

Fish Processing in Portugal: An Industry in Expansion

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Abstract

The purpose of this paper is to analyse developments in the Portuguese fish processing industry from the 1960s to the present as well as prospects for future expansion. In this period, Portugal has undergone tremendous political and macroeconomic changes. While Portugal used to be nearly self sufficient in the supply of fish, the country has become a net importer of this commodity. These changes have also affected fish processing. Moreover, the development of the industry has been promoted in several different ways. Fish processing has expanded in recent decades gaining market share in the domestic market for processed products at the expense of imports. Furthermore, Portugal has now become an important exporter to several countries, for instance gaining a market share of more than 40% for salted & dried cod in Brazil.

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1. BACKGROUND

The purpose of this paper is to analyse developments in the Portuguese fish processing industry from the 1960s to the present. In this period, Portugal has undergone tremendous political and macroeconomic changes. In addition, the future potential of the industry will be analysed.

At the beginning of this period, Portugal was a colonial power with a dictatorship (*Estado Novo*) led by Oliveira Salazar (1932-68). Cod fisheries reached their peak during the *Estado Novo*. The importance of cod as a source of protein for the population and as an important factor in the trade deficit, led to investments in the fisheries sector (Moutinho, 1985). This period of fisheries protectionism lasted from the mid 1930s to 1967, when imports were liberalised. Nevertheless, even with the implementation of this policy, imports were still needed to satisfy demand (Garrido, 2004).

In the overseas territories, there was some discrimination favouring Portuguese mainland products, and some restrictions and higher tariffs were applied to imported products. Portugal joined the European Free Trade Area (EFTA) in 1959. The effect of EFTA on Portuguese exports was of major importance and the country began to industrialise as a result (Lains, 1994; Barreto, 2002; Pinto and Teixeira, 2002). In 1962, when Portugal accessed the General Agreement on Tariffs and Trade (GATT), there was some relaxation of trade restrictions on foreign products. However, a residual list of import barriers remained, of which olives, olive oil, cod and metal-mechanic products were amongst those that had the most important restrictions (Rocha, 1982). At that time, the majority of exports was comprised of only a few products – canned fish, raw and manufactured cork, cotton textiles and wine. However, by the early 1970s (before the 1974 military coup), Portugal's export list showed higher product diversification (Baklanoff, 1979), and despite Portuguese public accounts having a negative balance, the economy was booming with a notable growth in exports of Portuguese merchandise – 11% per annum (Neves and Rebelo, 2001). Between 1976 and 1982, controlling the balance of payments was a constant concern. Only by the 1980s there was some strong industrial diversification due to export growth and domestic consumption (Costa *et al.*, 2011).

The agreement with the European Economic Community (EEC) was signed in 1972 (e.g. Bruneau, 1982). Thus, an opening in terms of trade with other western countries occurred just after the democratic regime was established (Bastien and Cardoso, 2003). In 1986, Portugal became a member of the then EEC and left EFTA. In the late 1980s, the Portuguese economy began to display several problems, especially concerning productivity,

as well as substantial fiscal and external imbalances (Blanchard, 2007). During the 1990s, Portugal became an open economy with good transport infrastructure, and income inequality was reduced (Neves and Rebelo, 2001). After a recession in 1993, the economy grew at an average annual rate of 3.3%, well above EU averages, and was being praised for its economic miracle (Tomé, 2011) and for the speed of its convergence (Barry, 2003). In 1999, Portugal adopted the Euro replacing the former national currency, the Escudo (Mateus, 2012). However, in the following decade, the Portuguese economy stagnated.

Traditionally Portugal was a distant water fishing state (DWFS), but this changed with the introduction of Extended Fisheries Jurisdiction at the end of the 1970s, leading to the demise of Portugal as a DWFS. While Portugal used to be nearly self sufficient in the supply of fish, the country has become a net importer and has maintained one of the largest per capita consumption of fish in the world. These changes have also affected fish processing.

The development of the processing industry has been promoted in several different ways, such as by EU investment funds. Moreover, EU tariffs are designed to protect and promote the fish processing industry: while imports of raw materials are largely duty free, imports of processed products are subject to duty. As a consequence, fish processing in Portugal has expanded and the country has become an important exporter to several countries and has increased its market share for salted & dried cod to Brazil at the expense of Norway.

The *per capita* fish consumption was drastically reduced before, during and soon after the Carnation Revolution. It subsequently recovered and has been kept more or less constant since then (Bjørndal *et al.*, 2015). In 2012, the average EU expenditure per capita for fish was €103, but with substantial variation between countries. Portugal was at the top with about €260 per capita.

This paper analyses these developments and considers the future of the industry. In a sense, it is an extension of Bjørndal *et al.* (2015), who analysed the developments in Portuguese fisheries from the 1960s to the present.

Data from different sources were collected for the preparation of this article. In some instances, there may appear to be divergences between data. This will often be for reasons such as different definitions of products as well as periodisation. All monetary values are nominal, unless otherwise noted. Some monetary values are in US dollars while others are in Euros.

The article is organised as follows. Fish supply to Portugal, consisting of domestic landings and imports, is quantified in section two. In section three, the economic environment of the industry is analysed, with an emphasis on the competitiveness of the Portuguese

industry vis-à-vis other countries. Section four deals with fish processing, while exports from the industry are given in section five and the final section provides some concluding remarks.

2. FISH SUPPLY TO PORTUGAL

Fish supply to the fish processing industry come from two sources, domestic production (fish landings and aquaculture) and imports. We will consider both. Bjørndal *et al.* (2015) analysed Portuguese fisheries for the period 1960-2011. They showed that Portuguese landings increased from 502,000 tonnes in 1961 to a peak of 578,000 tonnes in 1964, the highest quantity recorded. Subsequently landings were in decline but with a peak of 563,000 tonnes in 1967. At this time, the catch of cod (*Gadus morhua*) was the priority. It resulted from a political initiative aimed at preventing shortages in food supply. Another peak of 479,000 tonnes occurred in 1973. After this peak, there was a substantial drop in landings starting in 1974. This is explained not only by internal developments, which were mostly related to consequences of the Revolution in terms of economic conditions and demography, but also by the overexploitation of fish stocks, access restrictions to the waters of former colonies, the introduction of 200 mile Exclusive Economic Zones by coastal countries, the abrupt end of direct state support to fisheries, and the oil shocks during the 1970s that greatly affected the profitability of the distant water fisheries because of substantial fuel price increases. In the following years, Portuguese landings flattened out at an annual level of around 250,000 tonnes for the period 1978-1983.

In 1986, the year Portugal joined the European Economic Community, there was a substantial increase in the harvest to 407,000 tonnes, after which there was a gradual decline to a bottom of 198,000 tonnes in 2000. In 2013, total landings amounted to 196,250 tonnes. Catches of the 10 most important species landed, which combined represent 71% of total landings, are shown in table 1. The three most important ones (chub mackerel, sardine and horse mackerel) combined represent 87,439 tonnes or 45% of total landings.

Table 1: Catches of the 10 most important species in 2013 (tonnes)

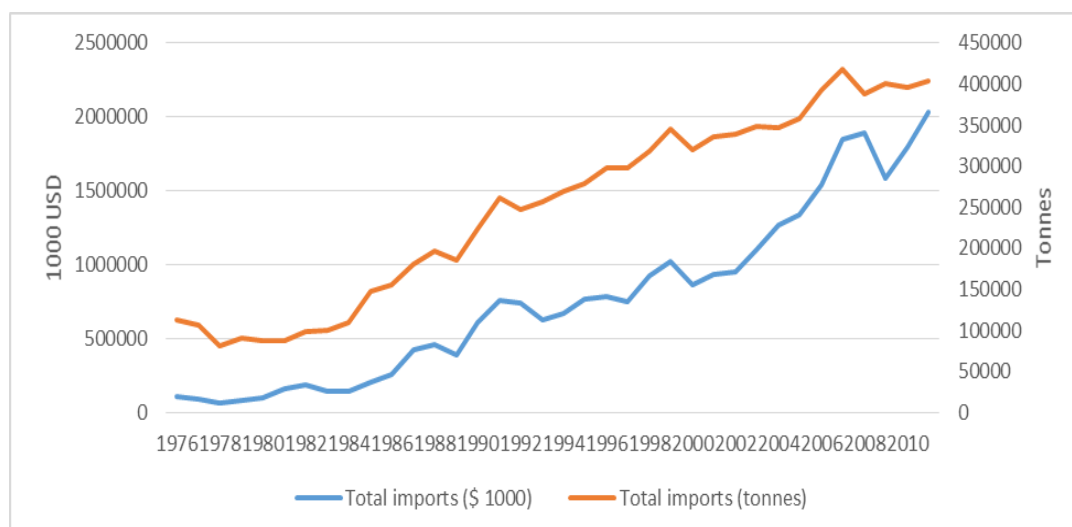
Species	Tonnes
Chub mackerel	40,477
European pilchard (=sardine)	27,752
Atlantic horse mackerel	19,210
Common octopus	11,513
Atlantic redfishes nei	9,576
Atlantic cod	9,485
Blue shark	6,915
Bigeye tuna	5,534
Atlantic mackerel	4,171
Black scabbardfish	4,116
Sum	138,749

Source: FAO (2015)

The entry to the EEC and the limitations on distant water fishing led to a change in the Portuguese fleet structure. The distant water fleet practically disappeared, while local and coastal fleets, despite being reduced drastically, had the opportunity to renew themselves.

Aquaculture in Portugal is still modest but is believed to have great potential. In 1993, aquaculture production was 6,391 tonnes, but by 2012, it had reached 10,317 tonnes. A similar trend is observed in the value of production. Throughout this period, the farmed species did not change significantly and were mainly trout, sea bream, sea bass, clams, cockle, oysters, mussels and turbot. Turbot and mussels have gained importance in the last few years due to investments in production capacity. From 2008 onwards, turbot has been the most important aquaculture product reaching 4,406 tonnes in 2012 with an average price of €4.62/kg. Clams were also very important with 2,394 tonnes in 2012 with a price of €8.45/kg.

