10/15

ARBEIDSNOTAT
WORKING PAPER

Value Chain and Price Integration in the Spanish Market for Salted Cod

José Fernández Polanco
Trond Bjørndal

SNF

Samfunns- og næringslivsforskning AS
Centre for Applied Research at NHH

SNF
SAMFUNNS- OG NÆRINGSLIVSFORSKNING AS

- er et selskap i NHH-miljøet med oppgave å initiere, organisere og utføre ekstern-finansiert forskning. Norges Handelshøyskole og Stiftelsen SNF er aksjonærer. Virksomheten drives med basis i egen stab og fagmiljøene ved NHH.

SNF er ett av Norges ledende forskningsmiljø innen anvendt økonomisk-administrativ forskning, og har gode samarbeidsrelasjoner til andre forskningsmiljøer i Norge og utlandet. SNF utfører forskning og forskningsbaserte utredninger for sentrale beslutningstakere i privat og offentlig sektor. Forskningen organiseres i program-mer og prosjekter av langsiktig og mer kortsiktig karakter. Alle publikasjoner er offentlig tilgjengelig.

SNF
CENTRE FOR APPLIED RESEARCH AT NHH

- is a company within the NHH group. Its objective is to initiate, organize and conduct externally financed research. The company shareholders are the Norwegian School of Economics (NHH) and the SNF Foundation. Research is carried out by SNF´s own staff as well as faculty members at NHH.

SNF is one of Norway´s leading research environment within applied economic administrative research. It has excellent working relations with other research environments in Norway as well as abroad. SNF conducts research and prepares research-based reports for major decision-makers both in the private and the public sector. Research is organized in programmes and projects on a long-term as well as a short-term basis. All our publications are publicly available.

Working Paper No. 10/15

Value Chain and Price Integration in the Spanish Market for Salted Cod

by

José Fernández Polanco
Trond Bjørndal

SNF Project No. 5228
Competion, cluster and market analyses for the salted cod and salted and dried cod industry

The project is financed by The Research Council of Norway

Centre for Applied Research at NHH
BERGEN, September 2015
ISSN 1503-2140

1. Introduction

Spain was one of the pioneering European countries in harvesting cod for processing and commercial purposes. Records of the activities of the Spanish fishing fleet in Newfoundland date back to 1561. In parallel, a large salted fish industry has been in existence in the Iberian Peninsula since ancient times, as reported by several Roman writers and evidenced by numerous archaeological sites all over Spain and Portugal. Salted fish and cod in particular, have been part of the Spanish diet for at least five centuries.

Nowadays salted cod is a much appreciated traditional product. However, consumption has declined in the last few decades. An increase in retail prices and the difficulties of a slow desalting process has prevented new generations from trying and becoming used to this kind of product. In households with the two working parents, fresh and frozen cod preparations are increasing sales at the cost of salted cod.

The Spanish market for salted cod has undergone important transformations in recent decades. The collapse of the Newfoundland fishery dramatically reduced local processors' access to the raw material, which previously was mainly supplied by Spanish vessels. The price of salted cod increased and processors margins decreased. Salted cod became an expensive product, no longer available for lower incomes.

2. Domestic production of salted cod commodities

Although the Spanish cod fleet has considerably decreased in the last few decades, it still holds an important 15% share of the EU quota for this species. This fleet supplies the local market and is the main provider of raw material for the domestic drying and salting industry. Because of the reduction in the fleet, the Spanish market has increased its dependency on imports in order to satisfy the demand of final consumers and the processing industry. Salted or cod in brine, locally know as green cod (bacalao verde), is the main raw material for the processing industry. It is presented in slices with 52 to 55% humidity and 15% to 18% salt content. Between 135 and 127.5 kilos of green cod is required to produce 100 kilos at the humidity levels fitting market preferences.

Spain retains an important drying and salting industry: between 2008 and 2012, the yearly average production was 19,000, despite a decline of 23.6% between 2010 to

2012. The price raised to around 7 euros per kilo in the same period and increased by 9.9% during the time production was in decline (table 1).

Table 1. Spanish Production (mt) and prices (€) of salted cod excluding fillets.
Source: INE, 2015

	Quantities	Price
2008	21.755	7,41
2009	19.862	6,99
2010	21.737	6,52
2011	17.920	6,62
2012	16.600	7,17

The capacity of the local industry also allowed a significant volume of exports resulting in positive trade balances during the period under investigation (Table 2). The bulk of the Spanish exports of locally processed dried and salted cod was the EU, with Portugal and France being the most important partners respectively.

Table 2. Trade balance and apparent consumption of salted cod excluding fillets in quantities and values.
Source: INE, 2015; Camaras, 2015

	Quantities in metric tones				
	Production	Imports	Exports	Balance	Consumption
2008	21.755	860,4	3.795,80	2.935,40	18.819,60
2009	19.862	1.223,70	4.687,80	3.464,10	16.397,90
2010	21.737	1.359,50	5.089,40	3.729,90	18.007,10
2011	17.920	1.067,60	3.688,20	2.620,60	15.299,40
2012	16.600	1.763,40	3.795,80	2.032,40	14.567,60
	Value in 1,000 euro				
2008	161.146	4.483,10	18.433,70	13.950,60	
2009	138.905	5.050,80	24.197,10	19.146,30	
2010	141.807	5.929,70	24.868,20	18.938,50	
2011	118.550	5.168,40	19.028,90	13.860,50	
2012	119.017	8.698,50	18.433,70	9.735,20	

3. Imports of salted and dried cod

Data for Spanish imports of salted and dried cod are available at the Database of External Trade which is provided by the Spanish customs. The harmonized codes used are:

03053011/211 – Fillets of salted cod of the species Gadus macrocephalus.
03053019/219 – Fillets of salted cod of the species Gadus Morhua and Gadus ogac.
03055110 – Cod dry & unsalted.
03055190 – Cod dry & salted.
03056200 – Cod salted or in brine (Green cod).

Due to the significance of the processing industry, green cod is the most important commodity of this group imported by Spain, making up more than 70% of the total quantities (Figure 1). The main engine for this product is the local cod processing industry, which will finish the process of drying the cod, cut and distribute to the domestic and export markets.

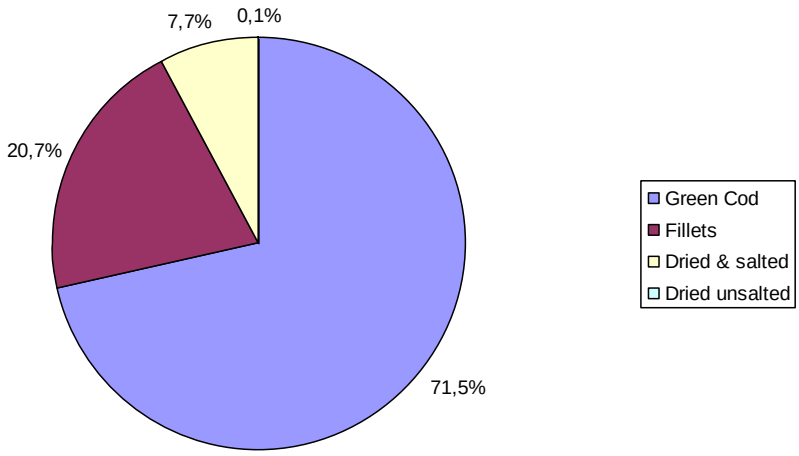

Figure 1. Composition of Spanish imports of salted and dry cod in 2013.
Source: Camaras, 2015

The market share of green cod significantly increased after 2011 due to a fall in the quantities of fillets, which decreased from nearly 10,000 tonnes in 2011 to 5,000 in 2013. Quantities of green cod and fillets decreased in 2008 by 4.8% and 48% respectively. In contrast, imported quantities of dried and salted cod, which is a ready for consumption commodity, increased by 120% reaching a peak in 2013 - the greatest volume since 2001. Dried unsalted cod is quite a marginal commodity that evolves randomly (Table 3).

