacKinnon and White, 1985).

obvious criterion to select the unit of clustering, we will estimate the models with different clustering units to evaluate the impact.

5. Empirical Results

In all the models estimated, the base product is a farmed, chilled salmon fillet sold at Asda (an inexpensive retail chain). The base product also is un-processed, has no eco-label (neither MSC nor organic), carries the supermarket's own private label, has a package size between 100 and 250 grams, is not labelled "Scottish", and does not come with any sauce, dressing or other value added ingredients that might significantly reduce the product's fish content. There are a number of potential dimensions in which the errors can be clustered. The clustering can simply follow the species, the product form, or the type of processing/preservation (e.g. salted). Or, clusters can be combinations of these with the most general being at the individual product level, indicating a similar pricing process for each product, but with dependencies in the pricing for each product. Models with all these clusters have been estimated. For brevity, we report and discuss the clusters by retailer, by product and a four dimensional cluster containing species, product form, and type of processing/preservation in the paper. Standard errors for clusters by other variable are reported in the appendix. The reported cluster dimensions are the dimensions where the estimated standard errors are most influenced (retailers with 8 clusters, products with 233 clusters and the four dimensional one with 57 clusters).

Before the results are discussed, there is one additional specification issue to address: to what extent there are systematic time patterns in the prices such as a trend or seasonality. To investigate this issue, we estimated the models with a set of weekly and a set of 4-weekly dummy variables.[10] Although the models with the seasonal dummies use additional degrees of freedom, the qualitative results are consistent with those in Models 1-5. Table 2 reports *F*-tests for the null hypothesis that that these seasonal dummies are zero without clustered errors. The null hypothesis cannot be rejected in any of the cases.[11] The *F*-tests are consistent with not including the weekly or 4-weekly dummies in our preferred specifications; price deviations appear to be idiosyncratic and not due to a systematic seasonal or trend component. This finding is not surprising given that all products are packaged and most products are processed, exposing systematic price changes to menu costs. Price fluctuations of individual products within a store could reflect inventory management or loss leader pricing strategies.

Model 1 contains baseline labeling premium estimates with no interaction dummies. Table 3 reports the parameter estimates from this model, with the estimated parameters in the second column, unclustered robust standard errors in the third column and three different clusterings of the standard errors in the following columns. The model has an R^2 of 0.808, indicating good explanatory power. In the model with no clustering of the errors, most parameters are significant at a 5% level. The exceptions are that there is no evidence of any premiums associated with Young´s brand or for the value-added product gravlax, and the retail chain Morrisons does not have a price level that is significantly different from Asda. The clustered errors are all more conservative, and these attributes remain statistically insignificant with clustering.

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[10] Although we have data for only one year, these dummies could potentially capture a within year trend as well as seasonality.

[11] As the clustered standard errors are more conservative, the results are similar

Overall, when the errors are clustered, most attributes remain statistically significant. Significance vanishes for some attributes, including some of the labels as we discuss below. For other clustering alternatives that are reported in the appendix, the results are somewhere in between what is reported with the unclustered errors and the three cluster dimensions that are reported in Table 3. The conclusion with respect to statistical significance is virtually identical for the three reported clusters, and for the product attributes dimension and the multi-cluster dimension, the standard errors are fairly close. This suggests that the retailer clustering captures a large part of the correlation, but that there is also some correlations in other dimensions that the other cluster dimensions are necessary to capture.

As expected, there is a negative premium for the wild species chum and pink, and this result holds with all error specifications. There seems to be a positive premium associated with sockeye, supporting the notion that there is a preference for wild salmon. However, this result is not robust across cluster specifications. For the wild salmon where species is not listed, there is a negative premium, though not as large as for chum and pink, and it becomes statistically insignificant when the errors are clustered.

The portion-size and product form attributes largely conform to expectations. For portion size, smaller package sizes command a larger price premium per kilogram as expected. Slices are a premium product, trimmings are discounted heavily, added ingredients receive a small premium, and other product forms (not specified) are sold at a modest discount. These attributes are always statistically significant.

Results from retailer dummies are consistent with our prior expectations of retailer price hierarchies. There is a significant negative premium associated with Lidl, a discount chain, no premium associated with Morrison, and all of the other chains command a higher price level than Asda. As expected, the high-end retail chains Marks & Spencer and Waitrose have the highest general price levels. Results across model specifications are robust.