Although there were substantial variations from year to year, import volume was on an upward trend from 1976 to 2011. Quantities grew from 113,500 tonnes in 1976 to 403,900 tonnes in 2011 – corresponding to an average increase of 3.7% per year (figure 1). The corresponding import value also increased significantly – from \$110 million in 1976 to \$2,030 million in 2011, an average annual growth of 8.7%.



Source: FAO (2015)

Figure 1: Portuguese fish imports 1961-2011. Quantity (tonnes) and monetary value (\$ '000)

In 2011, the top 10 import products accounted for 40% of imports, with the top five commodities representing 26% (table 2). It is noticeable that four of the top 10 commodities were based on cod, together amounting to 90,543 tonnes or 56% of the total (Cods nei, salted or in brine, 27,835 tonnes; Atlantic cod, frozen, 26,823 tonnes; Cod, salted & dried, 24,617 tonnes; Pacific cod, frozen, 11,268 tonnes). All four commodities experienced an increase in imports from start to end of the period (1976-2011).

Table 2: Imports of the 10 most important commodities by volume in 2011. Tonnes

Commodity	Tonnes
Cods nei, salted or in brine	27,835
Atlantic cod, frozen	26,823
Cod, salted & dried	24,617
Octopus, frozen	13,895
Jack and horse mackerels, fresh or chilled	13,436
Squids (<i>Ommastrephes sagittatus</i> , <i>Loligo spp.</i>), frozen	11,491
Shrimps and prawns, frozen, nei	11,385
Pacific cod, frozen	11,268
Marine fish, fresh or chilled, nei	10,812
Mackerels nei, frozen	10,794
Sum	162,356

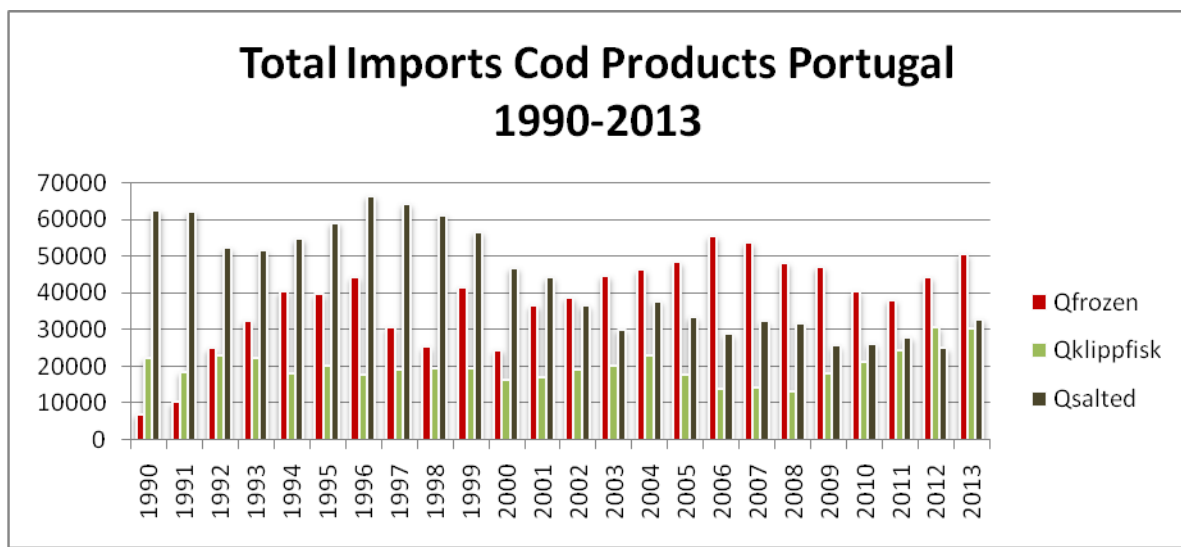
Source: FAO (2015)

Cod Imports

Data are available on imports of frozen, salted and salted & dried cod to Portugal for the period 1990-2013 (figure 2). Imports of all products show variation over time. Nevertheless,

frozen and salted & dried cod showed an increase over the period, while imports of salted cod declined. Most imported cod originates in the North Atlantic, from Norway, Iceland and Russia, but some also comes from the North Pacific.

Imports of frozen cod were only 6,880 tonnes in 1990, but subsequently increasing to quantities at about 40,000-44,000 annually between 1994 and 1996. After a decline, the quantity started increasing again and reached a peak of just over 55,000 tonnes in 2006. After a reduction in the recession years, 50,355 tonnes were recorded in 2013.



Source: Eurostat (2015)

Figure 2: Total Imports of Frozen Whole Cod to Portugal: 1990-2013

Imports of salted & dried cod varied between 16,300-22,800 tonnes annually in the period up to 2004, but without any particular trend. During the recession imports declined, reaching a nadir of 13,150 tonnes in 2008. Subsequently, imports increased to a level just over 30,000 tonnes in 2012 and 2013.

Imports of salted cod were around 62,000 tonnes in 1990-1991. After a decline, imports increased to a peak of 66,000 tonnes in 1996. Subsequently, a declining trend was observed up until 2003. Since then, there has been a lower level of imports, although with variations from year to year. In 2013, 32,700 tonnes salted cod were imported – just over half the quantity from 1990.

Thus, if we look at unprocessed (frozen) and semi-processed (salted) products, the increase in frozen product is noticeable. This indicates that more fish is now salted and dried in Portugal than in the past. It is also noticeable that imports of salted & dried cod have increased in recent years.

Over the period, salted & dried received the highest price per kg, while salted cod received a premium over the frozen product. In 2013, the real price – defined as real revenue divided by quantity - of salted & dried cod was €4.39/kg, that of salted cod €3.25/kg and that of frozen cod €1.88/kg (Asche and Gordon, 2015). The differences reflect the degree of processing.

Country of origin for different cod products also shows variation over time. For frozen cod, the most remarkable change is the Netherlands with a market share of 0.494 in 2013, up from zero in 1990. In the same period, the US share was reduced from 0.414 (1990) to 0.101 (2013) while that of Russia was reduced from 0.526 in 1995 to 0.075 in 2013. These changes are due to the role of the Netherlands as a hub in the international cod trade: cod from many countries in the North Atlantic and North Pacific is shipped to the Netherlands for further distribution to other markets. For salted & dried cod, the reduced market share of Norway from 0.427 in 1990 to 0.012 in 2013 is remarkable. This is due to the fact that products are shipped to EU member countries to reduce duty by taking advantage of duty free quotas (Bjørndal and Ellingsen, 2015). Sweden is most important in this respect, as its market share for salted & dried cod has increased from zero in 1990-1995 to 0.623 in 2013. For salted cod, Norway's market share has declined while those of the Netherlands and, in particular, Sweden has increased substantially.

In recent years, China has become an exporter to Portugal. In 2013, China exported 82 tonnes of frozen cod, 326 tonnes of salted & dried cod and 3,092 tonnes of salted cod to Portugal. China's market share for salted cod in 2013 was 9.45%, up from only 1.83% in 2005. This cod originates in the North Atlantic and/or the North Pacific and is re-exported after being salted in China.

3. THE ECONOMIC ENVIRONMENT OF THE PORTUGUESE FISH PROCESSING INDUSTRY

Several policies are in place to promote the Portuguese fish processing industry. Some of these are EU policies while others are national.

Cod is the most important fish product in the Portuguese market (table 2). Moreover, almost all cod is imported mainly from North Atlantic countries but some cod also originates in the North Pacific. For this reason, it is of interest to look at duty on cod exports to the EU, including Portugal, originating in different countries as well as duty free quotas. The rates for Most Favoured Nations (MFNs) apply to all members of the World Trade Organisation

(WTO) and are intended to ensure non-discrimination. General Agreement on Tariffs and Trade (GATT) quotas also apply to all members of the WTO.

For Norway, there is no duty on exports of frozen, salted and salted & dried fillet of cod, while there is a 0.9% duty on frozen cod fillets once total exports exceed the duty free quota. For Norwegian exporters, duty free exports can be achieved in two ways. One is through the 'compensation' quota, which applies to Norway only. The other is through the autonomous quota, but in this case the frozen fillet of *Gadus morhua* (Atlantic cod) or *G. macrocephalus* (Pacific cod), must be destined for processing in the EU by an importer who has an end-use licence.

For salted & dried cod, the duty is 3.9% once exports exceed 25,000 tonnes. The GATT quota in question applies to cod of the species *Gadus morhua*, *G. ogac* (Greenland cod) and *Boreogadus saida* (Arctic cod). This means that at the margin, the duty is 3.9%. It is noticeable that the duty is higher on processed products (salted & dried) than on less processed products. This is due to the EU policy of protecting and promoting their processing industry.

As for other countries, Iceland faces the same duties as Norway, except for an exemption on frozen cod fillets. Canada and Russia, on the other hand, in general face the duties for MFNs with 12% for frozen cod, 13% for salted cod and salted & dried cod; however, Russia pays only 8.5% for frozen cod. Thus, these two countries face considerably higher duties than Norway and Iceland.

Under the Comprehensive Economic and Trade **Agreement (CETA)** between the EU and Canada, Canadian products will enjoy preferential access to the EU once the agreement is implemented. This agreement will benefit the salted & dried fish industry in Canada. After CETA is in force, almost 96 percent of EU tariff lines for fish and seafood will be duty-free. After some years, 100 percent of these tariff lines will be duty-free, making Canadian products more competitive.¹

Bjørndal and Ellingsen (2015) studied the *effective protection* of processing of salted & dried cod in Portugal based on raw fish imported from Norway. Under reasonable assumptions they found that effective protection can be more than 20%.

Fish processing is considered a labour intensive industry. For this reason, labour market conditions and labour costs are important. In 2012, average wage costs including social costs for one man-year in the fish processing industry in Portugal were €12,000 (Döring

¹http://www.geraldkeddy.ca/media/CETA%20Backgrounder_Nova%20Scotia.pdf

and Borrello, 2014). Norway is the main supplier of salted & dried cod to Portugal, but also exports frozen or salted cod for processing in Portugal. The annual minimum salary for a Norwegian production worker in 2015 is about €34,000, excluding social costs² (Arbeidstilsynet, 2015).