Table 3. Evolution of Spanish salted and dried cod imports by commodities
Source: Camaras, 2015

	Green Cod	Fillets	Dry & salted	Dry unsalted
2000	22.371,10	8.632,60	1.346,50	44,80
2001	19.685,30	10.723,20	2.869,00	42,90
2002	21.193,70	12.856,10	1.149,60	55,40
2003	26.033,50	12.486,40	736,00	92,40
2004	24.905,40	11.226,60	1.023,50	43,60
2005	23.851,60	13.374,70	1.379,20	29,20
2006	23.867,30	11.203,30	1.230,00	40,80
2007	23.860,50	11.867,60	1.083,30	83,80
2008	19.293,70	10.628,50	860,70	56,30
2009	20.443,30	10.519,40	1.219,40	36,60
2010	21.667,20	11.697,10	1.359,60	15,40
2011	19.606,50	9.891,00	1.069,00	0,70
2012	18.676,10	4.022,70	1.763,30	31,50
2013	18.356,80	5.327,50	1.972,60	23,90

Prices differ according to the commodities' level of processing resulting in higher prices for fillets and lower for green cod. In general, the prices of all commodities has been falling since 2008, with decreases of 32 and 35% in green cod and fillets respectively and only 3% in dry and salted cod (table 4).

Table 4. Evolution of CIF price of Spanish salted and dried cod imports by commodities
Source: Camaras, 2015

	Green Cod	Fillets	Dry & salted	Dry unsalted
2008	5,63	7,15	5,21	5,23
2009	4,34	4,95	4,13	3,81
2010	4,04	5,00	4,36	5,41
2011	4,56	5,47	4,84	-
2012	4,47	5,51	4,93	5,29
2013	3,82	4,63	4,53	5,39

Imports by countries of origin

Salted cod arrives into Spain from several different countries. Some of these countries are the traditional cod harvesters of the North Atlantic, particularly Iceland, the Faeroes and Norway, but also other less traditional countries that participate in the processing and trade of salted cod. The importance of these intermediating countries varies across commodities and in some cases there is a clear specialization. Some of these countries are significant in exporting one commodity while not dealing at all in others.

The data on exports by country allow estimates of the levels of concentration faced by exporters in the destination markets. The volume of commodity per deal provides information about the average importers' purchasing power and their ability to exert market power against exporters. The exercise of market power by Spanish importers can be further analyzed by studying the relationship between the level of market concentration and exporters' prices.

Iceland and the Faeroes are the most important exporters of salted cod of any kind to Spain. Imports of green cod from these two countries in 2013 exceeded 5,000 and 3,000 tonnes respectively, representing 49% of the total yearly imports of the commodity. A further 31% of green cod was exported to Spain from four other northern European countries, (Germany, Sweden, Norway and Denmark) but their ranking does not correspond to their fishing effort and in some cases, these were only processors. The average price for green cod during 2013 was 3.82 euros per kilo. The most expensive average yearly price for a kilo of green cod was recorded by Russia, which accounted for only 2.9% of total imports. On the other hand, the UK, with 4.2% market share, accounted for the lowest price with a surprising 1.82 euro per kilo of green cod. The two countries supplied quantities per contract below the average 19.7 tonnes. Across the top six exporters, Sweden had the lowest price despite facing the strongest purchasing power of importers with an average of 79.2 tonnes per contract. Norway and Denmark followed Sweden as the lowest priced large exporters. Their yearly average prices only differed by 2 cents even though they faced significantly different purchasing power from importers. The Faeroes, Germany and Iceland were the most expensive of the large exporters with prices of 4.39, 4.26 and 4.03 euros respectively. The average volumes per contract of these three countries were above 19.7 tonnes, but Iceland and Germany were 8 to 9 tonnes higher while the Faeroes were only one tonne higher (table 5).

Table 5. Quantities, prices and concentration of green cod imports by country in 2013. Source: Camaras, 2015

	Quantity (tm)	€/Kg	Concentration
Germany	1.689,70	4,26	29,13
China	419,9	3,74	16,80
Denmark	1.305,80	3,40	10,45
France	69	3,46	2,38
Greenland	236	3,58	29,50
Ireland	33,9	3,66	3,08
Iceland	5.491,60	4,03	28,02
Faeroe	3.510,70	4,39	21,02
Norway	1.308,60	3,42	21,45
Netherlands	808,9	3,59	14,71
Portugal	805,3	3,32	7,90
UK	784,2	1,82	16,69
Russia	546,5	4,53	19,52
Sweden	1.346,80	3,13	79,22
Total	18.356,80	3,82	19,76

Imports of Gadus macrocephalus fillets were only 93.8 tones in 2013, resulting in a very small number of exporting countries. Norway, Iceland and Denmark, respectively, accounted for almost 85% of total imports. Much more interesting are the data on fillets of Gadus Morhua, which is the original cod species of the Atlantic. Rather than a raw material, this is a higher-level processed commodity ready for final consumption. This fact results in lower technical requirements for handling and storage, allowing relevant trade contributions from less specialized countries. Iceland was the dominant actor in this market, accounting for 36.9% of the total import volume in 2013, followed by the Faeroes (17.5%) and Denmark (14.1%). Behind the top three, imports from the Netherlands, Liechtenstein and Latvia accounted for around 300 tonnes each resulting in a volume of 19.1% all together. As a processed product, differences in quality attributes, branding and packaging resulted in a wider dispersion in prices, going from 1.55€ for the UK to 10.5€ for France (Table 6).

Table 6. Quantities, prices and concentration of salted Gadus morhua fillets imported by country in 2013. Source: Camaras, 2015

	Quantity (tm)	Euro per kilo	Concentration
Germany	124,2	3,22	5,40
China	189,1	2,30	23,64
Denmark	740,9	4,19	18,52
France	1,7	10,53	0,03
Greenland	215,8	4,61	26,98
Iceland	1.935,50	5,40	18,61
Faeroe	917	5,32	19,10
Liechtenstein	329,4	3,46	27,45
Lithuania	326,1	3,24	23,29
Norway	25,9	4,06	8,63
Netherlands	343,2	4,27	19,07
UK	35,1	1,55	5,01
Dominican Republic	15	7,05	15,00
Russia	10,9	3,40	10,90
Sweden	23,9	3,82	11,95
Total	5.233,70	4,65	14,62

Finally, imports of dried and salted cod show a clear Icelandic leadership, accumulating 58.7% of the total imported volumes in 2013 with a yearly average price of 4.58 euros per kilo. The second largest exporter of this commodity was Portugal, concentrating 19.8% of total quantities and a price just five cents lower than Iceland. The Faeroes, Norway and Germany were all around 100 tonnes with prices below 4 euros per kilo (Table 7).

Table 7. Quantities, prices and concentration of dried and salted cod imports by country in 2013. Source: Camaras, 2015

	Quantity (mt)	Euro per kilo	Concentration
Germany	103,2	3,90	4,49
Denmark	22,5	2,89	22,50
Iceland	1.158,90	4,58	33,11
Faeroe	133,9	3,86	14,88
Latvia	0,3	3,33	0,30
Lithuania	1,4	2,86	0,28
Norway	112,6	5,90	10,24
Netherlands	38,4	3,97	19,20
Portugal	391	4,53	5,21
Sweden	10,3	4,55	10,30
Total	1.972,60	4,53	11,96

4. Consumption and retail of salted cod

There are no specific data series for the retailing and consumption of salted cod, but there are for aggregated salted fish. Using as a reference the domestic production of salted fish in 2012, 77% of the aggregate was cod. The rest of the group was composed of tuna (8.9%), sardines (6.4%), anchovy (5.7%) and other non-specified species (2%). This distribution may change geographically within the country as previous research reports that the consumption of salted fish other than cod increases when moving from north to the southeast regions of a country. In any case, fresh cod was the most consumed by Spanish households in 2013, accounting for 53.8% of total home consumption (Figure 2). Higher prices for salted fish also contributed to reducing the appeal of a less convenient product (Table 8).

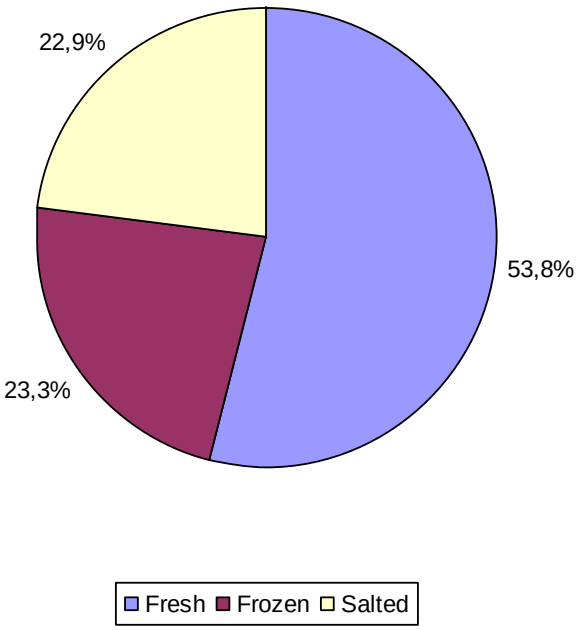

Figure 2. Household consumption of cod and salted fish in 2013
Source: MAGRAMA, 2014

Table 8. Household consumption (mt) and prices (€) of cod and salted fish in 2013
Source: MAGRAMA, 2014

	Quantities	Price
Fresh cod	28.155,89	6,90
Frozen cod	12.182,60	7,71
Salted fish	12.007,63	11,61

The traditional salted fish is evidenced when observing the distribution of household purchases across the different retail categories. Modern, organized formats such as supermarkets and hypermarkets account for a 70% market share of the total seafood retailing, but they control only 53.7% of the salted fish market (Figure 3).