For all the eco-labels, there is a statistically significant premium in the specification with robust standard errors. The MSC premium is 13.1%, which is very close to the 14.2% reported for Alaska Pollock by Roheim, Asche and Insignaris and the 10% reported for haddock by Sogn-Grundvåg, Larsen and Young (2013). The premium is higher for organic at 25.3%. Scottish origin has a premium of 4%, which is smaller than the eco-label premiums but may still be significant in a price competitive market. With all the reported clusters, the MSC attribute becomes insignificant, as does the Scottish origin in two of the cluster dimensions. This result suggests that there is substantial correlation in these dimensions that must be accounted for when evaluating the impact of the ecolabels. In all specifications, an F-test for the hypothesis that the premium is equal for the three ecolabels can be rejected with p-values less than 0.001. Hence, there is evidence that the premium varies by label.

In Models 3-5, we introduce different combinations of interactions of the eco-labels and origin labels with retailers. The base eco-label and origin label coefficients that are included in Models 3-5 (reported in the appendix) are highly robust and quantitatively similar to those in Model 1.

Model 2 includes interaction dummies for the tree types of labeling. The R^2 in this model increases to 0.817. When disregarding the lables, the model largely confirms the results from Model 1 for the different attributes, and also with respect to the impact of the clusters. The interaction terms indicate that eco-labels have a significant premium for some retailers, and there is substantial variation in pricing strategies across different retail chains for the various labels. The variation is largest for the MSC label; the estimated premium varies from negative but statistically insignificant to 56.6% for Asda. The variation is almost as large for Scottish salmon, although this variation is primarily due to Tesco, which charges a 44% premium. For most retailers, there is a moderate or no premium for Scottish origin on salmon, and for Morrison it is negative. The three retail chains that carry organic salmon charges relatively similar premiums at around 25%. These results are statistically significant with robust standard errors and across the different clustering approaches. For MSC, whether the standard errors are treated as clustered or not makes a substantial difference with respect to statistical significance. But given clustering at all, the three clustering dimensions reported here yields relatively similar standard errors. Clustering only by retailer is not as conservative as the other two clustering dimensions, and yield statistical significance for the labels for a few more retailers. Again, the estimated standard errors are very similar for the two most conservative cluster dimensions.

With robust errors, the results indicate that for two of the chains the MSC premium is not significantly different from zero, and the premiums charged by Lidl at 27.6% and Asda as 57.0% is very high. All organic premiums are statistically significant, as are all but one of the premiums for Scottish origin. With the errors clustered in the product dimension or multi-dimensional, only two MSC premiums remain statistically significant. These are the premiums for Asda and Lidl, two of the most discount oriented chains. When the clustering is only in the retailer dimension, there is a significant premium associated also with Waitrose. The organic premiums are always statistically significant. The Scottish premium disappears for all chains but Tesco for the two most conservative standard errors, while there is a premium for Scottish also at Sainsbury's when the errors are clustered only by retailers.

Table 5 reports *F*-tests on the interactions of the label dummies with retailer dummies for Model 2 with standard errors clustered by product form. With one exception, the results are the same independently of which standard errors are used. The *jointly* column reports tests for the null that all these interaction dummies are jointly zero. The *equality* column reports tests for the null in which the interaction parameters are equal; that is, the null hypothesis is that the model can be reduced to Model 1. All of these restrictions are rejected with the exception of the null that the organic premiums are equal. This null hypothesis is rejected if the ordinary robust errors are used. Hence, with an exception for organic, the different retailers pursue different pricing strategies across eco-labeled and country of origin seafood, where some charge a substantial premium while others do not charge any premium at all. This result is independent of whether one accounts for within group correlation by allowing the standard errors to be clustered or not. However, the premiums are statistically significant for more retailers when the standard errors are estimated less conservatively.

6. Concluding remarks

This paper provides several important insights with respect to how eco-labels are valued at the retail level of the value chain. The present study is one of very few that has estimated price premiums for eco-labels on seafood using real data. Our finding that the MSC eco-label commands an average price premium of 13.1% (from Model 1) corroborates the findings from two earlier studies that found very similar premiums for MSC-labelled Alaska pollock (Roheim, Asche and Santos, 2012) and haddock (Sogn-Grundvåg, Larsen and Young, 2013) in the UK retail market. Together these three studies, which cover two different regions in the UK (Glasgow and London) and three different species (salmon, Alaska pollock and haddock), appear to indicate that in the UK, the MSC label has gained consumer preference and commands a willingness to pay for the intrinsic qualities within this label. However, our results also clearly demonstrate that the eight retailers included in the study have adopted very different pricing strategies for eco-labels, and accordingly, the term "market premium" does not seems to be appropriate. Moreover, there appears to be substantial correlation for several attributes and particularly in the retail chain dimension. When accounted for, this changes several of the intermediate conclusions substantially. It does not materially change the main conclusions in the preferred and most general model, although there are significant ecolabel premiums associated with fewer retailers.