The European Union offers investment funds to promote growth and job based recovery in Europe. The investment funds offered by the EU represent subsidies directed at industries such as fish processing in member countries. In Portugal, the national framework of support to the fisheries sector is given by the Operational Programme of Fisheries 2014-2020 (PROMAR), under the European Fisheries Fund (FEP). These are subsidies for financing the systems and equipment necessary for the processing, handling, storage, packaging, final storage, marketing, and traceability of salted & dried fish products.

The funds are given in the form of non-refundable or refundable subsidies. The public support for investment projects with a value under €100,000 is in the form of a non-repayable grant. Support for investment in projects with a value in the range €100,000 - €2.5 million is in the form of a non-repayable grant of 80% of its value and a repayable grant for the remaining 20%. Support for projects of €2.5 million or more is provided in the form of a non-repayable grant for 40% of its total value and with a repayable subsidy for the remainder. The maximum value of a non-repayable grant is €4.2 million and the total value for public support is €6 million per project.

The refundable subsidy takes the form of a loan with a zero interest rate, which is repayable over six years, counted from the date of payment of the last portion of the subsidy. The refundable subsidy is converted into a repayable grant by half the amount, if approved and if the planned targets specified in each contract are achieved by the end of the free period.³

The 10 biggest non-refundable grants to support salted & dried fish production in Portugal amount to €16 million. Up until 2013, a total of 81 projects had been supported.

The Portuguese government also supports investments through the Investment Tax Code and Portugal2020 (AICEP, 2015) to encourage investment projects with a positive impact on innovation and job creation. Eligible expenses can be machines, equipment and buildings, as well as intangibles such as software and technology transfer. However, it only applies to projects with eligible expenses of €3 million or more. Recipients can be granted a

²Based on salary group 1, fish processing industry, production work: the minimum wage at 37.5 hours per week is NOK 162.85 per hour.

³http://www.promar.gov.pt/Download/EIXOS/EIXO2/Medida2/Port_424_C.pdf

corporate income tax credit of 10 - 25% of the eligible investment. Other tax benefits such as exemption from municipal property tax, municipal tax and stamp tax transactions can be granted up to a 10-year period after the conclusion of the investment.

Investments in new products, services, production methods or processes may also receive financial incentives in the form of a loan where 35% of eligible expenses constitute an interest-free loan with an eight years repayment period and a loan conversion of up to 50% (cash grant) of the incentive depending on the performance of the project. Financial grants combined with tax incentives applied to the same expenses may not exceed 25% of the eligible investment (tax credit + cash grant + loan interest saving).

Bjørndal and Ellingsen (2015) show that the Portuguese fish processing industry has advantages also in other areas such as export finance and support of research & development compared to competitors such as Norway, Iceland and the Faroe Islands.

In the framework of the Anti-Crisis Measures adopted by Portugal, SMEs' access to export finance has been a major priority for the government (OECD, 2015). In this context, 12 'SME Invest and SME Growth' credit lines have been launched to facilitate SME access to credit. These credit lines, with a total bank credit of €12.2 billion, have long-term maturities (up to 7 years) and preferential conditions, namely, partially subsidised interest rates and risk sharing public guarantees, which cover 50 - 75% of the loan. These credit lines aim to support the financing of fixed investments and SME working capital.

State guaranteed products managed by COSEC⁴, the Portuguese Credit Insurance Company, cover the risks associated with export and investment, especially to politically risky countries. COSEC acts as an export credit agency (ECA) and provides, on behalf of the Portuguese State, insurance cover for the transactions applied by Portuguese exporters. The guarantees cover up to 98%, with a minimum credit of €20,000 (Bjørndal and Ellingsen, 2015).

Investments in the research and development (R&D) of new products, services or new production methods and processes are supported by the Government through financial incentives, *Portugal2020* and tax incentives, *SIFIDE II* (AICEP, 2015). Financial incentives are distributed in the form of a base rate covering 25% of eligible expenses⁵; bonuses of up to 60 percentage points according to project scope and company size; cash grants of up to €1 million of incentives; and for an incentive amount that exceeds €1 million, 25% can be given

⁴<http://www.cosec.pt/index.php?id=1>

⁵Eligible expenses are costs of technical staff dedicated to R&D activities; acquisition of services from third parties, including technical and scientific assistance and consulting; purchase of scientific and technical instruments and equipment; as well as costs associated with patent registration and acquisition.

as an interest free loan and 75% as a cash grant. A Corporate Income Tax Credit (deduction) is given at a base rate of 32.5% of expenses incurred in that period and an incremental rate of 50% of the increase in expenses incurred during that period compared to the average from the previous two fiscal years, of up to €1.5 million.

In summary, Portugal is becoming an increasingly attractive destination for investment and industry growth, offering competitive grants and incentives for R & D – reinforced by Portugal2020: a more competitive tax regime with the reform of corporate income tax in 2014 and a sustained public effort to maintain SME access to finance. Moreover, labour costs are competitive, and fish processing is protected by duty on exports from other countries with fairly high effective protection of processing of salted & dried cod in Portugal.

4. FISH PROCESSING IN PORTUGAL

Various data series are available when it comes to the development of the fish processing industry. However, there are changes in data series and variables over time. Moreover, while some time series go back to 1969, others are much more recent.

The annual turnover - domestic sales plus exports - of the Portuguese fish processing industry increased from €740 million in 2002-2003 to €988 million in 2007 and €1,091 million in 2008 when it levelled off, with €1,078 million recorded in 2012 (appendix, table A1). The total quantity produced was 127,000 tonnes in 2000, increasing to 212,000 tonnes in 2009 – when it levelled off except for a small dip in 2011. Cost data are available only from 2008. Profits, defined as turnover minus total production costs, declined from €425 million in 2008 to €342 million in 2012. The levelling off in turnover and the reduction in profits is presumably due to the recent recession.

The gross value added, defined as turnover + other income - energy costs - purchase of fish and other raw material for production - other operational costs, increased from €449 million in 2009 to about €510 million in 2010-2011, before declining to €421.6 million in 2012. Capital productivity, calculated as gross value added divided by the total value of capital assets, varied between 43.2 – 50.2% over the period (appendix, table A1).

The outputs of the fish processing industry are composed of three main product forms: frozen⁶, salted & dried and canned products. In 2012, frozen production was 106,000 tonnes, salted & dried 61,000 tonnes and canned 45,000 tonnes. The different sectors will be analysed in more detail below.

⁶The frozen products include aquatic invertebrates (squid, cuttlefish, octopus, clams, cockles and others), hake, fish fillets sardine, cod and redfish.

The number of firms in the industry declined from 134 in 1996 to 94 in 2003 (table 3). Subsequently it increased to a peak of 211 in 2008, before it went down to 180 in 2012. The trend in the total number of employees is similar with a peak of 7,314 in 2011, down to 6,823 in 2012 when females represented 68% of the workforce (Döring and Borrello, 2014). The decrease in the last three years examined can be explained by the recent economic crisis.

Table 3: Number of Firms and Employees in the Fishing Processing Industry in Portugal

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004
No of Firms	134	135	111	115	104	n.a.	95	94	143
No of employees	6,570	5,553	5,893	5,823	5,469	n.a.	5,627	5,429	5,854

Year	2005	2006	2007	2008	2009	2010	2011	2012
No of Firms	150	166	187	211	202	194	185	180
No of employees	6,149	6,149	6,685	6,668	6,815	7,277	7,314	6,823

Source: INE (2015)

n.a.=not available

As shown in table 4, the industry is comprised mainly of small firms with less than 10 employees. In fact, in 2012 Portugal had only four firms with more than 250 employees and 43 firms with more than 50 employees, against 137 firms with fewer than 50 employees.

Table 4. Overview over the Portuguese processing industry

	2008	2009	2010	2011	2012	Δ 2011-12	Δ 2008-12
STRUCTURE							
Company	213	202	194	185	180	-3%	-15%
≤ 10 employees	111	99	91	82	91	11%	-18%
11-49 employees	57	62	59	58	46	-21%	-19%
50-249 employees	43	37	41	41	39	-5%	-9%
≥ 250 employees	2	4	3	4	4	0%	100%

Source: Döring and Borrello (2014)

The period 1969-2012

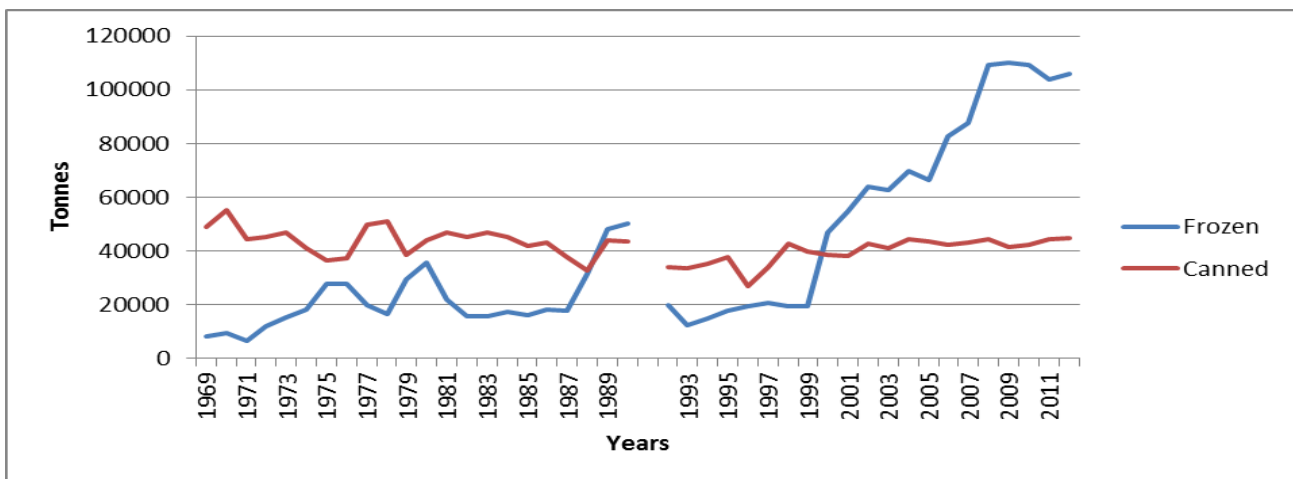
Data for some variables are available from 1969 onwards⁷. Up to 1990, only quantities are available for canned and frozen products, while only the value is available for salted & dried.