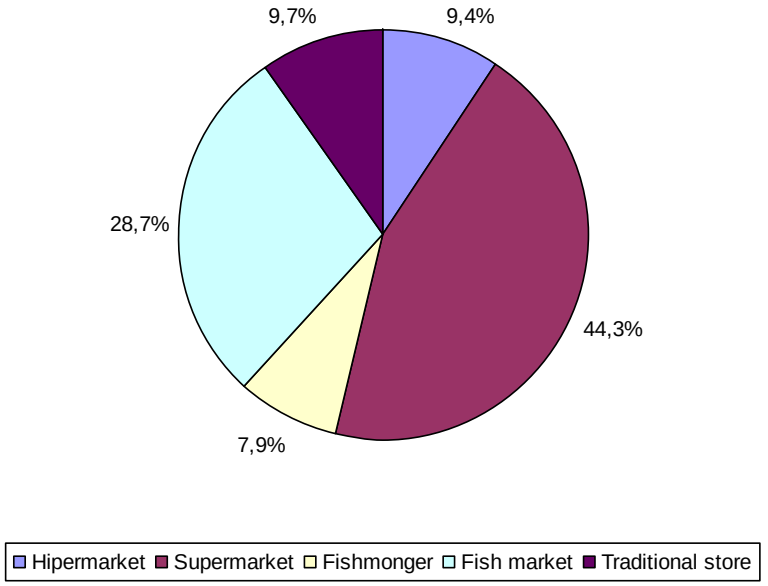

Figure 3. Salted fish sales by retail category in 2013
Source: MAGRAMA, 2014

The important share of traditional retail outlets, whether or not specialized, highlights another particularity of salted cod retailing, as it can be found in a wide variety of grocery stores, also bars and taverns, alongside products other than fish.

Different retail formats also result in different price levels (Table 9). The differences in prices between traditional and modern retail formats are of particular interest. In general terms, fish is more expensive in traditional retail outlets, which not only links to retailers' costs, but also to the belief held by a broad range of Spanish consumers that products from these outlets are of a higher quality. While the difference between hypermarket and supermarket appears not to be significant, it may be across the traditional categories. Traditional fish markets were the most expensive retail category

for these commodities and accounted for 28.7% of the market share in 2013 with an average price per kilo of 12.64 euros.

Table 9. Quantities sold (mt) and prices (€) of salted fish by retail categories in 2013
Source: MAGRAMA, 2014

	Quantities	Price
Hypermarket	1.131,33	11,10
Supermarket	5.319,48	11,05
Fishmonger	942,97	11,85
Fish market	3.444,45	12,64
Traditional store	1.169,40	11,47

Prices do also vary depending on the part of the cod in which the slice can be divided. Upper fillets, barbells and crumbs used to be more expensive than other parts. The thickness of the slice also affects the price. Depending on all of these factors, the price of salted cod can go from 9 to 24 euros per kilo. Spain's preferences for salted cod are similar to Portugal and Italy, which means humidity between 41% to 45% and a salt content of 19%.

Spanish retailers follow the mandatory labelling schemes to identify salted cod. This means that the information regarding origin is limited to the broad FAO fishing areas. Atlantic North East is the most frequent area of origin. The retailer must request any further information about the country of origin from the wholesaler or agents higher up the supply chain. This information is easier to obtain from the traditional channels, where the seller, frequently the owner of the shop, is more specialized and skilled than sales personnel working in the modern retail chains who are hired on a temporary basis or rotate across stores or product categories. In some supermarket chains, Pacific cod can be found frequently in packed crumbs.

5. Price integration and the study of the salted cod value chain

The study of price transmission along value chains allows the analysis of changes in the value between the intermediaries, helps determine their negotiating power and explains sales margins at the different levels of the chain. The analysis of price transmission is relevant for the different stakeholders involved in the value chain as it demonstrates how the value generated by a product or service is distributed between the different actors and so helps to detect inefficiencies. These analyses are particularly important in the activities of the primary sector, where a large number of middlemen are involved and important differences in the degree of concentration

between the stages of the chain exist. This is especially true in the case of fisheries, in which the high degree of fragmentation of the extractive sector, especially in small-scale fisheries, puts producers in a weak negotiating position. Due to the growing social and economic concern about how the value generated by food products is distributed, price transmission along food value chains has received increasing attention in the scientific field. The research interest in price transmission in the seafood market is relatively recent, however, it has been increasing in recent years and interest in the economic issue of price integration across the different stages of the value chain in fisheries is growing.

The issues of price transmission and distribution of revenues along the value chain in the fisheries industry is a matter of concern for the FAO. In this context, Gudmundsson et al (2006) conducted a study in order to discover how the revenues from the seafood trade were distributed over the value chain. Findings indicated that, as in many other primary industries, producers receive a relatively low share of the final product value compared with other agents in the chain. This share of revenues also differs according to the level of processing and across developed and developing countries. The proportion was found to be higher for fresh rather than for highly processed fish as well as being higher for producers in developed countries than for those in developing countries. More recently, a research project funded by the Norwegian Agency for Cooperation (NORAD), was undertaken on the analysis of the value chain in small-scale fisheries in 14 developing and developed countries between 2010 and 2012 (Bjørndal et al., 2014). The main purpose of the project was to improve understanding of the dynamics of relevant value chains in the international and domestic seafood markets, with special attention on the mechanisms of price transmission from the ex-vessel/ex-farm level to the final consumer. Since the project covered many different geographic locations and development levels, the value chains analysed differed significantly. In general, with notable exceptions, the case studies found that processors and retailers were those receiving the largest benefits from the value chain, sometimes due to their stronger bargaining power. Despite differences at the national level, a series of general policy recommendations were put forward in order to improve the earnings of small-scale fishery and aquaculture through the value chain.

5.1 Price integration in fisheries research

Competition and price transmission is analysed using methods of price integration. The most common forms of price integration comprise vertical and horizontal integration.

Vertical integration focuses on the study of price transmission along the value chain (Asche et al, 2007). Horizontal integration, or market delimitation, describes price linkages across different market places and commodities (Asche et al, 1999; Singh et al, 2015). The models presented in this report combine the two approaches. Horizontal price integration will test for competition across imports of the same or similar species from different countries. Vertical price transmission will test whether the prices resulting from the competitive relations across imports are transferred to the consumers through the retail sector.

The first studies on horizontal price transmission (Marshall, 1947; Cournot, 1971) provided market definitions based on the relationship between the prices of a group of goods, stating the Law of One Price (LOP) (Asche et al. 1999). Further developments in econometric techniques (Engle & Granger, 1987; Johansen, 1988, 1991) allowed the use of efficient modelling of endogeneity in all price variables for testing the degree of market integration within and across commodity markets (Gordon and Maurice, 2015). The research interest in market integration in the seafood industry is relatively recent and new research findings have increased the literature in the last few years. First approaches were de veloped in some markets for wild species (Bose and McIlgrom, 1996; Gordon and Hannesson, 1996), and in those of salmon with particular attention on the role of farmed Atlantic salmon (Gordon et al. 1993; Asche et al, 1997; Asche, 1997; Asche et al 1999).