Our results on retail pricing of eco-labels show a complex picture with important implications for both research and practice. For other researchers attempting to quantify premiums for eco-labeled products, our findings strongly suggest that the market impact of eco-labels (and origin) can only be assessed accurately when the pricing strategies of individual retailers are taken into account. Studies based on scanner data that do not specify individual retail chains may overlook important insights regarding the nature and heterogeneity of the market for eco-labels. In studies that rely on data from a single retailer, the eco-label premium could be over- or underestimated depending on the pricing strategy such as whether the retailer uses the eco-labeled product as a loss leader. This question of external validity helps to account for differences in measured eco-label premiums in the literature. Use of a single retailer also suggests the potential for customer selection bias in attempts to understand consumer responses to both environmental signalling and screening (e.g. wallet cards). On the other end of the spectrum, studies that use data from multiple retailers but that fail to control for eco-label/retailer interactions suffer from omitted variable bias.

The highly segmented nature of the market for eco-labels also suggests that individual retail chains use eco-labels as one means of differentiation, at least with respect to their seafood offerings. This strategy may also serve a broader communications objective in that emphasis upon the sustainability of the seafood category helps to at least infer, if not necessarily reflect, similar emphasis in other foods and non-foods. In this respect seafood may be a particularly apposite medium because it encompasses a number of discrete and very different characteristics. Selling eco-labeled seafood may be a part of a larger corporate sustainability campaign. U.S. retailer Wal-Mart reported that 76% of its seafood sold was third-party certified and an additional 8% was pursuing certification as of January 31, 2012, and the chain set a goal that 100% of its seafood would be working toward sustainable certification by June 2012.[12] Fast food chain McDonald's recently announced that 100% of the seafood sold in its 14,000 U.S. restaurants would be MSC-certified.[13] Some argue that large brands are pursuing these corporate sustainability efforts to secure their supply chains for the long term (Dauvergne and

[12] http://corporate.walmart.com/global-responsibility/environment-sustainability/sustainable-seafood (Accessed February 11, 2013)
[13] http://www.huffingtonpost.com/2013/01/24/mcdonalds-fish-sustainable_n_2542502.html (Accessed Feburary 11, 2013)

Lister 2011). Undoubtedly, companies like Wal-Mart and McDonald's have a stake in securing large and steady flows of product that could be compromised by unsustainable practices. However, they also have a stake in projecting positive corporate image. Sustainable seafood may be a relatively inexpensive way to highlight green practices because seafood accounts for a small fraction of sales but is prominent in the media.

For labels that are intended to provide producers with incentives to produce sustainably, the different pricing strategies also raise important questions. For instance, one may wonder to what extent any premium is passed on to fishers and other earlier marketing channel actors when the premium varies between zero and 57%, and the premium is largest for the discount chains. Considering the recent strategic business decision of the Alaskan industry to drop MSC-certification, the premium may simply be absent, too small, or at best distorted and ill-received. In the longer term the implications of such a move may be significant not least in terms of future candidate fisheries and retailers' interpretations of how their sustainable products might best be marketed.

Questions about how eco-label premiums are transmitted through the marketing chain to the actors who ultimately affect sustainability (fishermen, fish farmers, and fishery managers) highlight a key limitation of the hedonic approach to price premiums, namely lack of quantity data. Because we do not observe quantities sold, we do not know whether high- or low-premium pricing strategies move more eco-labeled product. Suppose that the high-end retailers sell most of the MSC-labeled salmon and that low-end retailers sell little. Because high-end retailers have the lowest premiums, then the average premium passed through to the harvest sector will be low. The opposite would be true if the low-end retailers sell most of the MSC-labeled salmon. The Alaskan salmon industry's decision would seem most consistent with the former. It could even be the case that retail pricing strategies deliberately discourage the purchase of eco-labeled products; simply including these products in stores and not necessarily selling them would then be part of projecting a positive corporate image.

The role of eco-labels in private provision of public goods is still not well understood. Our analysis provides one important piece of this puzzle by illustrating the importance of retailer pricing strategies. The amount of premium, if any, that is transmitted back to agents that affect environmental outcomes and whether eco-labels cause behaviors to change are still open questions. Moreover, whether consumer expenditures on eco-labeled products crowd out direct contributions to public goods—a mechanism through which increased demand for a green product can theoretically lower environmental quality (Kotchen 2005)— and whether private provision can overcome free riding to be a viable alternative to public provision are all unknowns. Exploring these other links in the chain are important questions for future research.