In 1969, frozen production was 8,118 tonnes (see figure 3). Becoming part of the European Economic Community in 1986 gave a boost to this production, which increased

⁷During this period, there are missing values for the year 1991, due to a change in the series calculation carried out by INE.

from 17,981 tonnes in 1987 to 31,344 tonnes in 1988. In 1990, the frozen production was 50,305 tonnes, whereas in 1992 it dropped to 19,976 tonnes and remained at roughly this level for the rest of the decade. This occurred when European economies became weaker and Portugal experienced an unstable period. From 1999 and onwards, the quantities have increased significantly. In 2009, production was 109,953 tonnes followed by a slight decrease, which can be explained by the financial crisis. In 2012, a quantity of 105,892 tonnes was recorded. The share of cod in frozen production increased from 4% in 2000 to 30% in 2011, down to 26% in 2012.

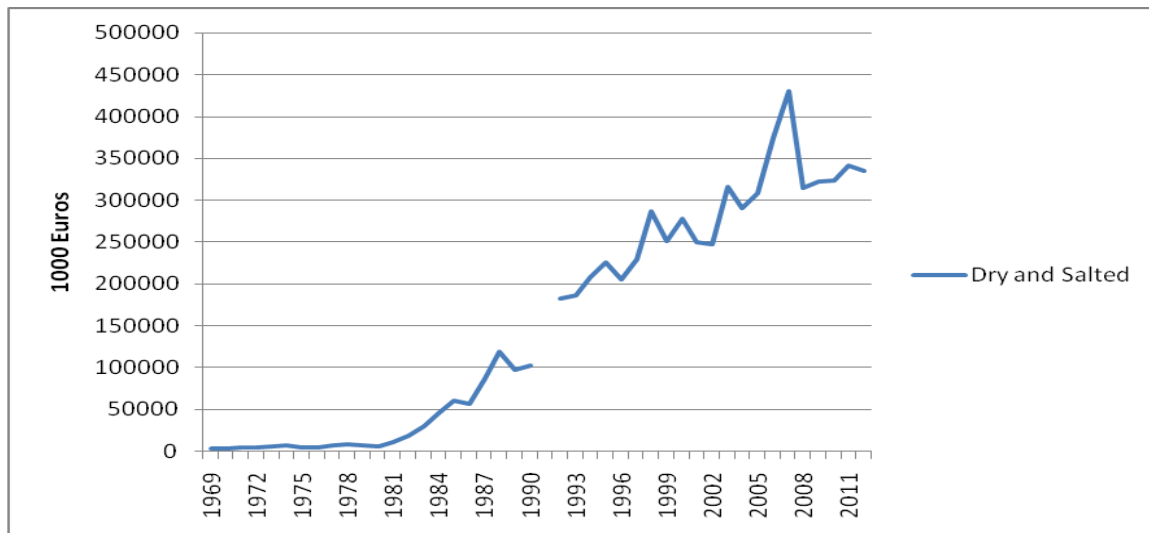
Canned production was around 50,000 tonnes in 1969. In 1990, it was 43,767 tonnes and dropped to 33,943 tonnes in 1992. Again, the weakening of the European economies and the instability in Portugal can explain this reduction. In 1996, the production reached the lowest level observed at 26,886 tonnes before subsequently increasing to 44,700 tonnes in 2012, about 10% less than in 1969.



Source: INE (2015)

Figure 3: Produced frozen and canned quantities in the fish processing industry: 1969-2012

In 1969, the value of salted & dried production was €2.852 million and remained very low until 1981 (figure 4). From this year on, there was a substantial increase, reaching its peak value of €430.3 million in 2007 followed by a decrease to €314.3 million in 2008. Subsequently, the production stayed at lower than peak-levels, with €335.5 million recorded in 2012. Cod represented more than 80% of salted & dried production.



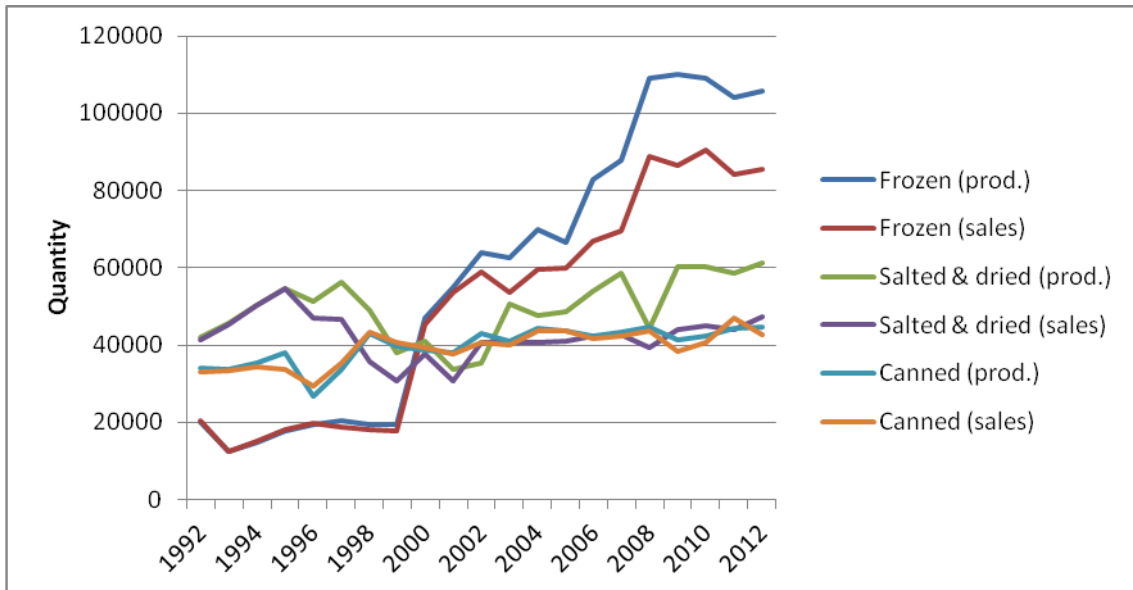
Source: INE (2015)

Figure 4: Value of Produced salted & dried quantities in the Fishing Processing Industry: 1969-2012. Monetary values

The 1992-2012 period

From 1992, more detailed data became available. Figure 5 gives annual production for frozen, salted & dried and canned products. Until 2000, salted & dried was the most important product form. In 1997, quantities produced were 56,295 tonnes against 20,551 tonnes for frozen production and 33,807 for canned production. However, since 2000, frozen has been the most important product form in terms of quantity. Throughout the period, the production of canned products has been fairly stable. In 2012, the quantity of frozen production was 105,892 tonnes, while salted & dried production was 61,411 tonnes and canned was 44,700 tonnes.

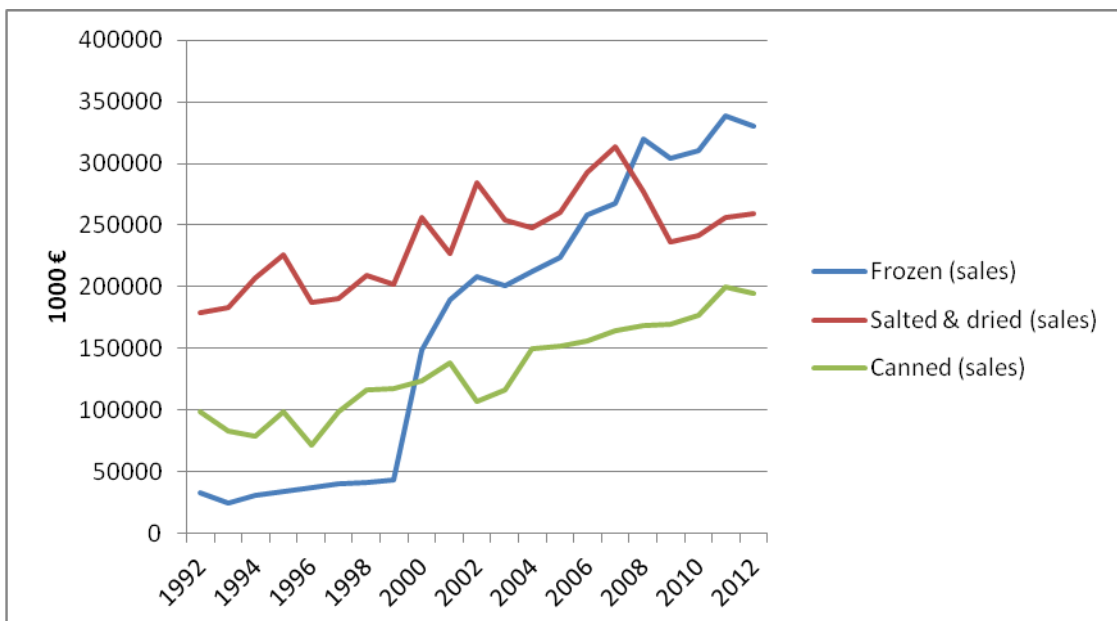
The difference between production and sales represents exports: in 2012, 62% of the overall production was for the domestic market, while 38% was exported (exports will be analysed in more detail below). Annual domestic sales of frozen products were slightly less than 20,000 tonnes up to 1999; subsequently increasing to 88,761 tonnes in 2008, before falling to 85,601 tonnes in 2012. Again, the crisis affected the sales negatively. The trends for salted & dried products as well as canned products were similar from 2001. In 2012, the quantities sold for salted & dried was 47,406 tonnes and for canned it was 42,808 tonnes.