Some recent studies in market delimitation have focused on the possible existence of integration between different markets for the same species. Nielsen (2004) found that the ‘Law of One Price’ is in force between the Norwegian and Danish herring markets. Nielsen (2005) also identified a partially integrated European first-sale market for whitefish and a strong integration of European cod markets. Vinuya (2007) tested for market integration in world shrimp markets using import prices from Japan, the United States and the European Union. Some other studies analysed the competitive relationship between wild and farmed products of the same species. Asche et al. (2005) examined market integration between wild and farmed salmon in the Japanese market and results showed that the species were close substitutes. Furthermore, farmed salmon had generated price decreases for all salmon species. Asche et al. (2012) developed a cointegration analysis of market integration in the U.S. shrimp market considering different product sizes and the integration between wild caught and imported farmed shrimp. They found significant evidence of market integration, suggesting that the ‘Law of One Price’ holds for this industry. This result means that in

the case of a supply shock, prices do not rise, instead, imports of foreign, farmed fish increase. Rodriguez et al. (2013) found that wild and farmed gilthead sea bream formed two heterogeneous products in the Spanish market.

Other researchers analysed the possible existence of market integration between different products in the same market, identifying potential substitute products in different categories. Nielsen et al. (2007) studied the markets for trout in Germany and its potential imported substitutes. The study found that in Germany markets for farmed trout are linked to other fish markets, particularly to capture fish markets rather than markets for farmed salmon. Quagraine and Engle (2002) found that pangasius frozen fillets imported from Vietnam were competing with channel catfish farmed in the US. However, Norman-Lopez and Asche (2008) found that imports of fresh and frozen tilapia fillets compete in different market segments, while fresh and frozen catfish fillets compete in the same market. The previous work was later extended by Norman-Lopez (2009) with a study of the tilapia market in the U.S. Results did not find evidence of competition in the same market between tilapia and fresh catfish fillets. However, there was evidence that fresh, farmed tilapia fillets compete with wild whole red snapper, wild, fresh fillets of sea dab, and blackback flounder. Norman-Lopez and Bjørndal (2009) found that tilapia imports into the US are differentiated by continents, but producers from the same region seem to be competing in a continent of origin and commodity delimitated market. Nielsen et al. (2009) analysed market integration of fish in Europe and identified a form of market integration between 13 fresh and seven frozen fish species. Their conclusions stated that the Law of One Price is in force within the European markets for fresh flatfish, fresh pelagic fish and between frozen cod and plaice. Blomquist (2015) tested market integration among 12 fish species in Sweden using cointegration tests. His results allowed identifying market integration for two separate clusters of species and found that the Law of One Price holds for six of the 12 species considered. Schrobback et al. (2014) provided a new approach in the application of market integration analyses when they addressed the economic competition between the native Sydney rock oyster and the Pacific oyster introduced in the Australian market. The results concluded that the markets for the two species are integrated, but the species are not perfect substitutes. Norman-Lopez et al. (2014) investigated the market integration of Australian rock lobster exports to Hong Kong, considering four species and different exporting states. The co-integration analysis indicated that all four species and producers/export states considered were substitutes for each other, so that, in the long run, prices paid to operators in the industry converged.

The first studies of vertical price integration were developed in the agricultural industry, starting in the US and following in the European Union. Most of the studies undertaken were focused on a particular species. Guillotreau (2004) analysed the changes in the value spread between the intermediaries in the European fish markets after the introduction of farmed salmon. Jaffry (2005) estimated a price transmission model for the value chain of fresh whole hake sold in France. Guillotreau et al. (2005) evaluated the effect of structural changes in the mechanisms of price transmission along the fresh salmon value chain between Norway and France. Jiménez-Toribio and García-del-Hoyo (2006) analysed the price transmission along the Spanish value chain of red seabream (Pagellus bogaraveo). Other works also considered price transmission in a market as a whole, such as Shirazi and Moghaddasi (2011) for the Iranian fish markets or Sakai et al. (2012) for the Japanese seafood markets. Finally there are a few studies that consider and compare price transmission in the seafood value chain between different markets. Jiménez-Toribio et al. (2010) evaluated the price integration relationships between the world market and the major European marketplaces for frozen and canned tuna.

Recently, some studies combined the analysis of market integration and the study of price linkages across the value chain. Asche et al. (2007) combined the analysis of market integration between the UK and Norway in the French market for smoked salmon, and the study of price linkages across the full value chain in French markets. A high degree of price integration was found in both horizontal and vertical analyses. Jimenez-Toribio et al. (2010) analysed the degree of integration between the world market and the main European markets for tuna through vertical and horizontal price linkages. In the case of horizontal analysis, spatial linkages are investigated in order to estimate the connection between the European market and the world market in the primary stage of the value chain. Their results showed strong market integration at the ex-vessel stage, and the price leadership of yellowfin tuna over skipjack tuna. Gordon and Maurice (2015) tested for vertical and horizontal co-integration in the fish supply chain in Uganda for five important fish species using the Johansen vector error correction model and found that a long-run relationship does exist both in horizontal and vertical market segments of the fish supply chain in Uganda. Fernandez Polanco and Llorente (2015) found that market integration across local and imported fresh fish improved price transmission along the Spanish value chain in three popular species. Singh et al. (2015) examined the presence of price transmission asymmetry along the value chain, and the price transmission across four main aquaculture species in the

Thai fish market. They found that, in general terms, the price of one species does not significantly affect the price of the other species at the same level in the value chain.

5.2 Methods and Materials

The logic of price integration is based on the law of one price (LOP), which states that all products in the same category are equally priced in an efficient market. Under this condition, competition can be tested by the correlation across the prices of the different products. Considering a market of two products, the relationship studied in the analysis of integration is given by the formula:

$$Ln(p_{1t}) = \alpha + \beta \ln(p_{2t}) \quad (1)$$

Where p_{1t} and p_{2t} are the prices of the two products in the same period t, the parameter α is a constant term that reflects the differences in quality and marketing cost of product 1 versus product 2, and parameter β determines the relationship between the prices.

When $\beta = 0$, then the prices are unrelated to each other. In a typical case of market delimitation, it indicates that the products in question do not compete with each other. In the present case, if p_1 represents the price of a given commodity and p_2 represents those of a potential substitute, the conclusion that follows is that changes in the prices of one species do not change the prices of the other, and thus they are not competing in the same market. On the contrary, if $\beta = 1$, the Law of One Price (LOP) is verified and it can be concluded that both commodities are competing in the same delimitated market.

The suitability of the different cointegration techniques is given by the properties of the price series and whether these are stationary or non-stationary. The Augmented Dickey-Fuller (ADF) (Dickey & Fuller, 1981) is one of the tests used to analyse the time series properties of the data. The null hypothesis of unit root is tested in an autoregressive model for the price levels and their first differences. When the price series are found to be non-stationary, the statistical method recommended for studying the relationships among them is the cointegration analysis, which will be tested using the contrast developed by Johansen (1991). When the price series are found to be stationary, the Johansen test, even less restrictive than other previous cointegration

procedures (Ravallion, 1986; Asche et al., 2004), may not be conclusive. In any case, integration across price series can be analysed by performing a Vector Autoregressive (VAR) model, and Granger causality will test for bivariate linkages across the different price series. Both methods will be used in this report, which may also help contribute to the consistency of the results.

The maximum lag order for the Granger causality analysis was set according to the common criteria used in these cases (Singh et al, 2015). Three different information criteria (Akaike, Schwarz Bayesian and Hannan-Quinn) were used to find the maximum lag that minimized the corresponding values of the criteria from a starting number of 12 monthly lags for one year. Finally, potential effects from seasonality are assessed in the model by inclusion of dummy fictitious variables.

The data for the analysis of the case studies are available from different European and Spanish official sources. The main trade partners exporting the commodities of interest were identified in the Spanish External Trade Database (Cámaras, 2015). This service provides data from the Spanish customs from 2010, which include quantities, values and countries of origin of imports for every tariff code. Longer series of quantities and the values of Spanish imports from specific countries can be downloaded from the Eurostat (2015) external trade database (ComExt). Data on retail quantities and values are available at the Ministry of Agriculture website, from the food consumption panel (MAGRAMA, 2014).

6. Price integration analysis

The characteristics of the salted cod trade in Spain allow for targeting three issues in international trade that are suitable for a price integration analysis. Horizontal integration allows for studying the competitive relationships across exporters of salted cod commodities to Spain, including also re-exporting countries. Vertical integration analyses how prices are transferred from imports to the retail sector and allows the investigation of some examples of price transmission in intra EU trade, by integrating the prices of producing and re-exporting countries in the imports to retail model.