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Table 1
Descriptive statistics

Variables	Description	Mean	StDev
Price	Price per kg (£)	21.959	11.046
Ln Price	Logarithm of price per kg	2.970	0.494
Chum/Pink	1 if chum/pink, 0 if otherwise	0.087	
Sockeye	1 if sockeye, 0 if otherwise	0.018	
Other wild	1 if other wild, 0 if otherwise	0.021	
Farmed*	1 if farmed, 0 if wild	0.874	
Chilled*	1 if chilled, 0 otherwise	0.823	
Fresh	1 if fresh, 0 otherwise	0.066	
Frozen	1 if frozen, 0 otherwise	0.111	
Fillets*	1 if fillets, 0 otherwise	0.698	
Flakes	1 if flakes, 0 otherwise	0.028	
Slices	1 if slices, 0 otherwise	0.223	
Trimmings	1 if trimmings, 0 otherwise	0.028	
Other product form	1 if whole, side or steak, 0 otherwise	0.020	
Smoked	1 if smoked, 0 if natural	0.484	
Gravlox	1 if graved, 0 otherwise	0.014	
Added ingredients	1 if added ingredients, 0 otherwise	0.098	
Weight < 100 gr.	1 if <100 gr., 0 otherwise	0.018	
Weight 100-250 gr.*	1 if 100-250 gr., 0 otherwise	0.653	
Weight 250-500 gr.	1 if 250-500 gr., 0 otherwise	0.195	
Weight 500-900 gr.	1 if 500-900 gr., 0 otherwise	0.059	
Weight individual	1 if individual weight, 0 otherwise	0.078	
Bird's Eye	1 if BEY, 0 otherwise	0.026	
Young's	1 if YNG, 0 otherwise	0.034	
Other brands	1 if other brands, 0 otherwise	0.101	
Private labels*	1 if private labels, 0 otherwise	0.779	
MSC	1 if MSC, 0 otherwise	0.059	
Organic	1 if organic, 0 otherwise	0.051	
Unlabeled*	1 if unlabeled, 0 otherwise	0.890	
Scottish	1 if Scottish, 0 otherwise	0.428	
ASDA*	1 if Asda, 0 otherwise	0.236	
COOP	1 if Coop, 0 otherwise	0.111	
LIDL	1 if Lidl, 0 otherwise	0.035	
Marks and Spencer	1 if Marks, 0 otherwise	0.178	
Morrison	1 if Mors, 0 otherwise	0.124	
Sainsbury's	1 if Sain, 0 otherwise	0.069	
Tesco	1 if Tesc, 0 otherwise	0.069	
Waitrose	1 if Wait, 0 otherwise	0.177	

* Base categories in regression

Table 2

Sesonality tests

Model	Weekly		4-weekly	
	F-value	Prob > F	*F*-value	Prob > F
1	0.54	0.993	1.43	0.167
2	0.57	0.986	1.52	0.136
3	0.54	0.993	1.42	0.171
4	0.54	0.993	1.38	0.191
5	0.57	0.986	1.48	0.148

Table 3. Parameter estimates from model 1

Variable	Parameter	St. Error			
		No cluster	Retailer	Product	Multi
Chum Pink	-0.195	0.020*	0.088*	0.094*	0.087*
Sockeye	0.126	0.029*	0.099	0.133	0.124
Wild Alaska	-0.089	0.043*	0.142	0.163	0.136
Fresh	-0.255	0.013*	0.080*	0.060*	0.066*
Frozen	-0.187	0.014*	0.080*	0.057*	0.055*
Flakes	0.138	0.011*	0.056*	0.059*	0.057*
Slices	0.252	0.009*	0.059*	0.050*	0.049*
Trims	-0.724	0.021*	0.118*	0.126*	0.132*
Other prod.	-0.183	0.035*	0.132	0.128	0.127
Smoked	0.209	0.007*	0.024*	0.038*	0.033*
Grav lox	0.023	0.020	0.067	0.081	0.070
Value added	0.033	0.008*	0.045	0.037	0.041
Wgt_90	0.516	0.022*	0.075*	0.104*	0.113*
Wgt_250_500	-0.291	0.007*	0.023*	0.036*	0.032*
Wgt_500	-0.407	0.012*	0.026*	0.048*	0.042*
Wgt_ind	-0.339	0.013*	0.051*	0.054*	0.045*
Bird's Eye	0.308	0.022*	0.113*	0.097*	0.087*
Young	0.018	0.017	0.039	0.091	0.080
Other brand	0.126	0.011*	0.068**	0.059*	0.059*
MSC	0.131	0.025*	0.101	0.107	0.090
Organic	0.253	0.008*	0.026*	0.046*	0.035*
Scottish	0.040	0.007*	0.019*	0.038	0.040
Coop	0.174	0.011*	0.026*	0.056*	0.051*
Lidl	-0.390	0.015*	0.034*	0.065*	0.078*
Marks	0.420	0.009*	0.010*	0.052*	0.057*
Morisson	-0.006	0.011	0.018	0.050	0.053
Sainsbury	0.120	0.013*	0.010*	0.067**	0.032*
Tesco	0.267	0.014*	0.018*	0.074*	0.066*
Waitrose	0.440	0.009*	0.023*	0.049*	0.053*
Constant	2.740	0.008*	0.030*	0.046*	0.035*