Source: INE (2015)

Figure 5: Produced and sold products – frozen, salted & dried and canned 1992-2012. Tonnes

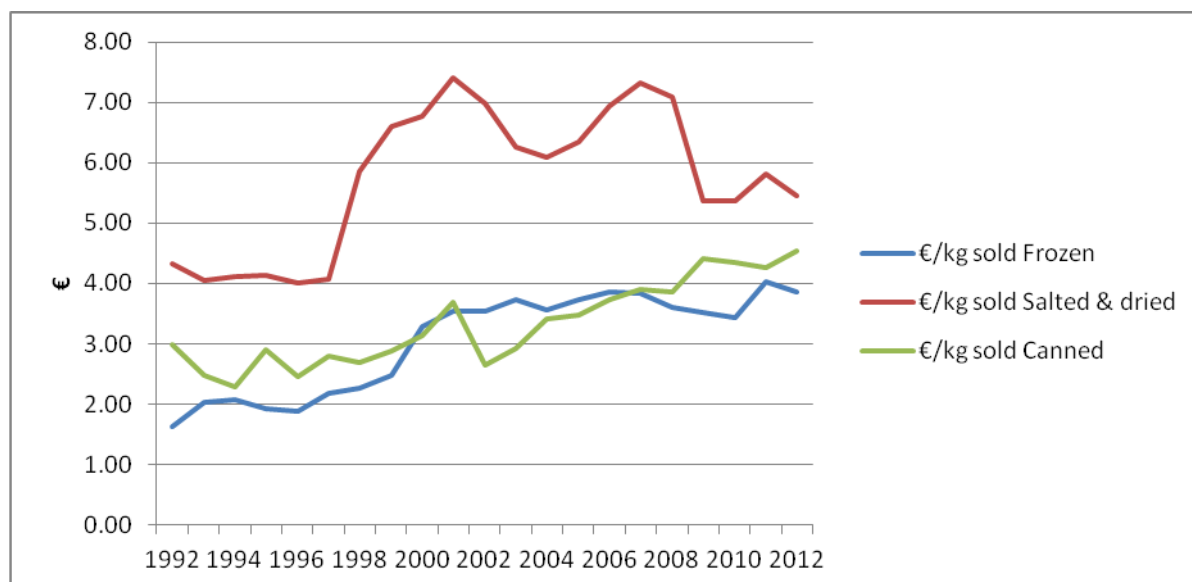
Value of sales is given in figure 6. Until 2006, the value of sales for salted & dried was the highest of the three product forms. In 2012, the value of sales was €330 million for frozen products, €259 million for salted & dried products and €194.7 million for canned products.



Source: INE (2015)

Figure 6: Value of sales from the processing industry. 1992-2012. € '000

The average sales price of salted & dried products is higher than that of frozen and canned products, although the prices of the latter two have shown an increasing trend over the period of study (figure 7). The difference in prices reflect the fact that salted & dried products are more processed than the other two product forms. In 2012, the price per kg was €5.46 for salted & dried, €4.55 for canned and €3.85 for frozen products.



Source: INE (2015)

Figure 7: Average sales prices 1992-2012. €/kg

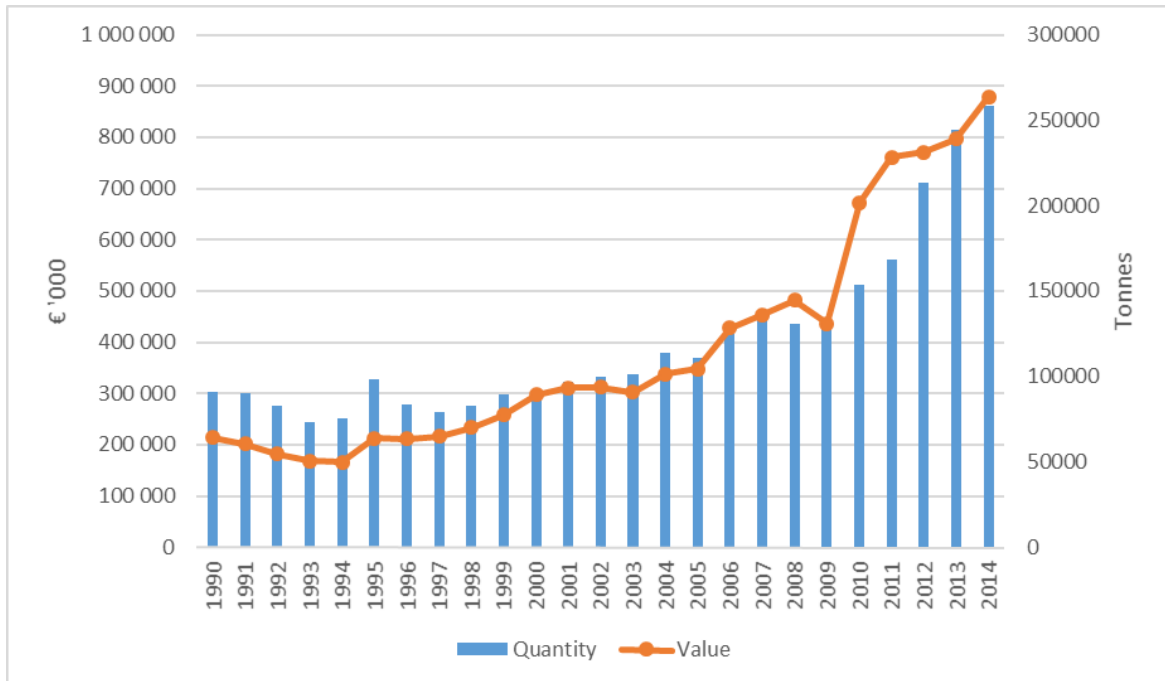
Summary

Overall, the Portuguese fish processing industry has gained importance over the last few decades. Total production increased from 127,000 tonnes in 2000 to 212,000 tonnes in 2012, while turnover increased from €740 million in 2002 to €1,078 million in 2012. Expansion has been particularly important for frozen and salted & dried production, which have experienced major increases over time. Canned production on the other hand has been more stable. It should be noted that the canned industry was already important during the dictatorship as it employed a significant number of the illiterate population at that time.

5. FISH EXPORTS FROM PORTUGAL

From 1990-2014, Portuguese exports were characterised by substantial growth (figure 8). From 1990-98, quantities were quite stable at around 90,000 tonnes, followed by a slow growth from 1999 to 2009. From 154,667 tonnes in 2010, export quantities reached 258,223 tonnes in 2014 - an increase of 68%. In terms of value, exports varied from €166 million to

€213 million during the first half of the 1990s. This was followed by a slow growing trend, increasing from €213 million in 1995 to €482 million in 2008. After a correction in 2009, a rapid increase occurred – and in 2014, export value amounted to €879 million, the highest value recorded.



Source: NSC (2015)

Figure 8: Portuguese fish exports. Quantity (tonnes) and value (€ '000). 1990-2014

In 1990, the 10 most important species accounted for 86% of the total value; sardine, cod and seabream alone represented 56%. In contrast, the three most exported species in 2014; ink fish, cod and sardine accounted for only 38%, while the top 10 species accounted for 75% of export value. Thus, the mix of species exported has become more diversified over time.

Ink fish exports has increased considerably, from €5.4 million in 1990 to €140.5 million in 2014. The three major importers were Spain, the United States and Italy, together accounting for 90% of the export value (74%, 9% and 7%, respectively).

Cod exports also showed a considerable increase (particularly in terms of value), from 17,793 tonnes valued at €36.8 million in 1990 to 23,328 tonnes valued at €121.5 million in 2014, indicating an increase in price over time. The three major markets were Brazil, Angola and France, accounting for 77% of the total value exported (51% to Brazil and 13% each to Angola and France).

Exports of salted & dried cod experienced an increase in the period – from €9.1 million in 1990 (25% of all cod exports) to €59.7 million (49% of all cod exports) in 2014, down from a peak of €75 million (80% of cod exports) in 2007. Exports of salted & dried cod are examined in more detail below.

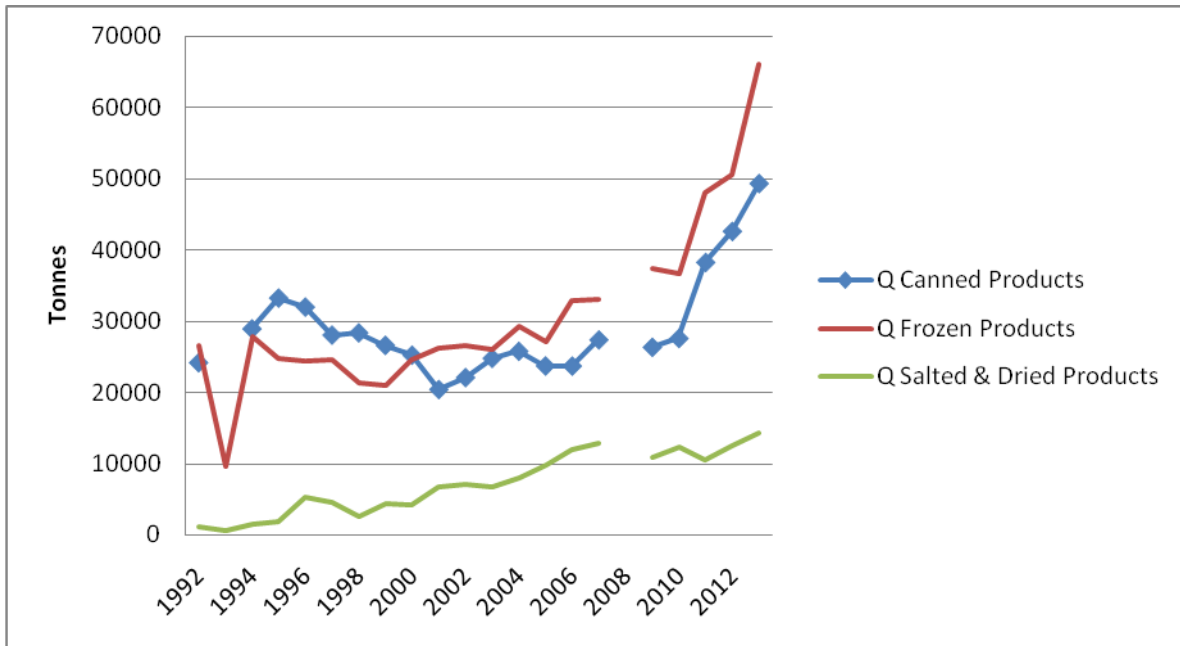
Frozen cod exports also exhibited an increase in terms of value – from €26.9 million in 1990 to €55.7 million in 2014. However, in terms of value relative to total cod export value, the opposite development was seen: from a share of 73% in 1990, bottoming out at 18% between 2005 and 2007 and then increasing to 46% in 2014.

The overall development for sardine exports was an increase from €51 million in 1990 to €72 million in 2014. The three major importers were France (30%), the United Kingdom (21%) and Spain (12%), accounting for a combined 63%.