On one side, vertical integration will study whether the prices resulting from the competition across commodities in the international market do finally reach the retail level in Spain. Raw material for the local processing industry is competing with ready to eat products such as salted and dry cod and fillets. Since wet “green cod” will be finally

processed and distributed in Spain, the analysis will clarify whether the final product is competing with imports in the same market or whether the local processors operate in a different segment or market conditions. In this case, price transmission analysis provides information about whether local processors or traders are increasing or decreasing their incomes by transferring or not the changes in the purchase price of raw materials and ready to sell products.

Horizontal integration is applied to studying the competitive relationships across exporters of wet “green” cod to Spain. Two situations are considered here: competition across producers and competition across exporters. The first scenario comprises only those countries that are significant in the production of salted cod, and by extension large exporters. In the second case, producers and re-exporting countries are combined to investigate whether there is any kind of competition across the two categories or if the second sale countries simply transfer the prices of producers.

Finally, vertical integration from producing and re-exporting countries for retail will help in understanding the dynamics of intra-EU trade for this commodity. The main questions are whether the re-exporter is transferring the price of the producer; are any changes in the price finally transferred to the retail level and if so, are any difference in the prices due to the costs of the services provided by the traders? Otherwise, are some actors gaining or losing incomes according to the changes in their margins due to price shocks in the previous stages of the value chain?

6.1 Data sources

Data on Spanish imports of salted cod are available at the Database of External Trade, which is provided by the Spanish customs (Cámaras, 2015). Additionally, longer series are available for aggregated imports at ComExt database (EUROSTAT, 2015). The available harmonized codes are:

03053011/211 – Fillets of salted cod of the species Gadus macrocephalus.
03053019/219 – Fillets of salted cod of the species Gadus morhua and Gadus ogac.
03055110 – Cod dry & unsalted.
03055190 – Cod dry & salted.
03056200 – Cod salted or in brine (Green cod).

Fillets of Gadus macrocephalus and dry unsalted cod are minor commodities with several blank periods. The analysis focuses on wet “green” cod, salted fillets of Gadus morhua/Ogac, and salted and dry cod. For similar reasons, analysis at country level is undertaken only for the category of wet “green” cod, as the dominant commodity and the raw material for the locally processed supply.

Detailed imports of salted cod from Norway, Iceland and the Faroes were not available on the ComExt database used when this report was being prepared. In the analysis of price integration of salted cod imports by country, the period covered goes from 2008 to 2013, as this was the information available from the Spanish customs (Cámaras, 2015) when the reasearch started. This issue with the sample size limits the models to a maximum of three variables for testing competition and price transmission at the retail level.

There are no specific data series for the retailing and consumption of salted cod, but there are for aggregated salted fish (MAGRAMA, 2014). Using as a reference the domestic production of salted fish in 2013 (INE, 2015), 74.2% of the aggregate is cod. The rest of the group is composed of tuna (8%), sardines (3.2%), anchovy (12%) and other non-specified species (2.6%). The importance of cod among the supply of salted fish makes the data on this broad category a good proxy for the prices of salted cod at the retail level. Although not in the absolute values, the trend and changes in the prices of salted fish are clearly influenced by the evolution in the prices of salted cod. The retail series for the retail process for salted fish are available from 2005 onwards.

6.2 Evolution of price series

The prices of the salted cod commodities used in this analysis evolved in different ways (Figure 4). While the price of imports of salted and dried cod, with an average of 4.63 EUR/Kg, increased 25% between 2005 and 2013, wet cod and fillets decreased 22% and 7% respectively. Salted and dried cod has the most volatile price of the three commodities, followed by wet “green” cod, with an average price of 4.7 EUR/Kg, and fillets, with a price of 5.36 EUR/Kg, with similar rates of volatility. The average retail price of salted fish in the period was 10.85 EUR/Kg, which was an increase of 40% since 2005, although this was also very volatile.

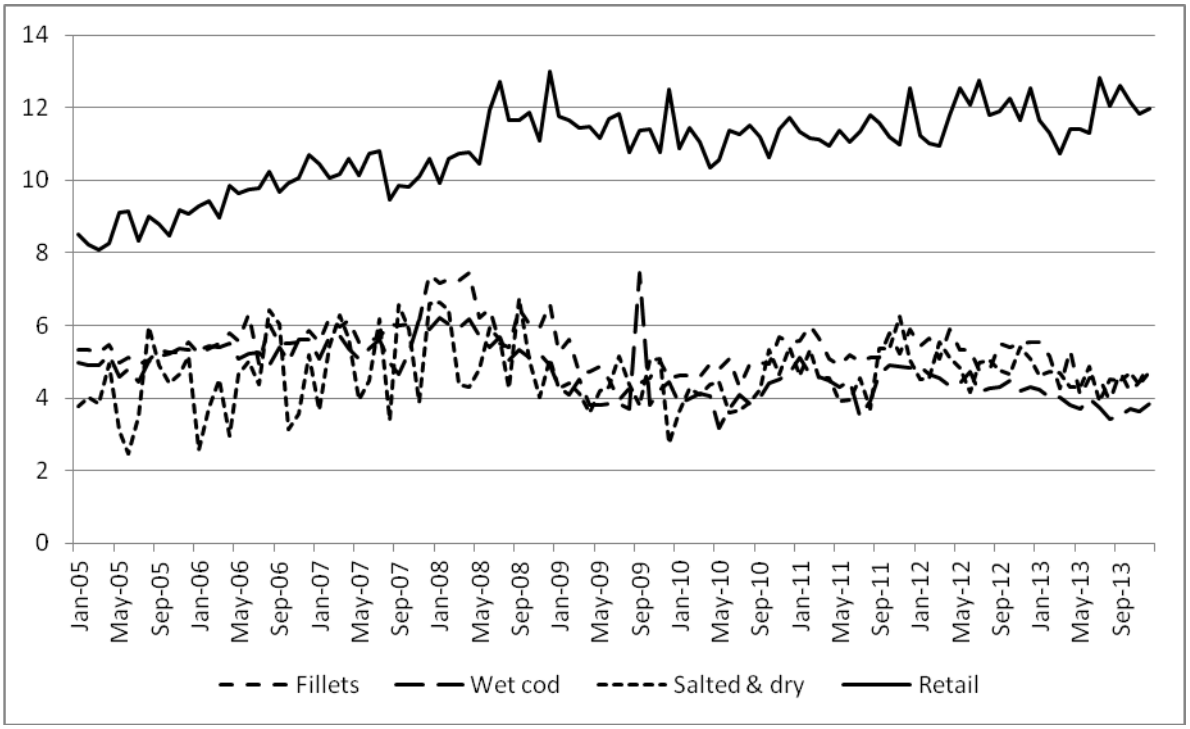

Figure 4. Evolution of the price series of salted cod imports by commodities and retail price in Spain.
Source: Eurostat (2015); MAGRAMA (2014).

The analysis of wet “green cod” imports by country covers the period from 2008 to 2013. The price of Spanish wet cod imports fell in all the countries under observation (Figure 5). The Faroes showed the highest average price in the period at 5.56 EUR/Kg, which had decreased 47% since 2008 and is the most volatile of all the series. Iceland and Norway are the other two producing countries, with average prices of 4.74 and 4.22 respectively. The price of imports from Iceland decreased 39% between 2008 and 2013 and that of Norway also decreased 33%. The re-exporter country, Denmark, with an average of 3.93 in the observed period, has the lowest price of all the countries, with a series more volatile than Norway and Iceland, but less so than the Faroes. The price of imports from Denmark also decreased by 33.7% in the same period. In this shorter period, retail prices increased up to an average of 11.49 EUR/Kg, becoming less volatile and increasing by 20%.