* indicates significant at a 5% level and ** indicate significant at a 10% level

Table 4. Parameter estimates from model 5

Variable	Parameter	St. Error			
		No cluster	Retailer	Product	Multi
Chum Pink	-0.179	0.020*	0.075*	0.083*	0.075*
Sockeye	0.006	0.013	0.038	0.061	0.061
Wild Alaska	-0.047	0.061	0.196	0.205	0.166
Fresh	-0.239	0.013*	0.090*	0.059*	0.067*
Frozen	-0.191	0.016*	0.071*	0.059*	0.055*
Flakes	0.124	0.012*	0.058**	0.065**	0.066**
Slices	0.228	0.010*	0.067*	0.051*	0.050*
Trims	-0.741	0.021*	0.122*	0.125*	0.131*
Other prod.	-0.197	0.034*	0.125	0.123	0.122
Smoked	0.225	0.007*	0.030*	0.040*	0.031*
Grav lox	0.054	0.019*	0.063	0.076	0.061
Value added	0.039	0.008*	0.050	0.037	0.044
Wgt_90	0.521	0.025*	0.064*	0.092*	0.104*
Wgt_250_500	-0.298	0.007*	0.020*	0.035*	0.032*
Wgt_500	-0.394	0.013*	0.029*	0.054*	0.048*
Wgt_ind	-0.334	0.014*	0.052*	0.056*	0.044*
Bird's Eye	0.326	0.023*	0.091*	0.096*	0.083*
Young	0.098	0.016*	0.041*	0.079	0.068
Other brand	0.155	0.013*	0.072*	0.069*	0.068*
Coop	0.142	0.015*	0.040*	0.078**	0.093
Lidl	-0.429	0.018*	0.026*	0.088*	0.095*
Marks	0.473	0.016*	0.035*	0.094*	0.119*
Morisson	0.053	0.015*	0.020*	0.070	0.077
Sainsbury	0.128	0.031*	0.021*	0.148	0.144
Tesco	0.278	0.016*	0.020*	0.085*	0.088*
Waitrose	0.466	0.012*	0.018*	0.065*	0.073*
MSC Asda	0.570	0.022*	0.060*	0.087*	0.086*
MSC Lidl	0.276	0.029*	0.074*	0.124*	0.118*
MSC Marks	-0.022	0.040	0.076	0.158	0.137
MSC Mor.	0.224	0.063*	0.226	0.214	0.180
MSC Tes	-0.051	0.086	0.259	0.241	0.229
MSC Waitr.	0.107	0.026*	0.039*	0.080	0.081
Org Asda	0.279	0.017*	0.032*	0.105*	0.063*
Org Marks	0.255	0.016*	0.051*	0.086*	0.106*
Org Waitr.	0.218	0.009*	0.025*	0.046*	0.038*
Scot. Asda	0.058	0.014*	0.019*	0.084	0.117
Scot. Coop	0.124	0.018*	0.045	0.091	0.087
Scot Marks	-0.007	0.015	0.034	0.083	0.075
Scot Mors	-0.053	0.018*	0.030	0.078	0.078
Scot. Sain	0.058	0.032**	0.021*	0.150	0.226
Scot. Tesco	0.440	0.019*	0.063*	0.100*	0.102*
Scot. Waitr.	0.044	0.013*	0.027	0.067	0.053
Constant	2.715	0.011*	0.027*	0.061*	0.065*

* indicates significant at a 5% level and ** indicate significant at a 10% level

Table 5. *F*-tests for model reduction for Model 5

H_0	Jointly[a]		Equality[b]	
	F-value	*p*-value	*F*-value	*p*-value
f_{k*MSC}	12.97	0.000	9.73	0.000
$f_{k*Organic}$	12.04	0.000	0.19	0.827
$f_{k*Scottish}$	3.57	0.001	3.60	0.002
$f_{k*MSC,Organic,Scottish}$	16.83	0.000		