Export evolution for processed products

Figure 9 shows the quantities of canned, frozen and salted & dried products that were exported from 1992 to 2014⁸. It is clear that, until 2000, canned was the most important export commodity with very modest exports of salted & dried. Subsequently, frozen products became the most exported product form and still is. From 2005 on, there is an increase in exports of all three product forms, especially for canned and frozen. In 1992 frozen products export was 26,529 tonnes, in 2000 24,518 tonnes, increasing to 65,972 tonnes in 2014. Canned products export was 24,223 tonnes in 1992, increasing to 25,269 tonnes in 2000 and 49,253 tonnes in 2014. Salted & dried products exports (which are mainly cod) have increased from 1,138 tonnes in 1992 to 4,112 tonnes in 2000 and to more than 15,000 tonnes in 2014.

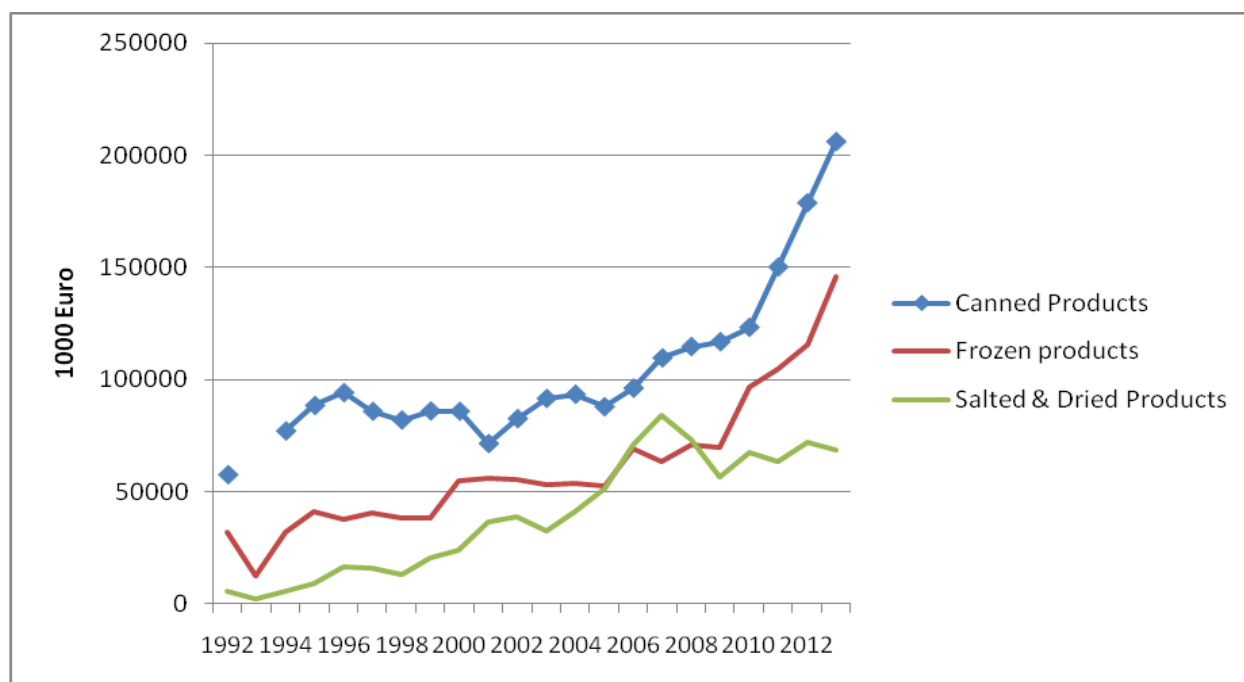
⁸Data for canned for 1993 and for all product forms for 2008 are not available.



Source: INE (2015)

Figure 9: Exports quantities of canned, frozen and salted & dried products. Tonnes

Figure 10 shows the nominal value of exports for the processed products. It is clear that canned products represent the highest share of these exports throughout the period under analysis, mainly due to its high price per kg. The value increased from €58 million in 1992, to €86 million in 2000 and finally to €206 million in 2014. The value for frozen products was €32 million in 1992, €55 million in 2000 and reached €146 million in 2014. Exports for salted & dried products increased from €5 million in 1992, to €24 million in 2000 and to more than €69 million in 2014. Since 2010 there has been a significant increase in the export value for frozen and canned, whereas salted & dried stabilized in recent years.

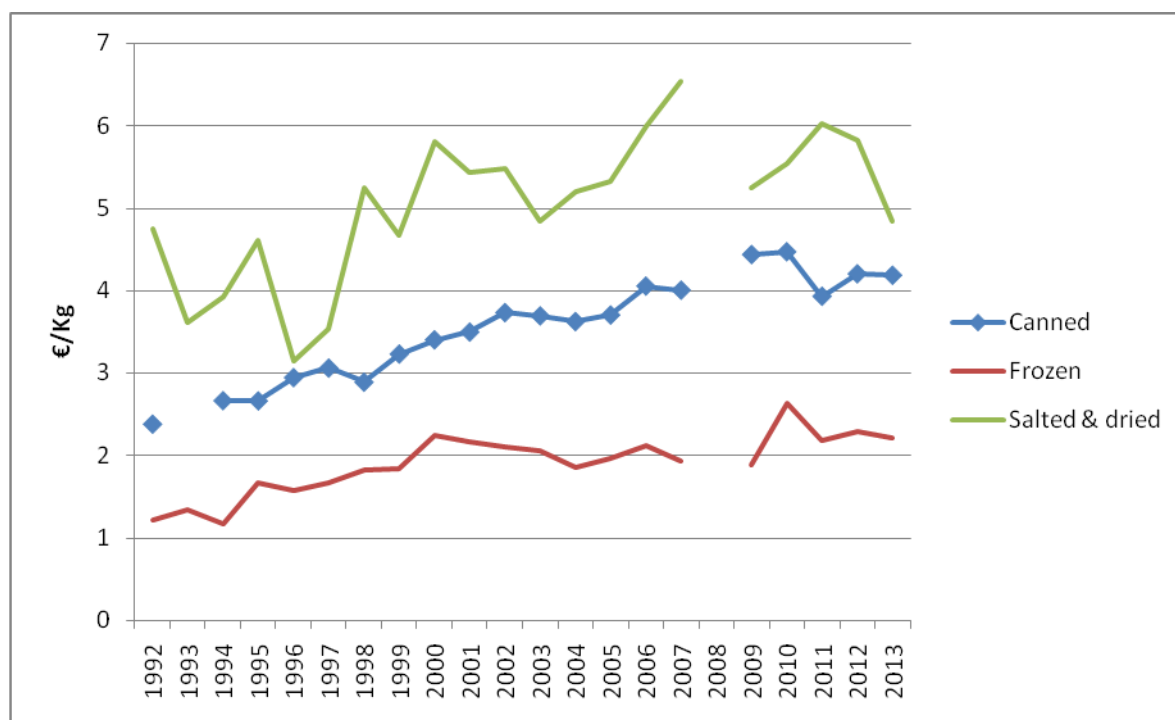


Source: INE (2015)

Figure 10: Export value (1000 euro) of canned, frozen and salted & dried products

Figure 11 shows nominal export prices per kg for processed products. The highest price is for salted & dried products followed by canned and frozen products. Although there are substantial variations from year to year, there has been an upward trend in prices of canned and salted & dried products over the period of analysis, while frozen prices have more or less levelled off since 2000. Canned product price was €2.40 in 1992 and increased to €3.40 in 2000 and to €4.20 in 2014. The price for salted & dried products was €4.70 in 1992, increased to €5.80 in 2000, attained a peak in 2007 with €6.50 and decreased to €4.80 in 2014 to. Frozen product price was €1.20 in 1992, increasing to €2.20 in 2000 and with the same price observed for 2014. Compared with the sales prices per kg in figure 7, we can see several similarities. Salted & dried products have the highest price both in domestic and external markets. In 2012⁹ the price in the external market was €5.80 and in the domestic market €5.40. Canned products had, in 2012, an average price per kg of €4.20 in the external market and of €4.60 in the domestic market. Frozen products had the lowest price both in the domestic market and in the external market. In 2012 the domestic price was €3.90 while it was €2.20 in the external market. It is interesting to note that for canned and frozen products higher prices are fetched in the domestic market than for exports.

⁹Data available for the domestic market are only available until 2012.



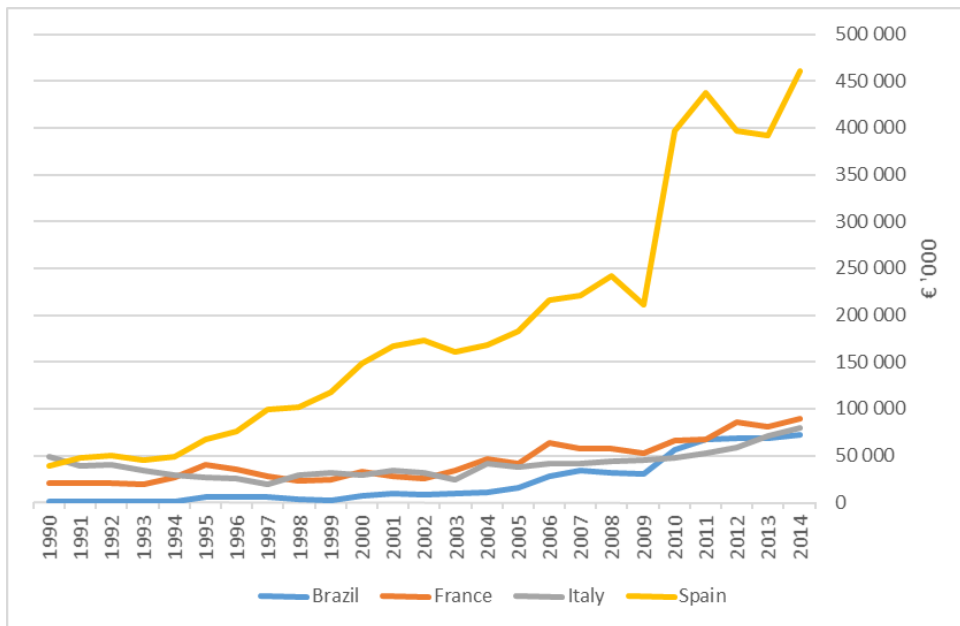
Source: INE (2015)

Figure 11: Export Prices for canned, frozen and salted & dried products. €/kg

Main export markets

In terms of quantities, the four major export markets - Spain, France, Italy and Brazil - accounted for 83% of the total volume in 2014 (figure 12). Spain dramatically increased its importance over the period – in relative as well as absolute terms – with an export share increasing from 22% in 1990 to 65% in 2014¹⁰. Meanwhile, the export share of Brazil increased from 1% to 5%, while the relative importance of France and Italy decreased.