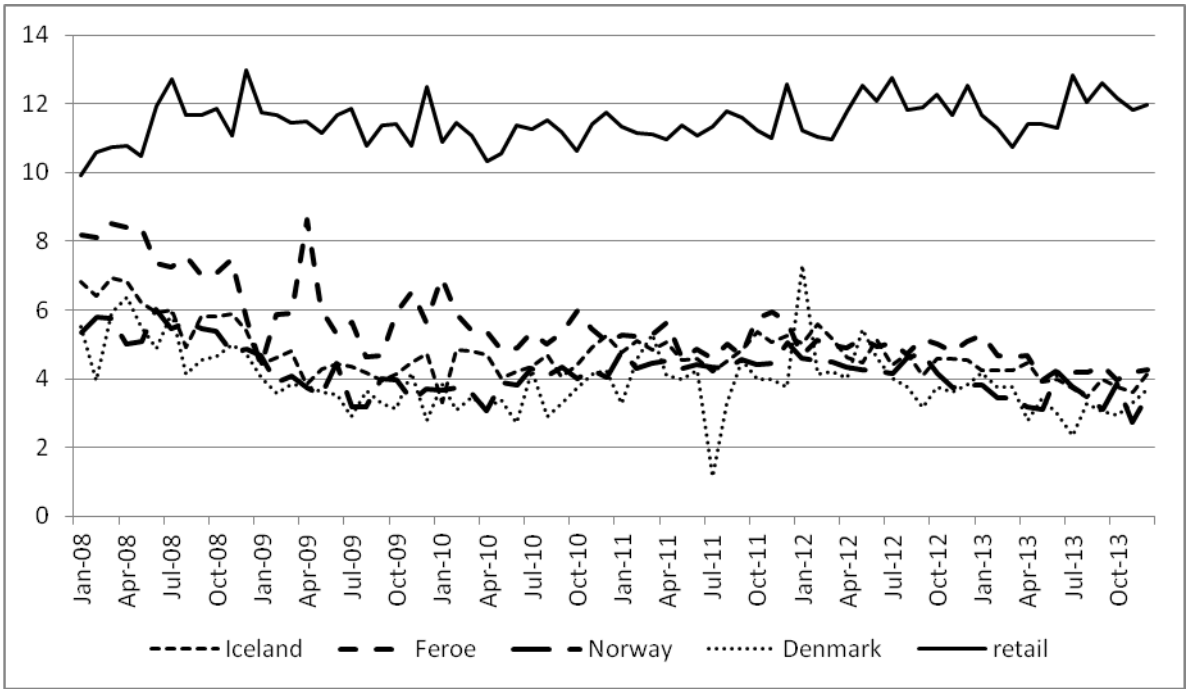

Figure 5. Evolution of the price series of wet “green” cod imports by country and retail price in Spain.
Source: Cámaras (2015); MAGRAMA (2014).

Distributional properties

The Augmented Dickey-Fuller unit root test is performed with the price series in order to select the appropriate procedure in the subsequent analysis. Results from the test (Table 10) indicate that the price series of the commodities and the retail price of salted fish are unit root at their levels but not at their first differences. Results from the Johansen test will be consistent and the Granger causality analysis will help to clarify the potential price linkages across competing commodities and the import to retail chain. On the contrary, the price series by countries do not fit with the requirement of being assumed to be non-stationary. This may be due to the sample size, however, this raises a question about the suitability of the Johansen test and only the Granger causality test can be conclusive. Despite the significant volumes of wet “green” cod imports from Germany and Sweden, these are not continuous on a monthly basis, with gaps of more than one month in several of the observed years. This is an inconvenience for the price integration analysis, which requires full and complete monthly series, so it is not possible to consider these countries in the models to be analysed. The model on price transmission in intra-EU trade is performed with the price series for Denmark, which is another important re-exporter of wet cod to Spain on a regular monthly basis.

Table 10. Augmented Dickey-Fuller test for the price series by commodities and countries.

	Constant		Linear trend		Quadratic trend	
	Levels	1st diff.	Levels	1st diff.	Levels	1st diff.
Fillets	-0.101313	-5.5457***	-0.14475	-5.6035***	-2.1901	-5.5692***
Wet cod	-1.31205	-11.173***	-2.66153	-11.167***	-2.64051	-11.11***
Dried cod	-3.85932**	-6.8259***	-1.68017	-6.8538***	-1.64511	-6.8106***
Retail	-2.35268	-11.740***	-2.2045	-11.870***	-2.2045	-11.829***
Iceland	-2.72549*	-1.43256	-2.50621	-1.1746	-1.87331	-2.13292
Norway	-3.16532**	-7.6373***	-3.41863*	-7.5822***	-3.73447*	-6.2801***
Faeroe	-0.701269	-2.35491	-3.46576**	-2.01087	-3.07596	-5.3621***
Denmark	-5.3196***	-7.4945***	-5.6903***	-7.4338***	-5.7783***	-2.8513

*** 99per cent CL; ** 95per cent CL; * 90per cent CL

6.3 Results

Integration across salted cod commodities and the retail price in Spain was tested first (Table 11). Price integration was found to be significant in the Johansen test with an unrestricted constant and linear trend. The test indicates there is one cointegrating vector causing the changes of prices in the system. In general, the system describes a market in which different commodities are competing at the import level and which is linked to the retail sector. The Granger causality test points to a bidirectional competition across Wet “Green” cod and fillets. At the same time, wet cod prices are caused by the retail price of salted fish. Retail prices also directly affect the import price of salted and dried cod, which is a commodity ready for final consumption. Reciprocally, the import price of salted and dried cod is a Granger cause, at a 95% confidence level, of the retail price of salted fish. In this way, the import prices of all the different commodities of salted cod and the retail prices of salted fish in Spain are related to each other.

Table 11. Price integration across salted cod commodities and retail prices (unrestricted constant, restricted trend).

Rank	Eigenvalue	Trace test	Lmax test
0	0.31911	67.878***	36.897***
1	0.22248	30.980**	24.158***
2	0.060216	6.8217	5.9621
3	0.0089142	0.85960	0.85960

Granger Causality				
	Causes			
	Fillets	Wet cod	Dried cod	Retail
Fillets	38.860***	14.608***	0.93028	0.11434
Wet cod	19.737***	12.885***	0.35978	15.691***
Dried cod	2.4077	1.5999	0.33928	5.8081***
Retail	0.051011	0.49868	5.0754**	265.58***

The next step of the analysis will test for market delimitation across the three main producers of wet cod, the most important commodity exported to Spain (Table 12). The Johansen test found one cointegrating vector in a model with no trend. This result is confirmed by the Granger causality test. The price in Iceland is affected by the price in the Faroes and the price in Norway by the price in Iceland. In other words, the Faroes is the price reference for Iceland and Iceland the price reference for Norway.

Table 12. Market delimitation across wet salted cod producers (unrestricted constant).

Rank	Eigenvalue	Trace test	Lmax test
0	0.57191	74.952***	50.905***
1	0.32633	24.047***	23.701***
2	0.0057444	0.34566	0.34566

Granger Causality			
	Causes		
	Iceland	Faeroe	Norway
Iceland	1.7132	3.2148**	1.4090
Faeroe	1.3499	2.3798*	0.60646
Norway	2.8556**	1.8398	1.3338

*** 99 per cent CL; ** 95 per cent CL; * 90 per cent CL

In order to understand how intra-EU trade affects the relationships across competitors in the Spanish market for imported “green” salted cod, a model of market delimitation was used for testing price integration across two producers, Iceland and Norway, and one re-exporter, Denmark (Table 13). Results from the Johansen test indicate that there is one cointegrating vector connecting the prices of the wet salted cod imported by the three countries. The Granger causality tests show a mutual causal link between Norway and Iceland which was not found in the previous case. Furthermore, Danish prices are Granger caused by Norway and there is no direct link with the prices of imports from Iceland. In a first attempt to understand this result, Iceland and Norway are considered to be competitors exporting wet salted cod to Spain, as suggested in the previous model, but Denmark only competes with Norwegian imports. This causal relationship could also indicate that Denmark is mainly re-exporting Norwegian “green” cod.

Table 13. Price competition across wet salted cod exporters: Iceland – Norway – Denmark (unrestricted constant).

Rank	Eigenvalue	Trace test	Lmax test
0	0.53439	67.020***	45.865***
1	0.28647	21.155***	20.252***
2	0.014938	0.90302	0.90302
Granger Causality			
		Causes	
	Iceland	Norway	Denmark
Iceland	9.5816***	14.211***	2.3216
Norway	17.834***	12.088***	0.39226
Denmark	1.2157	6.1596***	0.026371

*** 99 per cent CL; ** 95 per cent CL; * 90 per cent CL

Price transmission from imports to the retail level is tested in the first instance in a model considering only producing countries (Table 14). Results suggest cointegration according to the Johansen test and Granger causality confirms the relationships among the different price series. Competition across Iceland and Norway is evidenced again in this model of price transmission. Furthermore, retail prices of salted fish are affected by the price of wet “green” cod imports from Iceland and Norway to a lesser extent. Therefore, retailers are transferring the changes in producers’ prices to their consumers, with no signs of any influence of retailers on a producer’s prices.

Table 14. Price transmission from wet salted cod producers to Spanish retailers (unrestricted constant and restricted trend).