Appendix A
Number of unique products

Outlet	ASDA*	COOP	LIDL	MARKS	MORS	SAIN	TESC	WAIT
Total products	41	22	9	47	32	20	16	36
Species								
Chum/Pink	6	2	3	1	1		1	1
Sockeye	1	1						2
Other wild	1			3	1		1	
Farmed*	33	19	6	43	30	20	14	33
Conserv.								
Chilled*	28	20	5	46	29	20	14	25
Fresh	5				2			7
Frozen	8	2	4	1	1		2	4
Product form								
Fillet*	35	15	5	29	16	10	13	25
Flakes				2	1	1		1
Slices	5	5	3	14	11	8	2	7
Trimmings	1	2			2			1
Other			1	2	2	1	1	2
Processed								
Smoked	19	11	4	26	17	13	5	17
Graved			1	1	1			1
Added ing.	4	1	3	8	4	2	4	3
Prod. weight gr.								
<100				3	1	1		
100-250*	29	17	7	28	17	14	6	21
250-500	5	5	1	10	6	1	6	9
>500	3		1	6		2	2	3
Individual	4				8	2	2	3
Brand								
BEY	1	1					1	1
YNG	2	2			1			
Other brands	1	7	8		8	6	3	4
Private*	37	12	1	47	29	14	12	31
Eco-labels								
MSC	3		3	2	1		1	2
Organic	3			2			1	4
Unlabeled*	35	22	6	43	31	20	14	30
Other labels								
Scottish	14	11	2	27	16	13	1	14
Price per kg	16.7	21.2	11.4	29.9	17.6	23.7	19.1	26.9

* Base categories in regression

Appendix

Table A1. Standard errors with additional clusters for Model 1

Variable	Parameter	St. Error		
		Species	Conservation	Product form
Chum Pink	-0.195	0.059*	0.023*	0.057*
Sockeye	0.126	0.058*	0.105	0.061*
Wild Alaska	-0.089	0.049**	0.191	0.150
Fresh	-0.255	0.027*	0.047*	0.047*
Frozen	-0.187	0.070*	0.040*	0.023*
Flakes	0.138	0.023*	0.014*	0.009*
Slices	0.252	0.007*	0.004*	0.005*
Trims	-0.724	0.004*	0.008*	0.032*
Other prod.	-0.183	0.050*	0.196	0.196
Smoked	0.209	0.020*	0.013*	0.049*
Grav lox	0.023	0.014	0.021	0.025
Value added	0.033	0.022	0.014*	0.025
Wgt_90	0.516	0.178*	0.055*	0.007*
Wgt_250_500	-0.291	0.025*	0.017*	0.042*
Wgt_500	-0.407	0.044*	0.022*	0.045*
Wgt_ind	-0.339	0.046*	0.008*	0.045*
Bird's Eye	0.308	0.038*	0.017*	0.030*
Young	0.018	0.090	0.047	0.015
Other brand	0.126	0.002*	0.001*	0.044*
MSC	0.131	0.054*	0.040*	0.031*
Organic	0.253	0.024*	0.026*	0.035*
Scottish	0.040	0.008*	0.040	0.071
Coop	0.174	0.048*	0.057*	0.029*
Lidl	-0.390	0.094*	0.097*	0.064*
Marks	0.420	0.014*	0.030*	0.055*
Morisson	-0.006	0.019	0.016	0.037
Sainsbury	0.120	0.016*	0.022*	0.031*
Tesco	0.267	0.022*	0.017*	0.028*
Waitrose	0.440	0.022*	0.041*	0.030*
Constant	2.740	0.035*	0.037*	0.021*

* indicates significant at a 5% level and ** indicate significant at a 10% level

Table A2. Standard errors with additional clusters for Model 5

Variable	Parameter	St. Error		
		Species	Conservation	Prod. form
Chum Pink	-0.179	0.044*	0.071*	0.064*
Sockeye	0.006	0.052	0.063	0.025
Wild Alaska	-0.047	0.109	0.283	0.078
Fresh	-0.239	0.010*	0.045*	0.039*
Frozen	-0.191	0.046*	0.010*	0.017*
Flakes	0.124	0.017*	0.012*	0.028*
Slices	0.228	0.010*	0.010*	0.017*
Trims	-0.741	0.007*	0.009*	0.039*
Other prod.	-0.197	0.041*	0.182*	0.186*
Smoked	0.225	0.010*	0.015*	0.036*
Grav lox	0.054	0.018*	0.012*	0.040
Value added	0.039	0.013*	0.015*	0.050
Wgt_90	0.521	0.165*	0.092*	0.018*
Wgt_250_500	-0.298	0.022*	0.023*	0.024*
Wgt_500	-0.394	0.032*	0.024*	0.041*
Wgt_ind	-0.334	0.012*	0.013*	0.039*
Bird's Eye	0.326	0.032*	0.036*	0.010*
Young	0.098	0.099	0.097	0.024*
Other brand	0.155	0.026*	0.012*	0.019*
Coop	0.142	0.105	0.090*	0.049*
Lidl	-0.429	0.028*	0.054*	0.027*
Marks	0.473	0.033*	0.046*	0.179*
Morisson	0.053	0.006*	0.022*	0.026*
Sainsbury	0.128	0.019*	0.030*	0.071**
Tesco	0.278	0.006*	0.022*	0.031*
Waitrose	0.466	0.022*	0.046*	0.042*
MSC Asda	0.570	0.071*	0.068*	0.058*
MSC Lidl	0.276	0.047*	0.062*	0.058*
MSC Marks	-0.022	0.094	0.164	0.189
MSC Mor.	0.224	0.122**	0.272	0.047*
MSC Tes	-0.051	0.185	0.274	0.063
MSC Waitr.	0.107	0.088	0.072	0.044
Org Asda	0.279	0.024*	0.036*	0.074*
Org Marks	0.255	0.017*	0.035*	0.116*
Org Waitr.	0.218	0.029*	0.022*	0.029*
Scot. Asda	0.058	0.021*	0.038	0.153
Scot. Coop	0.124	0.089	0.085	0.081
Scot Marks	-0.007	0.025	0.032	0.078
Scot Mors	-0.053	0.022*	0.079	0.096
Scot. Sain	0.058	0.003*	0.014*	0.247
Scot. Tesco	0.440	0.024*	0.025*	0.087*
Scot. Waitr.	0.044	0.034	0.051	0.070
Constant	2.715	0.030*	0.036*	0.061*