¹⁰Some of this may be re-exports, i.e., fish imported to Portugal but then re-exported to Spain without any further processing. It has been impossible to verify how important this trade is.



Source: NSC (2015)

Figure 12: Total export value (€ '000) to the four major markets: Spain, France, Italy and Brazil, 1990-2014

Export quantities to Spain increased considerably throughout the period. In 2014, exports reached 168,262 tonnes valued at €89.8 million, up from 20,023 tonnes at a value of €20.7 million in 1990. In terms of value, the three most important species exported to Spain in 2014 were ink fish, prawns and swordfish, together accounting for 43% of the total value.

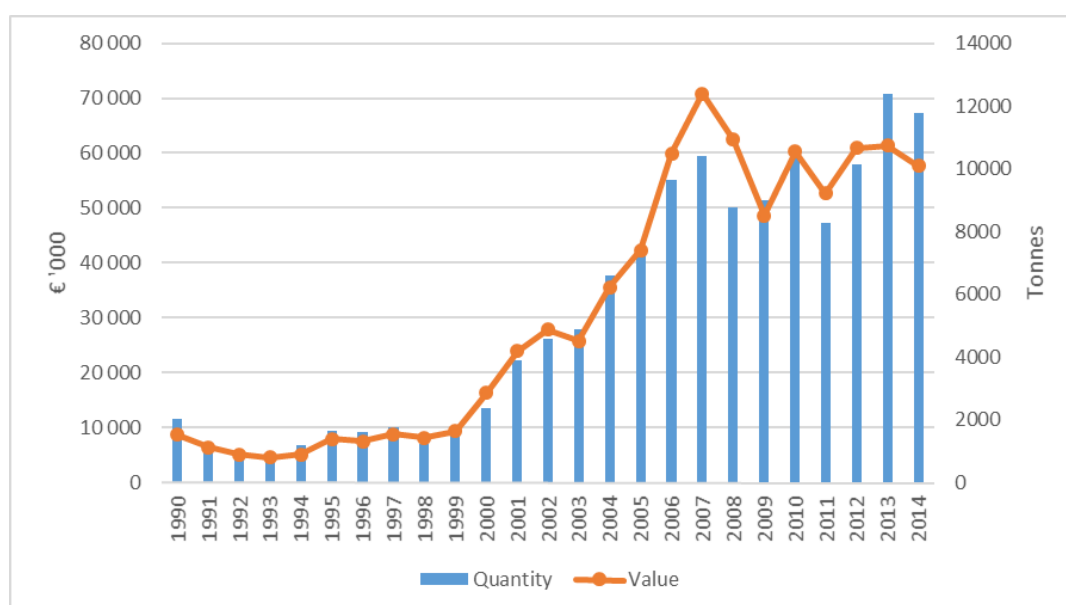
Portuguese exports to France experienced an overall increase from 8,500 tonnes in 1990, worth €20.7 million, to more than 19,000 tonnes in 2014, worth €89.8 million. The three most important species were mackerel, sardine and cod. Combined, they accounted for 70% of total export value.

Export quantities to the Italian market increased from 9,275 tonnes valued at €48.5 million in 1990 to 14,730 tonnes valued at €79.9 million in 2014. The three most important species were other tuna/bonito, mackerel and ink fish, together accounting for 42% of the total value.

Portuguese exports to the Brazilian market increased from 526 tonnes valued at €20.7 million in 1990 to 13,141 tonnes worth €89.8 million in 2014. The three most important species in 2014 were cod, 'other fish' and saithe, together accounting for 93% of the total value – whereof 86% came from cod.

Exports of salted & dried cod

The main product of the salting and drying industry is salted & dried cod¹¹. Exports exhibited considerable growth from 2,016 tonnes in 1990 to 11,777 tonnes in 2014 (figure 13). Export value in the same period increased from €8.7 million in 1990, through a peak of €70.8 million in 2007 and down to €57.6 million in 2014. The development in export value seemed to follow the development in quantity up to 2006. Between 2006 and 2008, export value increased more than the related increase in quantities, indicating that higher prices were achieved. However, after a drop in 2009 the value flattened out again, and the growth in quantity exceeded the related development in export value, indicating an exacerbation of average prices.



Source: NSC (2015)

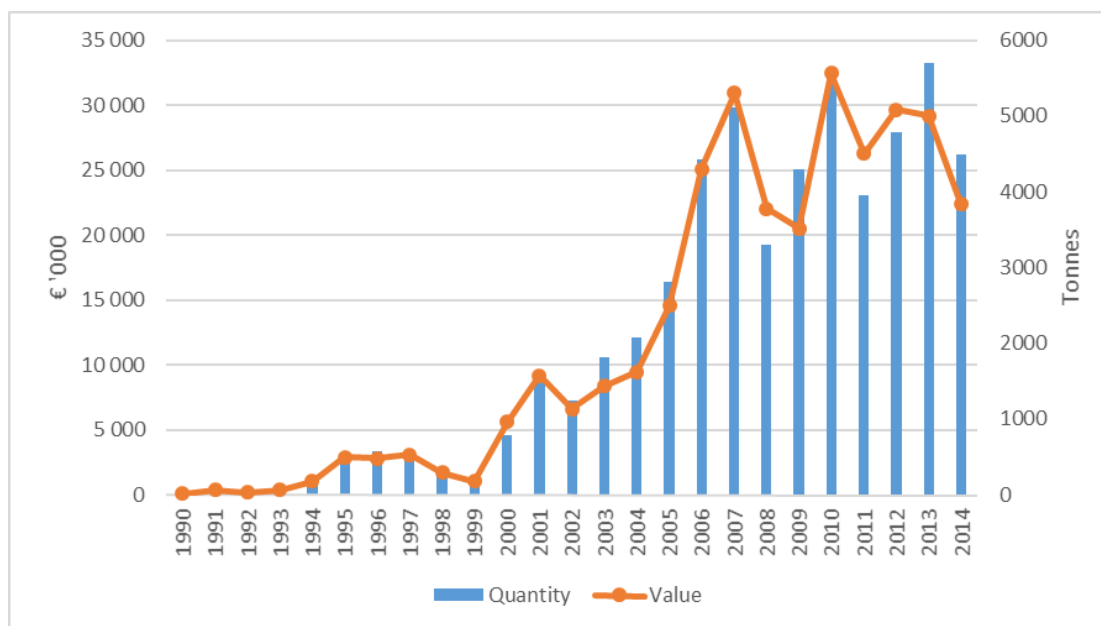
Figure 13: Portuguese exports of salted & dried cod, quantity (tonnes) and value (€ '000), 1990-2014

The most important markets for Portuguese salted & dried cod are Brazil, France and Angola. The importance of these markets has been increasing throughout the period. Their combined share increased from 35% in 1990 to 78% in 2014 (38% for Brazil and 20% each for France and Angola, respectively).

From 1990 to 2014, exports of salted & dried cod to Brazil increased from 50 tonnes to almost 4,500 tonnes (figure 14). The quantities exported were insignificant until 1994,

¹¹In addition to cod, the following analysis covers salted, salted & dried and dried fish from other species and other gadoids.

followed by a slow growth from 1994-2000. A rapid expansion took place in the period 2000-2007, before it levelled off at about 4,000-5,000 tonnes annually from 2007 to 2014. As illustrated in figure 14, the development in export value mostly followed the development in export quantities without major deviations. In recent years, values have varied considerably year on year with a peak of €32.5 million in 2010, down to €22.4 million in 2014.



Source: NSC (2015)

Figure 14: Portuguese exports of salted & dried products from 1990-2014 to Brazil

Portuguese exports of salted & dried cod to France have gone from less than 200 tonnes in 1990 to more than 2,400 tonnes at a value of €11.3 million in 2014. The growth in value has exceeded the related growth in quantity, indicating higher prices achieved or higher valued products exported to the market.

Exports to Angola increased from 476 tonnes worth €3.2 million in 1990 to 2,361 tonnes worth €11 million in 2014. In the last decade or so, Angola has experienced high growth rates. However, as the economy is highly reliant on oil, the recent reduction in the oil price has had an impact on the economy including imports.

Aggregate quantities for the 1990-2014 period show that salted & dried cod - 'cod, klipfish, not fillet/offals' - was the most imported product in all three countries. However, some differences existed in consumption patterns. Compared to Angola and France, the Brazilian market imported a larger share of salted & dried products from other fish species (i.e., not cod) over the period.