Rank	Eigenvalue	Trace test	Lmax test
0	0.50253	70.079***	41.894***
1	0.31092	28.186**	22.344***
2	0.092776	5.8419	5.8419
Granger Causality			
		Causes	
	Iceland	Norway	Retail
Iceland	0.51769	3.7364**	2.0071
Norway	4.4514***	1.2427	2.0345
Retail	4.3246***	2.6318**	2.9355**

*** 99per cent CL; ** 95per cent CL; * 90per cent CL

Finally, price transmission is tested in a scenario of intra-EU trade. Two models were used for testing for linkages across imports and retail prices in situations of this kind. The two models coincide in the inclusion of Denmark, as the EU re-exporter, and the retail prices of salted fish, as the market where the import prices are transferred. The difference is in the producer country, for which one model considers Norway and the other Iceland. Price linkages between Norway and Denmark were found previously when analysing market delimitation across producers and re-exporters. Results from the model using Norway as producer country confirm this linkage with Norway exerting a causal relationship on the price of imports from Denmark (Table 15). The main difference with the previous results is the causal link from the retail level to the prices of imports from Norway, which was rejected when only producing countries were considered. Since the retail price is a Granger cause of Norwegian prices and these are causing those of Denmark, there is a significant link between the retail level and the prices of imports from this EU country. This is the clearest case in which retail prices are found to be a cause of import prices, as seen in the model with the different commodities.

Table 15. Price transmission from wet salted cod producers and re-exporters to Spanish retailers Norway – Denmark – Retail (unrestricted constant).

Rank	Eigenvalue	Trace test	Lmax test
0	0.64508	89.276***	62.152***
1	0.36105	27.124***	26.876***
2	0.0041220	0.24783	0.24783
Granger Causality			
	Causes		
	Norway	Denmark	Retail
Norway	22.078***	2.4054	7.2009***
Denmark	7.2476***	0.059324	3.5141**
Retail	3.1053**	0.64276	10.823***

*** 99 per cent CL; ** 95 per cent CL; * 90 per cent CL

The results from the previous model are not replicated when Norway is replaced by Iceland. Although the Johansen test indicates one cointegrating vector, the relationship across the price series is not verified in the Granger causality tests (Table 16). The prices of imports from Denmark appear caused only at a 90% confidence level, as for the link from the retail level on the Danish prices.

Table 16. Price transmission from wet salted cod producers and exporters to Spanish retailers Iceland – Denmark – Retail (unrestricted constant and restricted trend).

Rank	Eigenvalue	Trace test	Lmax test
0	0.65166	97.588***	63.274***
1	0.35946	34.314***	26.727***
2	0.11879	7.5874	7.5874
Granger Causality			
	Causes		
	Iceland	Denmark	Retail
Iceland	3.7666***	0.93384	1.5896
Denmark	2.2061*	0.38083	2.1210*
Retail	2.1320*	0.33354	1.3212

*** 99 per cent CL; ** 95 per cent CL; * 90 per cent CL

7. Discussion

The Spanish market for salted cod combines products processed in the country with imported raw material and ready to eat imported products in the form of salted and dried cod leafs and fillets. The prices of the three commodities, including wet “green” cod for the domestic processing industry, are related in a horizontal and vertical system, including the retail price of salted fish. The retail price refers to imports of salted and dried cod, which makes sense given that it is a ready to eat product that goes directly to the retail point. The relationship between the prices of salted and dried cod and salted fish at the retail level is reciprocal. The retail prices are also a cause of variation in the prices of salted and dried cod imports, as well as for those of wet “green” cod, which is the raw material used in the domestic processing industry. Being a raw material, the causal link from retail to wet cod imports can only take place through local processors. Retailers may be setting the price for domestic processors and these may be trying to do the same backwards on producers and exporters. The price of fillets of salted cod, on the other hand, are mutually related to the price of “green” cod, putting all commodities into a system of price linkages with the retail level. The different causal relations show a scenario in which imports of salted and dried cod set the changes in the price at the retail level, and this is linked to the other commodities by the reciprocal influence of retail price on imports of dried and wet salted cod.

The results of the commodity model suggest that Spanish retailers have a certain level of bargaining power, since they are able to influence the prices of imports both for a raw material and for a ready to eat product. However, this conclusion may not be accurate if the differences across the countries exporting salted cod commodities to Spain are taken into account. All these commodities can be imported into Spain directly from a producer country such as Iceland, Norway or the Faroes, or from a third country within the EU, which previously imported the product. This product imported into a third country can be immediately shipped to the final destination country or stored, preserved and sold when the current price increases the margin with regard to the price at which it was purchased. This practice enables re-exporters to compete against producers offering lower prices with minimum or even no loss in their marketing margins. This kind of trade appears to be conducted by other key exporters of salted cod to Spain, who have almost no importance in cod harvesting and processing, such as Germany, Sweden, Denmark or the Netherlands.

The prices of the main producers have been found to be integrated in a delimitated market. The Faroes, which is the country with the highest price, is used as a reference by Icelandic exporters when shipping wet “green” cod to Spain. This explains why the price of imports from Iceland changes after the price of imports from the Faroes change. The same appears to be happening with the prices in Norway, which change after a shock in the prices from Iceland. These relationships across the prices of the main producers do not vary when re-exporter countries are included in the model. The causal relationships across producers persist and linkages may appear across producers and re-exporters pointing to the origin of the product traded by the third country. What is more relevant here is the fact that the retail price of salted fish becomes endogenous when only producer countries are considered, that is, the prices at the retail level are caused by the price of direct imports from producing countries. In this case, processors in Spain are transferring the raw material costs to the retailers and these to the final consumers. This is a situation of perfect price transmission, without any kind of bargaining power in effect by retailers. However, this situation changes when a third country is included in the system.

When a re-exporter is able to provide the product at a lower or similar price, including transport costs, to the producer then, the bargaining position of traders in the importing country improves. This situation has been observed in the model of price transmission across Norway, Denmark and the retail price in Spain. The direction of the causal link between Norway and the Spanish retail price changes when Iceland or Denmark is considered as the competitor for imports from Norway. When Iceland and Norway are analysed along with the retail price, Spanish retailers are found to be acting as price takers. The price of salted fish at the retail level reacts to changes in the price of imports of the raw material. In contrast, when the imports in the system are those from Norway and Denmark, then the link between Norwegian and Spanish retail prices becomes bidirectional with a causal relationship between retail and the imports from Denmark. Local traders improve their ability to exert bargaining power when a re-exporter enters the system. In this particular case, intra-EU trade is favouring the interest of Spanish retailers, who have the ability to import the same product from another member state, with no tariffs and lower shipping costs, in case the prices in Norway are not interesting according to the targeted marketing margins. This ability increases if there is also a competitive reaction, as was found in the model of the prices in Denmark when the Norwegian prices change. By entering into price competition with Norway, Danish traders can supply Spanish processors at a more attractive price, and these can supply the local demand at a more convenient price for retailers. When

negotiating with Norwegian exporters, Spanish importers can use this advantage, and if there is not a highly significant difference in terms of quality, Norwegian exporters may see their potential bargaining power reduced.

References

Asche, F. (1997). Trade disputes and productivity gains: The curse of farmed salmon production?. Marine resource economics, 12, 67-73.

Asche, F., Steen, F., & Salvanes, K. G. (1997). Market delineation and demand structure. American Journal of Agricultural Economics, 79(1), 139-150.

Asche, F., Bremnes, H., & Wessells, C. R. (1999). Product aggregation, market integration, and relationships between prices: an application to world salmon markets. American Journal of Agricultural Economics, 81(3), 568-581.

Asche, F., Guttormsen, A. G., Sebulonsen, T., & Sissener, E. H. (2005). Competition between farmed and wild salmon: the Japanese salmon market. Agricultural Economics, 33(3), 333-340.

Asche, F., S. Jaffry, & J. Hartmann (2007) Price transmission and market integration: vertical and horizontal price linkages for salmon. Applied Economics, 39(19), 2535–2545.

Asche, F., Bennear, L. S., Oglend, A., & Smith, M. D. (2012). US shrimp market integration. Marine Resource Economics, 27(2), 181-192.

Bjorndal, T., Child, A. & A.Lem, eds. 2014. Value chain dynamics and the small-scale sector: policy recommendations for small-scale fisheries and aquaculture trade. FAO Fisheries and Aquaculture Technical Paper No. 581. Rome, FAO.