* indicates significant at a 5% level and ** indicate significant at a 10% level

Table A3. Parameter estimates from model 2, interactions with MSC

Variable	Parameter	St. Error			
		No cluster	Retailer	Product	Multi
Chumpink	-0.181	0.019*	0.077*	0.083*	0.072*
Sockeye	-0.021	0.012	0.052	0.059	0.064
Wild Alaska	-0.020	0.062	0.188	0.213	0.164
Fresh	-0.240	0.013*	0.088*	0.060*	0.070*
Frozen	-0.191	0.016*	0.072*	0.061*	0.056*
Flakes	0.127	0.011*	0.054*	0.060*	0.059*
Slices	0.246	0.009*	0.059*	0.050*	0.043*
Trims	-0.727	0.021*	0.116*	0.124*	0.129*
Other prod.	-0.192	0.034*	0.124	0.126	0.124
Smoked	0.206	0.007*	0.024*	0.038*	0.032*
Grav lox	0.037	0.018*	0.061	0.070	0.062
Value added	0.026	0.008*	0.047	0.037	0.040
Wgt_90	0.487	0.025*	0.069*	0.095*	0.102*
Wgt_250_500	-0.303	0.007*	0.019*	0.035*	0.032*
Wgt_500	-0.418	0.013*	0.028*	0.051*	0.047*
Wgt_ind	-0.366	0.013*	0.056*	0.052*	0.042*
Bird's Eye	0.299	0.021*	0.094*	0.090*	0.083*
Young	0.066	0.016*	0.054	0.085	0.078
Other brand	0.120	0.012*	0.067**	0.061**	0.062**
Organic	0.247	0.008*	0.026*	0.047*	0.035*
Scottish	0.042	0.007*	0.020*	0.038	0.041
Coop	0.180	0.010*	0.026*	0.055*	0.052*
Lidl	-0.447	0.015*	0.023*	0.071*	0.073*
Marks	0.435	0.010*	0.012*	0.054*	0.061*
Morisson	0.005	0.011	0.017	0.050	0.050
Sainsbury	0.131	0.013*	0.008*	0.067*	0.029*
Tesco	0.290	0.014*	0.017*	0.075*	0.039*
Waitrose	0.454	0.009*	0.016*	0.049*	0.052*
MSC Asda	0.605	0.020*	0.066*	0.078*	0.070*
MSC Lidl	0.308	0.028*	0.070*	0.117*	0.105*
MSC Marks	-0.020	0.039	0.093	0.149	0.119
MSC Mor.	0.222	0.064*	0.216	0.217	0.166
MSC Tes	-0.089	0.087	0.255	0.245	0.218
MSC Waitr.	0.139	0.026*	0.057*	0.076**	0.077**
Constant	2.740	0.008*	0.027*	0.046*	0.037*