Table 5: Salted and dried cod – main products exported. Q = quantity and V = value shares

	Brazil		France		Angola	
Cod, klipfish, not fillet/offals	Q	79%	Q	95%	Q	91%
	V	88%	V	96%	V	93%
Other fish, dried/dried & salted, not fillet Other fish, dried/dried & salted, not fillet/offals	Q	21%	Q	4%	Q	6%
	V	12%	V	3%	V	3%

Source: NSC (2015)

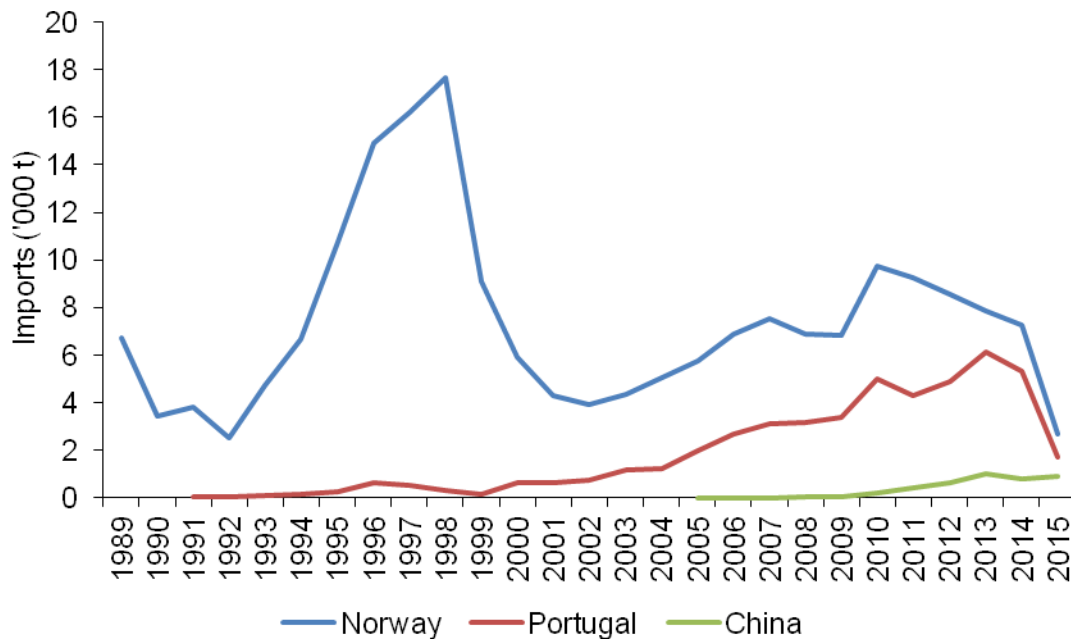
The average export price for Portuguese salted & dried cod increased from €4.30/kg in 1990 to €4.90/kg in 2014. In 1990, the average prices were €4.30 for total exports, €2.00 to Brazil, €3.80 to France and €6.80 to Angola. In 2014, prices were €5.00 to Brazil and €4.70 to both Angola and France. Thus, a notable convergence in prices occurred.

Salted & dried cod in the Brazilian market

Cod is one of the main fish products imported to Brazil. There are several types of imported cod products – with salted & dried cod being the most common, followed by dried cod, salted cod and less often smoked cod. In Brazil, salted & dried cod is consumed mainly by higher income consumers, due to its high unit value. The total annual imported quantity from 1989 to 2015 (Oct) was on average 9,360 tonnes (MDIC, 2015). The main exporters to Brazil are Norway, Portugal and China (MDIC, 2015); the latter being a recent exporter of this product to Brazil (figure 15). In 1989-90, Norway was the only supplier. Portugal entered the market in 1991, but initially with very small quantities.

Imports from Norway increased significantly from 6,000 tonnes in 1989 to 17,000 tonnes in 1998, but dropped to 4,000 in 2002. Since then, Norwegian imports increased to approximately 7,000 tonnes in 2014. The reason for the import pattern between 1992 and 2002 may be related to the Brazilian economic stabilisation, the increase in purchasing power, and the favourable exchange rate. Moreover, the years with high import volumes are also the years with a fixed exchange rate in the country. This stimulated the consumption of salted & dried cod, as the product became cheaper for Brazilian consumers. However, in the following years when the exchange rate was allowed to vary, there was a reduction in consumption and a subsequent devaluation of the currency. The opposite was observed during the periods when the Brazilian currency was revalued. In recent years, there was a reduction in the volume of salted & dried cod imported, which may be explained by the unfavourable exchange rate.

However, these imports are higher than the overall average for the period (9,360 tonnes); in 2014, the Brazilian imports of salted & dried cod were 12,610 tonnes.



Source: MDIC (2015)

Figure 15. Brazilian imports of salted & dried cod from Norway, Portugal and China (tonnes), 1989-2015 (Oct)

While Norway has been losing share over time, Portugal increased its share from 10% in 2000 to 40-41% in 2013-2014. China entered the market in 2010 and reached a market share of 7% in 2013, down to 6% in 2014. These developments may be related to the opening of the Brazilian market and the shift to a floating exchange rate in this period (Neto *et al.*, 2016).

During the whole period, the Norwegian prices were higher than the Portuguese prices, apart from the period 1997 to 1999. The annual average import price of salted & dried cod from Norway and Portugal was \$8.00 and \$7.50 per kg, respectively, for the whole period studied. After 2002, when the imports turned to an upward trend again, the import prices from Norway and Portugal also increased to \$8.60 and \$8.00 per kg, respectively. Since 2008, both Norwegian and Portuguese prices have had to compete with Chinese prices, which are usually lower than the other prices at an average of \$5.60 per kg.

6. DISCUSSION

Portugal has the highest per capita expenditure for fish in the EU at about €260 in 2012, and with an annual apparent consumption of 62 kg/capita in 2007/2009 (Bjørndal *et al.*, 2015) it has one of the highest per capita fish consumption in the world. What is remarkable is the fact that the high per capita consumption has been maintained despite tremendous changes in the fishing industry over the past half century, which has greatly reduced Portugal's self sufficiency when it comes to fish supply (Bjørndal *et al.*, 2015). This has been possible due to a tremendous increase in imports from 113,500 tonnes in 1976 to more than 400,000 tonnes in recent years.

Moreover, the Portuguese fish processing industry has gained importance over the last few decades. Total production increased from 127,000 tonnes in 2000 to 212,000 tonnes in 2012, while turnover increased from €740 million in 2002 to €1,078 million in 2012. Expansion has been particularly important for frozen and salted & dried production, which experienced major increases in recent years. In 1969, frozen production was just over 8,000 tonnes. In 2012, a quantity of almost 106,000 tonnes was recorded. In 1969, the value of salted & dried production was negligible. Production started increasing in the early 1980s, reaching its peak value of €430 million in 2007 although production has declined somewhat in recent years. Canned production on the other hand has been more stable.

From 1990-2014, Portuguese exports were characterised by substantial growth. Quantities were quite stable from 1990 to 1998 at around 90,000 tonnes, followed by a slow growth from 1999 to 2009. Then exports increased from 154,667 tonnes in 2010 to 258,223 tonnes in 2014 - an increase of 68%. Export values increased from €213 million in 1995 to €482 million in 2008. After a correction in 2009, a rapid increase occurred – and in 2014, export value amounted to €879 million.

For most products and markets, it is difficult to assess the market shares of the different suppliers. Nevertheless, this analysis shows that the share of the Portuguese fish processing industry in the domestic salted & dried cod market has increased considerably. Moreover, when it comes to imports of salted & dried cod to Brazil, Portugal has increased its market share to more than 40% at the expense of Norway which used to be the dominant supplier.

The main comparative disadvantage of the Portuguese fish processing is that, to a very large extent, it is dependent on imported raw materials with cod as the most important species. However, with the globalisation of fish markets, this is less of a disadvantage than in the past. Moreover, the fish processing industry is protected by tariffs. In addition, the industry is

supported in many other ways – by the EU as well as Portugal. This helps explain the considerable expansion of the industry. Our prediction is that the Portuguese fish processing industry will continue to expand in the foreseeable future.

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APPENDIX

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Turnover (million euros)	-	-	740	739	813	873	958	988	1091	1015	1089	1132	1078
Total production Costs (million €)									666	643	659	710	736
Quantity (tonnes)	126685	126552	142198	154415	161726	158694	179209	189666	198086	211542	211509	206914	212003
Frozen													
Production (tonnes)													
total	47013	54833	63936	62687	69829	66505	82766	87718	109098	109953	109052	103998	105892
cod	1708	2235	3557	3907	4555	6023	13748	14690	15668	22656	25478	30780	27161
% Cod	4%	4%	6%	6%	7%	9%	17%	17%	14%	21%	23%	30%	26%
Sales (tonnes)													
total	45366	53512	58818	53796	59542	59779	67053	69610	88761	86466	90530	84246	85602
cod	1663	2333	3595	4368	4537	5571	8826	8045	10231	12968	16496	21438	18726
% Cod	4%	4%	6%	8%	8%	9%	13%	12%	12%	15%	18%	25%	22%
Sales Value (1000 euro)													
total	148834	189227	207729	200455	212585	223653	258042	267299	320061	303804	310704	338927	329949
Cod	11700	18328	21767	29668	30385	39351	64200	63526	80778	88734	108761	142206	121726
% Cod	8%	10%	10%	15%	14%	18%	25%	24%	25%	29%	35%	42%	37%
Dry and Salted													
Production (tonnes)													
total	40988	33659	35410	50585	47555	48543	53991	58761	44406	60132	60267	58649	61411
cod	37871	32579	33199	45377	43999	42994	46978	47697	35275	51243	50713	50042	50049
% Cod	92%	97%	94%	90%	93%	89%	87%	81%	79%	85%	84%	85%	81%
Sales (tonnes)													
total	37848	30672	40703	40703	40745	41015	42227	42758	39208	44143	45017	43987	47406
cod	34748	29363	37745	36823	37213	36031	35763	34327	31613	36835	36700	36434	38434
% Cod	92%	96%	93%	90%	91%	88%	85%	80%	81%	83%	82%	83%	81%
Sales Value (1000 euro)													
total	256240	227503	284463	254382	248345	260319	293233	313092	277551	236677	241526	255789	258951
Cod	251526	221042	269647	235866	235054	241042	265257	275981	247093	208085	207952	226558	218652
% Cod	98%	97%	95%	93%	95%	93%	90%	88%	89%	88%	86%	89%	84%
Canned													
Production tonnes	38684	38060	42852	41143	44342	43646	42452	43187	44582	41457	42190	44267	44700
Sales tonnes	39495	37544	40698	40130	43745	43771	41789	42211	43533	38503	40671	46864	42808
Sales Value (1000 euro)	123869	138826	107454	116982	149366	151751	156250	164441	168200	169496	176637	200045	194725
Performa													
Gross value added (million €)	-	-	-	-	-	-	-	-	499.6	449	513.3	508.9	421.6
Capital productivity (%)	-	-	-	-	-	-	-	-	48.3	45.4	48.7	50.2	43.2

Source: Döring and Borrello (2014) and INE (2015)

Figure A.1. Economic performance of the Portuguese fish processing industry sector, 2000-12

This paper analyses developments in the Portuguese fish processing industry from the 1960s to the present as well as prospects for future expansion. Fish processing has expanded in recent decades gaining market share in the domestic market for processed products at the expense of imports. Furthermore, Portugal has now become an important exporter to several countries.

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