Blomquist, J. (2015). Multiple Inference and Market Integration: An Application to Swedish Fish Markets. Journal of Agricultural Economics, 66(1), 221-235.

Bose, S., & McIlgorm, A. (1996). Substitutability among species in the Japanese tuna market: a cointegration analysis. Marine Resource Economics, 11, 143-156.

Cámaras. 2015. Base de Datos de Comercio Exterior. Available at: http://aduanas.camaras.org/

Cournot, A.A. (1971). Researches into the mathematical principles of the theory of wealth. A.M. Kelly. New York.

Dickey, D.A. & W.A. Fuller (1981) Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica*, 49, 1057–1072.

Engle, R.F. & C.W.J. Granger. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica*, 55, 251–276.

EUROSTAT (2012). External Trade Databases. Available at: http://ec.europa.eu/eurostat/web/international-trade/data/database

Fernández Polanco, J.M.; Llorente, I.; Luna, L. & J. L. Fernández Sánchez. 2012. El Mercado de Productos Pesqueros en España: Efectos de la Crisis en la Producción y el Consumo. GLOBEFISH Research Programme, Vol. 106. Roma, FAO.

Fernández-Polanco, J. & I. Llorente. 2015. Price Transmission in the Spanish Fresh Wild Fish Market, Aquaculture Economics & Management, 19:1, 104–124.

Floros, C. (2007) Causality and price transmission between fish prices: New evidence from Greece and UK. European Journal of Social Sciences, 4(2), 147–155.

Gordon, D. V., Salvanes, K. G., & Atkins, F. (1993). A fish is a fish? Testing for market linkages on the Paris fish market. Marine Resource Economics. 11, 143-156.

Gordon, D. V., & Hannesson, R. (1996). On prices of fresh and frozen cod fish in European and US markets. Marine Resource Economics, 11, 223-238.

Gordon, D.V. & Maurice, S. (2015). Vertical and Horizontal Integration in the Uganda Fish Supply Chain: Measuring for Feedback Effects to Fishermen, Aquaculture Economics & Management, 19:1, 29-50.

Gudmundsson, E.; Asche, F. & M. Nielsen. 2006. Revenue distribution through the seafood value chain. FAO Fisheries Circular. No. 1019. Rome, FAO.

Guillotreau, P. (2004) How does the European seafood industry stand after the revolution of salmon farming: An economic analysis of fish prices. Marine Policy, 28(3), 227–233.

Guillotreau, P., Le Grel, L., & Simioni, M. (2005) Price-cost margins and structural change: Sub-contracting within the salmon marketing chain. Review of Development Economics, 9(4), 581–597.

INE (2015). Encuesta Industrial de Productos. Available at: http://www.ine.es/pls/eip09/p_eip_consulta_normal.consulta?v_opcion=1&v_anno=2008&v_datos=S04&v_idioma=s

Jaffry, S. (2005) Asymmetric price transmission: A case study of the french hake value chain. Marine Resource Economics, 19(4), 511–523.

Jiménez-Toribio, R. & García-del-Hoyo, J.J. (2006) Evidence of market price leadership in the Spanish red seabream value chain-Implications for fisheries management. Fisheries Research, 81(1), 51–59.

Jiménez-Toribio, R., Guillotreau, P., & Mongruel, R. (2010) Global integration of European tuna markets. Progress in Oceanography, 86(1-2), 166–175.

Johansen, S. (1988) Statistical analysis of cointegration vectors. Journal of Economic Dynamics and Control, 12, 231–254.

Johansen, S. (1991) Estimation and hypothesis testing of cointegration vectors in gaussian vector autoregressive models. Econometrica, 59, 1551–1580.

MAGRAMA (2015a) Precios Origen – Destino en Alimentación. Available at: http://www.magrama.gob.es/es/estadistica/temas/estadisticas-alimentacion/observatorio-precios/default.aspx

MAGRAMA (2015b) Panel de consumo alimentario. Available at: http://www.magrama.gob.es/es/alimentacion/temas/consumo-y-comercializacion-y-distribucion-alimentaria/panel-de-consumo-alimentario/

Marcos-Pujol, J.M. & Sansa-Brinquis, P. 2007. Comercialización mayorista en España. La posición de la red de Mercas y el resto de canales. Distribución y Consumo, Marzo-Abril, 5–21.

Marshall, A. (1947). A principles of Economics. Macmillan. London.

MERCASA. 2015. La Alimentación en España, 2014: Productos de la Pesca y la Acuicultura. Available at: http://www.mercasa-ediciones.es/alimentacion_2014/pdfs/pag_233-249_producstos_pesca_y_acuicultura.pdf

Nielsen, M. (2004) International market integration and demand: an analysis of the Norwegian and Danish herring market. Food Economics, 1(3), 176–184.

Nielsen, M. (2005) Price formation and market integration on the European first-hand market for whitefish. Marine Resource Economics, 20(2), 185–202.

Nielsen, M., J. Setala, J. Laitinen, K. Saarni J. Virtanen, & A. Honkanen (2007) Market integration of farmed trout in Germany. Marine Resource Economics, 22(2), 195–213.

Nielsen, M.J. Smit, & J. Guillen (2009) Market integration of fish in Europe. Journal of Agricultural Economics, 60(2), 367–385.

Norman-López, A. (2009) Competition between different wild and farmed species: The US tilapia market. Marine Resource Economics, 24(3), 237–251.

Norman-López, A. & F. Asche (2008) Competition between imported tilapia and US catfish in the US market. Marine Resource Economics, 23(2), 199–214.

Norman-López, A. & T. Bjørndal (2009) Is tilapia the same product worldwide or are markets segmented? Aquaculture Economics and Management 13(2): 138–154.

Norman- López, A., Pascoe, S., Thébaud, O., Putten, I., Innes, J., Jennings, S., Green, B. & Plaganyi, E. (2014). Price integration in the Australian rock lobster industry: implications for management and climate change adaptation. Australian Journal of Agricultural and Resource Economics, 58(1), 43-59.

Quagrainie, K. & C. R. Engle (2002) “Analysis of Catfish Pricing and Market Dynamics: The Role of Imported Catfish” Journal of the World Aquaculture Society, 33, 4, 389 – 97.

Ravallion, M. (1986) Testing market integration. American Journal of Agricultural Economics, 68(2), 292–307.

Rodríguez, G. R., Bande, R., & Villasante, S. (2013). Origins matter: (No) market integration between cultured and wild gilthead sea bream in the Spanish seafood market. Aquaculture Economics & Management, 17(4), 380-397.

Sakai, Y., Nakajima, T., Matsui, T., & Yagi, N (2012) Asymmetric price transmission in the Japanese seafood value chain -Analyses focusing on six fish species. Workshop in FAO/NORAD value chain in small scale fisheries. IIFET Conference. Tanzania.

Schrobback, P., Pascoe, S., & Coglan, L. (2014). Impacts of introduced aquaculture species on markets for native marine aquaculture products: the case of edible oysters in Australia. Aquaculture Economics & Management, 18(3), 248-272.

Shirazi, A.H. & Moghaddasi, R. (2011) Price transmission and marketing margin in the Iranian fish markets. World Applied Sciences Journal, 13(8), 1901–1908.

Singh, K., Dey, M. M., Laowapong, A., & U. Bastola, 2015. Price transmission in Thai aquaculture product markets: An analysis along value chain and across species. Aquaculture Economics & Management, 19(1), 51-81.

Vinuya, F.D. (2007). Testing for market integration and the law of one price in world shrimp markets. Aquaculture Economics and Management, 11(3), 243–265.

Salted cod is a much appreciated product in the traditional Spanish cuisine. Following the collapse of the Newfoundland fishery, local processors became dependent on imports of raw material in order to keep on producing. As a result, substantial changes in the value chain structure and dynamics took place. Using price integration techniques, this paper analyzes the relation across prices of salted cod products along the value chain in the modern Spanish markets. Horizontal price integration is used to test competition across commodities and countries at the import level. Vertical integration analyzes price transmission from imports to retail. Results suggest competition across imports of different commodities of salted cod and countries of origin. On the other side, changes in the prices of imports are transmitted to final consumers when the product is imported from the producing country. However, price transmission can be affected when intra EU trade takes place.

SNF

Samfunns- og næringslivsforskning AS
Centre for Applied Research at NHH

Helleveien 30
NO-5045 Bergen
Norway

P +47 55 95 95 00
E snf@snf.no
W snf.no

Trykk: Allkopi Bergen