* indicates significant at a 5% level and ** indicate significant at a 10% level

Table A4. Parameter estimates from model 3, interactions with organic

Variable	Parameter	St. Error			
		No cluster	Retailer	Product	Multi
Chumpink	-0.191	0.020*	0.089*	0.095*	0.088*
Sockeye	0.120	0.029*	0.097	0.132	0.123
Wild Alaska	-0.087	0.043*	0.142	0.163	0.136
Fresh	-0.259	0.013*	0.081*	0.061*	0.066*
Frozen	-0.188	0.014*	0.081*	0.057*	0.056*
Flakes	0.138	0.011*	0.056*	0.060*	0.057*
Slices	0.252	0.009*	0.059*	0.050*	0.044*
Trims	-0.724	0.021*	0.117*	0.125*	0.130*
Other prod.	-0.191	0.035*	0.128	0.128	0.126
Smoked	0.209	0.007*	0.024*	0.038*	0.032*
Grav lox	0.022	0.020	0.066	0.080	0.068
Value added	0.031	0.008*	0.045	0.037	0.041
Wgt_90	0.517	0.022*	0.075*	0.104*	0.113*
Wgt_250_500	-0.294	0.007*	0.023*	0.036*	0.030*
Wgt_500	-0.408	0.012*	0.026*	0.048*	0.042*
Wgt_ind	-0.326	0.014*	0.044*	0.057*	0.047*
Bird's Eye	0.303	0.023*	0.115*	0.098*	0.087*
Young	0.020	0.017	0.039	0.092	0.080
Other brand	0.127	0.011*	0.069**	0.059*	0.061*
MSC	0.128	0.025*	0.102	0.107	0.090
Scottish	0.040	0.007*	0.019*	0.038	0.041
Coop	0.176	0.011*	0.025*	0.056*	0.050*
Lidl	-0.387	0.015*	0.034*	0.066*	0.078*
Marks	0.420	0.010*	0.009*	0.054*	0.060*
Morisson	-0.008	0.011	0.017	0.051	0.051
Sainsbury	0.121	0.013*	0.011*	0.068*	0.032*
Tesco	0.280	0.015*	0.019*	0.076*	0.043*
Waitrose	0.445	0.010*	0.024*	0.053*	0.057*
Org. Asda	0.268	0.017*	0.029*	0.104*	0.038*
Org. Marks	0.287	0.011*	0.032*	0.058*	0.065*
Org. Wait.	0.233	0.008*	0.025*	0.044*	0.044*
Constant	2.739	0.009*	0.029*	0.048*	0.037*

* indicates significant at a 5% level and ** indicate significant at a 10% level

Table A5. Parameter estimates from model 4, interaction variables with Scottish origin

Variable	Parameter	St. Error			
		No cluster	Retailer	Product	Multi
Chumpink	-0.200	0.020*	0.085*	0.093*	0.084*
Sockeye	0.147	0.029*	0.097	0.131	0.121
Wild Alaska	-0.099	0.043*	0.147	0.159	0.136
Fresh	-0.253	0.013*	0.081*	0.059*	0.065*
Frozen	-0.184	0.014*	0.076*	0.054*	0.053*
Flakes	0.136	0.012*	0.058*	0.063*	0.063*
Slices	0.232	0.010*	0.068*	0.051*	0.050*
Trims	-0.744	0.021*	0.122*	0.126*	0.132*
Other prod.	-0.179	0.034*	0.137	0.125	0.123
Smoked	0.232	0.007*	0.030*	0.039*	0.028*
Grav lox	0.046	0.021*	0.069	0.088	0.070
Value added	0.048	0.008*	0.046	0.037	0.045
Wgt_90	0.546	0.022*	0.064*	0.097*	0.113*
Wgt_250_500	-0.286	0.007*	0.025*	0.036*	0.033*
Wgt_500	-0.385	0.012*	0.026*	0.050*	0.044*
Wgt_ind	-0.322	0.013*	0.053*	0.055*	0.044*
Bird's Eye	0.342	0.023*	0.106*	0.102*	0.083*
Young	0.049	0.017*	0.048	0.090	0.073
Other brand	0.158	0.012*	0.069*	0.066*	0.065*
MSC	0.122	0.025*	0.100	0.107	0.088
Organic	0.257	0.008*	0.025*	0.046*	0.037*
Coop	0.129	0.015*	0.039*	0.076**	0.090
Lidl	-0.389	0.016*	0.030*	0.074*	0.087*
Marks	0.443	0.014*	0.022*	0.079*	0.094*
Morisson	0.043	0.014*	0.020*	0.067	0.074
Sainsbury	0.105	0.031*	0.023*	0.147	0.144
Tesco	0.237	0.015*	0.021*	0.078*	0.081*
Waitrose	0.428	0.011*	0.030*	0.058*	0.065*
Scottish Asda	0.041	0.014*	0.022*	0.079	0.107
Scottish Coop	0.121	0.018*	0.043*	0.090	0.084
Scottish Marks	0.003	0.013	0.020	0.073	0.054
Scottish Morr.	-0.066	0.018*	0.030*	0.076	0.076
Scottish Sain.	0.064	0.032*	0.020*	0.151	0.224
Scottish Tesco	0.469	0.018*	0.061*	0.096*	0.099*
Scottish Wait.	0.064	0.013*	0.036*	0.067	0.057
Constant	2.724	0.010*	0.032*	0.056*	0.058*

* indicates significant at a 5% level and ** indicate significant at a 10% level